Enhancing Climate-related Disaster Resilience through Effective Risk Communication in Bandung, Indonesia

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Enhancing Climate-related Disaster Resilience through Effective Risk Communication in Bandung, Indonesia

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Abbreviations and Acronyms

ADPC	Asian Disaster Preparedness Center
Bappenas	*Badan Perencanaan dan Pembangunan Nasional* (National Development and Planning Agency)
BNPB	*Badan Nasional Penanggulangan Bencana* (National Disaster Management Agency)
BPBD	*Badan Penanggulangan Bencana Daerah* (Local Disaster Management Agency)
Bappeda	*Badan Perencanaan dan Pembangunan Daerah* (Local Disaster Management Agency)
CBDM	Community Based Disaster Management
CBDRR	Community Based Disaster Risk Reduction
CBSOs	Community Based Society Organizations
CCA	Climate Change Adaptation
CDRI	Climate Disaster Resilience Index/Initiative
CIG	Community Information Group
CRED	Centre for Research on the Epidemiology of Disasters
DM	Disaster Management
Diskominfo	*Dinas Komunikasi dan Informasi* (Communication and Information Service Agency)
DRR	Disaster Risk Reduction
FBOs	Faith-Based Organizations
GDP	Gross Domestic Product
GOI	Government of Indonesia
HFA	Hyogo Framework for Action
IFRC/RC	International Federation of the Red Cross and Red Crescent
IPCC	Intergovernmental Panel on Climate Change
LECZ	Low Elevation Coastal Zone
MoE	Ministry of Environment of Republic Indonesia
MSP	Multi-Stakeholder Platform
Musrenbang	*Musyawarah Rencana Pembangunan* (Annual coordination meeting of development planning between government and community)
NGOs	Non-governmental Organizations
POSKO	*Pos Komando* (Disaster Coordination Unit)
Puskesmas	*Pusat kesehatan masyarakat* (Community health center)
Rakor	*Rapat koordinasi* (Local coordination meeting of development planning between government and community)
SIERA	Social Institutional Resilience Activities
SP	Single Platform
TAGANA	*Taruna Siaga Bencana* (Youth Disaster Preparedness Unit)
UN	United Nations
UNISDR	United Nations International Strategy for Disaster Reduction
USD	United States Dollar
WWAs	Women Welfare Associations *(TP-PKK: Tim Penggerak dan Pemberdayaan Kesejahteraan Keluarga)*
YUs	Youth Unions *(Karang Taruna)*

Executive Summary

1. Background of Dissertation

Since the past decades, the rising pressures of climate-related disaster risk due to climate change are impacting cities increasingly. Coupled with the emerging urban risks, described as stresses, such as the ever-growing urban population in terms of urbanization, leads to inadequate resources for cities to fulfill its services to citizen. Particularly for Asian cities, where the trend of urban population is observed increasing, cities aggravated by disasters will exacerbate the underlying risks such as issues closely link to urban poverty, pressure on land that is causing informal settlements that push people migrating and living in high-risk conditions and being exposed to disaster events, lack of basic supplies and ecosystem services, loss of urban green spaces, unplanned development, inadequate health, lack of sanitation and improper solid waste management. It is also observed that the increasing climate-related disasters in urban areas, shaping as high frequent and low consequent events such as regular floods and local inundations, in the context of climate change, are the driving force for cities in Indonesia, as being one of the most disaster prone countries in the world, to urgently address locally these threats; since the impact of disasters in terms of affected people and damages, are largely felt at the local level. Consequently, against this backdrop, medium size cities in Indonesia, which has the potential of growth, such as Bandung, are frequently affected from these local inundations. This high frequency of local inundations have been affected people and caused economic damages in Bandung. Therefore, Bandung City has to be resilient, competent and sufficiently resourced to reduce this climate-related disaster risks. To carry out proper risk reduction actions, resilience needs to be assessed, and risks need to be informed to communities. Consequently, risk communication process highlights as the crucial element in the enhancement of disaster resilience.

2. Research Objectives, Hypothesis, and Questions

The aim of this research is to understand the linkages between emerging urban risks, increasing trends of climate-related disasters, and resilience through risk communication.

Hypothesis:
Effective risk communication approaches between government and community enhance the disaster resilience"

Research questions:

- To what extent are city and its sub-city entities resilient to climate-related disasters?
- What are the risk communication approaches in the community that can enhance the disaster resilience?
- How is the effective risk communication approach contributes to disaster resilience?

Figure E.1: Hypothesis and research questions of the dissertation

The objectives are as follows: firstly, to assess disaster resilience of urban area at city and its sub-city entities towards climate-related hazard such as high frequent and low consequent floods, secondly, to identify risk communication approaches at community level to enhance the resilience, and to formulate effective risk communication approaches for a disaster resilient community.

Figure E.1 highlights the hypothesis and research questions of this dissertation, which have been addressed through literature review; fieldworks in the form of questionnaire surveys, workshops, focus group discussions, interviews; and gathering and analyzing secondary data.

3. Model of Risk Communication Approach for Disaster Resilience in Bandung

The model of effective risk communication approach is that it enables the integration of resilience assessment and risk communication in allowing the two-ways communication processes between city and its citizen, between government and communities, takes place (Figure E.2). It is comprehensive, hence it involves all actors, approaches, means, sector-wise, and time-scale based. It is integrated, hence it assimilates two approaches namely resilience assessment and risk communication process, blending local government and community efforts to act upon improvements in resilience in achieving ultimate disaster risk reduction; with the media as the connector and mediator in bringing the gaps and issues, concerns, and needs of both sides, government and community closer. The Multi-Stakeholders Platform for risk communication (MSP RC) at the city level is the key forum in addressing the aspects collaboratively in seeking ways, solutions, strategies, and plans; and to set planned actions in operationalization, key local stakeholders such as government and agencies, academe, private sector, CBSOs, and other organizations are strongly involved. This risk communication approach is called network practices. Subsequently, risk communication approaches at the community level, Community-Based Society Organizations, such as Women Welfare Associations (WWAs), Youth Unions (YUs), and Faith-Based Organizations (FBOs) are strengthening the process. With their respected DRR activities as Single Platform for risk communication (SP RC), risks information and key messages are transformed and conveyed to communities. This risk communication approach is called community practices. Finally, it is two-ways, hence a process of exchanging risk information between city and community takes place; where concerns, prioritization of actions, and needs are communicated and addressed. It is reciprocating, creating a two-way of communication of informed decision and actions, knowledge, and messages between government and community through media practices and local risk communication. To have a comprehensive approach of risk communication, three indispensible elements should be in place; network practices, community practices, and media practices. The contents of each practice are subject to and contextualized to each area's condition. For example, it may happen in other area that in community practices, CBSOs other than WWAs, YUs, and FBOs are arising and identified as local champions and risk communicators to community. The bottom line is that there should be local actors and local actions that drive community to take actions in enhancing the resilience, as in accordance with the fundamental principle of risk communication that it triggers people to act, correctly.

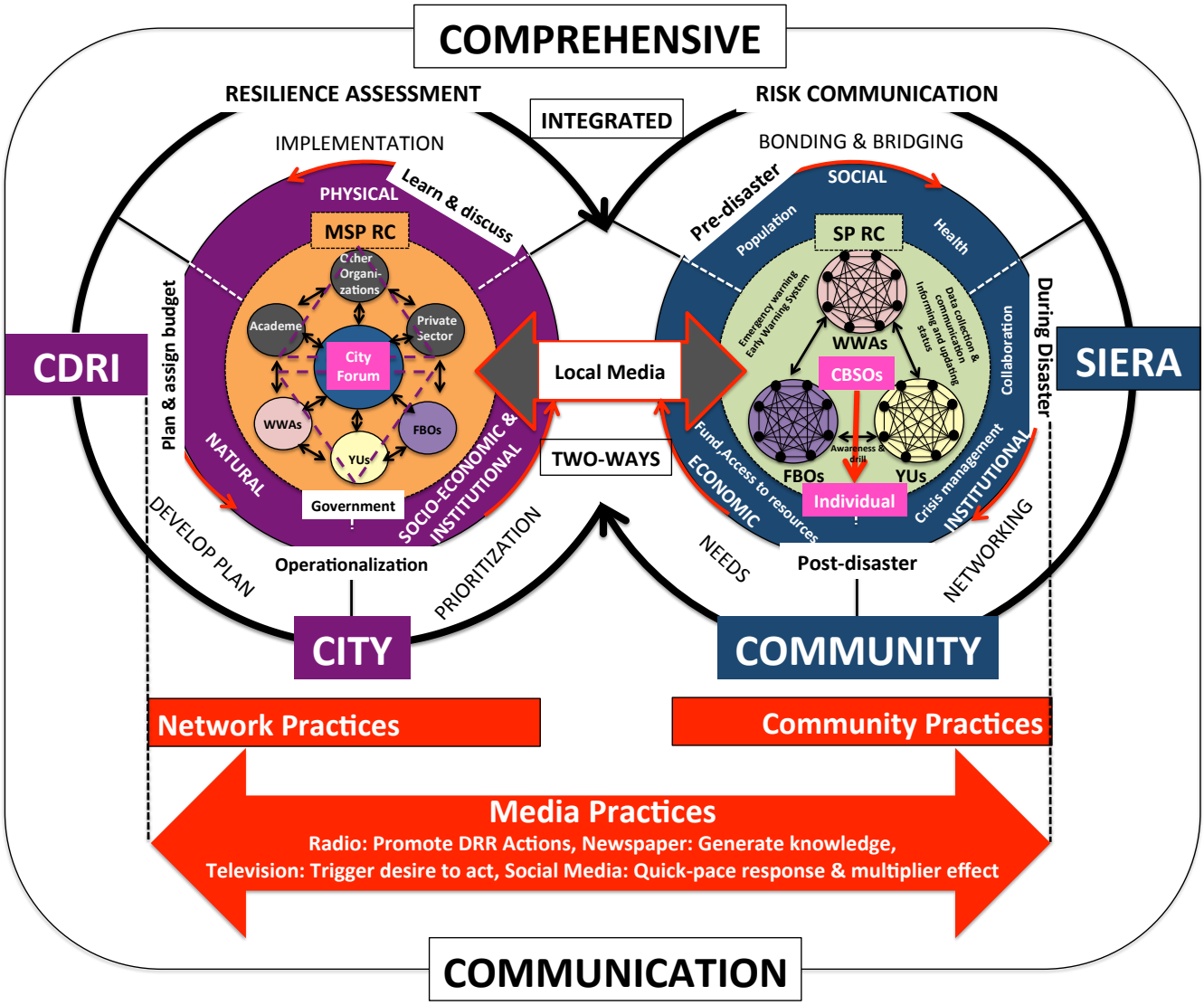


Figure E.2: Model of Comprehensive Risk Communication Approach for Disaster Resilience

4. Key Findings on Effective risk communication approach in enhancing the resilience of Bandung

The implementation of resilience assessment through CDRI methodology in the study is an approach to institutionalize local initiatives in risk reduction and city development and local governance that are not enough reflected in the national context. Key findings drew from the assessment at the city level supports the Government of Bandung City in pointing out weaker and stronger sectors in stimulating action planning of DRR and resilience activities. Socially, institutionally, and economically are measured weak at city level. On the contrary, these sectors are strong in sub-city level; whereas this sub-city level assessment helps in contextualizing specific DRR and resilience actions by local actors, such as WWAs, Youth YUs, and FBOs, as the most active CBSOs at neighborhoods in Bandung. Through women's, youth's and mosque leaders' social, institutional, and economic activities, risks are informed and DRR are implemented and therefore it underpins the promotion of local governance in city. WWAs have proved through SIERA approach to be effective in communicating risk in pre-disaster period. Awareness and drill and emergency warnings, as well as establishing early waning system with local

authority and informing, updating disaster status to local authority are as most conducted WWAs' risk communication. Women's activities are strong in social issues, specifically on population and health issues, of which these are the platform in engaging communities in DRR and resilience. Due to WWAs' nature of organization, their activities are inline with governmental programs and thereby WWAs in Bandung contribute in city development. The YUs are mostly active in during disaster period. Most of the members of the active YUs (40%) are members of TAGANA (Youth Disaster Preparedness Unit) in Bandung. This affects YUs' skills and knowledge during emergencies, such as mobilization of youths as first responders and fund raising. Due to involvement of TAGANA, YUs are strong in institutional sector and have close networking with local agencies and authorities, such as sub-district and ward governments, as well as Bandung Social Service. Most distinguished YUs' risk communication is data collection of disaster losses and communicating these to officials. Additionally, mosque leaders within FBOs engage in humanitarian aspects. Key findings point out that mosque leaders in Bandung are determinant figures within communities and neighborhoods in mobilizing all community members in taking DRR actions. FBOs are strong in socio-economic sector. Mosques' activities provide communities the psychological solace in post-disaster and its construction enable as community evacuation shelters due to its simple yet complete facilities; thus made FBOs as place-based risk communicators. Lastly, the media practices, such as radio, newspaper, and television support the dissemination of risk information to citizen in Bandung. Coupled with local risk communication interfaces, such as community radio, neighborhood network, local annual and weekly coordination meetings of development planning between government and community, risk communication process between city and community is strengthened. Therefore, the conducted resilience assessment through Climate-related Disaster Resilience Index (CDRI) initiates the translation of planning into action through CBSOs' Social Institutional Economic Resilience Activities (SIERAs). The strength of the three CBSOs is showcasing local practices in risk reduction within the community, enhancing resilience, and contributing to city development and local governance. CBSOs' activities serve as the risk communication platform and create concerned citizen in Bandung.

5. Way Forward

The study of enhancing climate-related disaster resilience through effective risk communication in Bandung, Indonesia has brought some deep thoughts on further investigations and tries to identify recommendations and innovative ideas as future research scope. But the most urgent issue that needs to be taken up by the Government of Bandung City is institutionalization of regular assessment. Resilience assessment needs to be regularly updated and it should be included in the annual working program of Government of Bandung City. It will reduce the gap horizontally (bring governmental agencies closer in terms of coordination) and vertically (bring government at city and sub-city level closer in terms of collaboration). Thus, the assessment process needs to be included in city's development planning, with clear task description and budget allocation, formally applies to and endorses by city house of representatives. This provides the entry point of risk reduction actions to be followed up at community level in creating concerned citizen of Bandung City, Indonesia.

Chapter 1
Introduction

"The way to do research is to attack the facts at the point of greatest astonishment."
~Celia Green

Chapter 1
Introduction

This chapter presents an overview of the entire dissertation. It illustrates the objectives, research hypotheses and questions, as well as methodology of the research. Additionally, this chapter draws a background of the key issues and challenges in urban areas such as the emerging urban risks and climate change that lead to the increased climate-related disasters in cities. Therefore, cities in Indonesia need to be resilient to cope with underlying urban risks. It highlights the importance of local governance, such as local actors and methods in the resilience assessment and risk communication to wider public. This chapter also outlines and provides brief explanation of each chapter of the dissertation.

1.1 Background and Problem Statement

"I call for the need of world leaders to address climate change and reduce the increasing risk of disasters- and world leaders must include mayors, townships and community leaders". Above statement was delivered by Ban Ki-moon, UN Secretary-General at the Incheon Conference "Building an Alliance of Local Governments for Disaster Risk Reduction" on August 2009. This statement is extremely important to be translated into actions since the impacts of climate change are likely to aggravate further the rising trends of hydro-meteorological-related disasters, such as floods, storms, droughts, etc., or in other words climate-related disasters (IPCC, 2007). As of today, more than half of the global population resides in urban areas and by 2050, two-thirds of the world's population and the vast majority of wealth will be concentrated in urban centers (UNISDR, 2012). Thus urbanization as one of urban emerging risks that is occurring in cities is a concern, particularly where local infrastructure and institutions are extremely important to cope with impacts of more extreme climatic events that pose greater risk to disasters. Consequently, against this backdrop, cities in developing and disaster prone countries such as Indonesia have to be resilient, competent and sufficiently resourced to reduce disaster risks. Key issues for building urban resilience is how to assess and support its resilience and communicate this to the public (urban communities/citizens), as well as how to support and learn from local actors, risk communicators, and change drivers in leveraging their significant changes in city and micro-city level resilience; hence appropriate risk reduction actions can be taken.

1.1.1 Emerging Urban Risk

A significant risk that is shadowing cities is the ever-growing urban population in terms of urbanization and adequate resources to fulfill its services to citizen. Cities are places for opportunity but as well as vulnerable spots to disasters for human being. In cities, both population and wealth are accumulating and lead to higher exposure and consequently increasing for example flood damage potential (IPCC, WMO, and UNEP, 2012). Figure 1.1 illustrates global and Asian urban and rural population, which shows that the trend of urban population in Asia is increasing. Urban areas are complex and have intrinsic elements that affect people's lives. Thus cities aggravated by disasters will exacerbate the underlying risks such as issues closely link to urban poverty, pressure on land that is causing informal settlements that push people migrating and living in high-risk conditions and being exposed to disaster events, lack of basic supplies and ecosystem services, loss of urban green spaces, unplanned development, inadequate

health, lack of sanitation and improper solid waste management, as further discussed in Chapter 2. The increasing climate-related disasters in urban areas, shaping as high frequent and low consequent events such as regular floods and local inundations, in the context of climate change, are pushing cities to urgently address locally these threats; since the impact of disasters will largely felt at the local level.

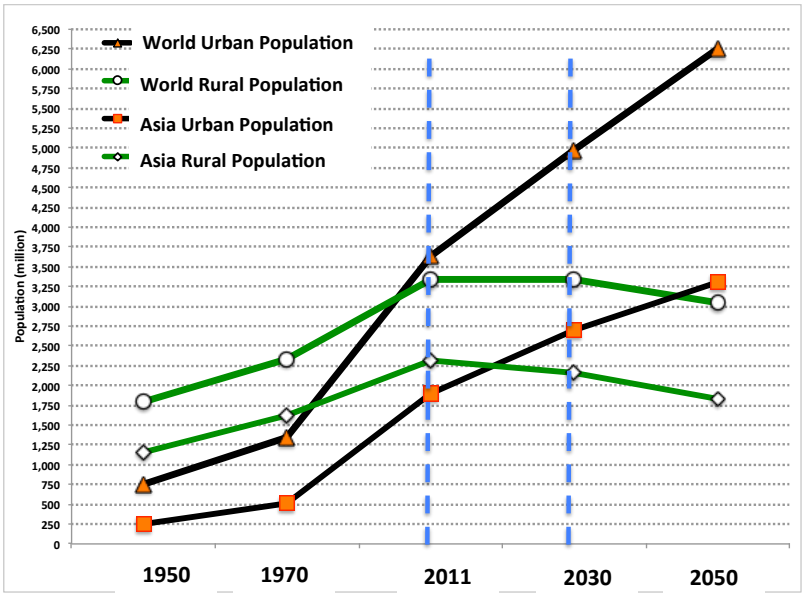


Figure 1.1: Urban and rural population in World and Asia (data analyzed, Source: UN, 2012)

1.1.2 Climate Change and Climate-related Disasters

There has been a 50 percent rise in the extreme weather events associated with climate change from the 1950s to the 1900s (IPCC, 2001; UNHABITAT, 2007). According to the Intergovernmental Panel on Climate Change (IPCC), the global warming over the past decades is man-made and has led the global temperature to increase by 0.8 degree (in Celsius) in the twentieth century and is further expected to rise depending on the scenarios and location on the earth by up to 6.4 degree in the twenty-first century (IPCC, 2007). Many cities have already started experiencing increased intensity of storms, flooding, water stresses, migration storms, and landslides that climate change is bringing (Sharma, Surjan, and Shaw, 2011).

The International database has recorded that over the years, the trends of climate-related disasters, particularly floods are increasing, affecting more people (Figure 1.2), and causing more damage in economical terms; although the geophysical disasters, such as earthquake, tsunami, and volcanic eruptions are recorded as the deadliest disasters. Therefore it is of utmost important to assess local potentials that may increase community resilience to climate-related disasters. Consequently, this study thus put local governance and the resilience assessment at the forefront. Particularly risk communication processes and approaches at the local level are essentials in bridging the gap between local government's and community's needs and concerns as the follow up of resilience assessment on how to way forward in the overarching goal of risk reduction and disaster resilience.

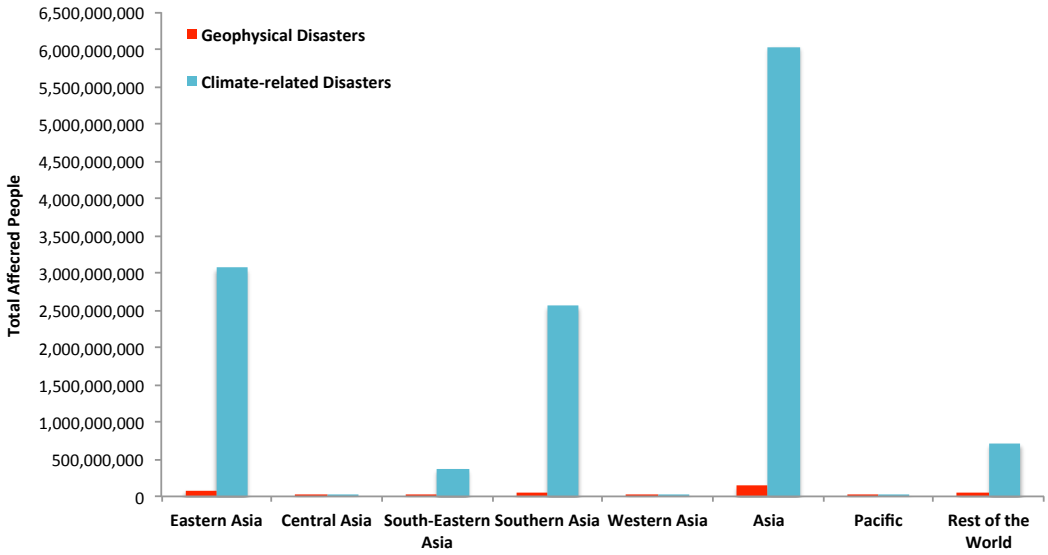


Figure 1.2: Global and Asia-Pacific total people affected by disasters, 1900-2013
Data Analyzed based on CRED/EM-DAT as of December 31, 2013 (Source: CRED/EM-DAT, 2013)

1.1.3 Local Governance in Disaster Risk Reduction and Resilience

The issue of local governance in disaster risk reduction and resilience in this study is focusing on how risks are reduced and resilience is enhanced at the local level. It is how two major components, namely, local government and community are interacting towards a common goal of resilience to disasters due to changing climate. Therefore it is of extreme importance to look at the institutional framework for both disaster risk reduction and climate change adaptation, focusing on local actions. The crucial and effective process of climate-related disaster risk reduction is thus required at local levels; because it is there, where disasters' impacts are most immediately and intensely felt. Subsequently, the importance of localizing disaster risk reduction activities and local actors that may inhibit local potentials as the agents of change, risk communicators, and drivers of risk reduction within communities are thus becoming widely recognized. For example, local governments have strong role in determining the disaster risks that their communities are facing and bear the ultimate responsibility for the safety of their citizens and communities (Christoplos, 2003). Moreover, local community groups play a crucial role in disaster risk reduction and in the overall resilience building. Norris et al. (2008) stated that the community is not always bound by geography. Communities are formed from grass-roots groups and neighborhoods to complex amalgams of formal institutions and sectors in larger geo-political units form communities. One path towards community resilience is the prevention of disaster-related health or mental problems among community members and the other path have been more concerned with community resilience through effective organizational behavior and disaster management. Thus the concept of resilience is closely related to risk reduction; therefore it is pragmatic to apprehend that risk reduction is a path to resilience building. To carry out proper risk reduction actions, resilience needs to be assessed, and risks need to be informed to communities. Consequently, risk communication process highlights as the crucial element in disaster resilience.

1.1.4 Risk Communication through Local Actors

The field of risk assessment and risk management has advanced considerably in the past few decades as the trends of disaster, particularly climate-related disasters, is increasing. The manner in which the community was informed of the associated risk before, during, and after the event can directly affect whether the event is perceived as being handled successfully or not. Consequently, risk communication and its application are becoming widespread and important (Maher, 2006). Shaw (2011) mentioned that people at the community level are the first one become vulnerable to the effects of hazardous events. Since disasters are impacting directly at the local level, local potentials and actors that are driving as risk reduction force within communities are essential to be identified. Therefore the concept of putting the communities at the forefront gave rise to the idea of Community-Based Disaster Management (CBDM). These forces are taking a shape as Community-Based Disaster Risk Reduction (CBDRR) that is driven by Community-Based Society Organizations (CBSOs) in the overall framework of Community-Based Disaster Risk Management (CBDRM). Thus CBSOs as local actors withhold an important role as local actors in risk reduction and communication processes in the community, as further discussed in Chapter 2 and specifically in Bandung, Indonesia in Chapter 5. CBSOs are considered not only as local actors in disaster risk reduction and communication, but also they play critical role in providing social services and mainstreaming these as development activities (Clayton et al., 2000). Their nature, as close to community members, scale and profile of CBDRR have been acknowledged and recognized by the government. Consequently through these recognitions, it enables them to mainstream and conduct activities on reducing the disaster risks, thus communicating risks targeting the beneficiaries for communities.

1.1.5 Risk Communication in the Context of Climate-related Disasters in Urban Areas

Above points argued why local actions, such as risk reduction and communication, are needed to enhance resilience to the increasing climate-related disasters and why therefore the institutional framework for both disaster risk reduction and climate change adaptation, focusing on local actions is extremely important. The ultimate key question arises as how to reverse this trend of increasing climate-related disasters. It requires an understanding of how cities grow and what will be the impact of autonomous growth on their susceptibility to disasters, particularly to small high frequent and low consequent floods events that can lead to big catastrophic event in cities. Accelerated urbanization in the last two decades is a major development that has caused climate transformation in many countries. The South East Asia Study for Climate Change Adaptation conducted by Resurreccion, Sajor, and Fajber (2008) showed that urbanization plays a significant role in adapting to the climate change. Since the 1970s, a shift to urbanized living has become a major trend in many Southeast Asian countries, foremost in Indonesia as the largest nation in South East Asia region. Urbanization, including peri-urbanization is undoubtedly the impact of rapid development of most countries in South East Asia in the current and next decades. Thus local government in urban areas needs to be equipped with strong administrative structures and authorities for effective jurisdiction by innovative and renewed institutional arrangements in flood disaster management. These factors give a distinct dimension to the socio-economic

vulnerability of people in these places. Since local authorities have mandate and legal aspects background, it is crucial for them to pick up the lead and convey the flood risk information to the communities through risk communication.

Risk communication is an "interactive process of exchanging of information and opinion among individuals, groups, and institutions", as defined by the Society of Risk (US Public Health Service, 1995 in Adler and Kranowitz, 2005). If often involves multiple messages to the types and levels of the risk, or to concerns, opinion, or reactions to risk messages, or to legal or institutional arrangements for risk management. A working definition of risk communication is done when public is informed of potential risks and benefits of specific projects and programs (Mulyasari et al., 2011). The National Research Council (1983) summarized that disaster risk communication is actually the creation of a platform to enable stakeholder participation in all processes of the risk analysis cycle to support stakeholders understand the rationale behind risk assessment results and management options. And by that people can make better-informed choices of actions in an uncertain and complex situation. The involvement of media such as radio, newspaper, and television and local media such as community-radio, campus-based radio, and community development meetings to contextualize the actions are determinants in risk communication process; because media are the key mediators of communication between the public, science, and political and management spheres on collective challenges as natural hazards and climate change (Beck, 1992). Media outlets such as radio, newspaper, and television make the same information available to various audiences, even across geographical and political borders. They hence act as "social glue" with respect to the perception and interpretation of natural hazards in heterogeneous societies (Miles and Morse, 2007).

Thus, the need of such urban flood risk information at the local scale is one of central issues, especially for urban development planning. Such information is necessary in order to assess the impacts of urban floods on human and natural systems and to develop suitable adaptation, mitigation, and risk reduction strategies at the local level. Therefore it is imperative in exploring local risk communication approaches through local potentials and actors in cities that may enhance the city's resilience (government and community) to climate-related disaster.

1.2 Research Location

The research is carried out in Bandung City, Indonesia (Figure 1.3). Bandung is the third largest city in Indonesia with nearly 2.4 million inhabitants and the capital city of most populated part of the country, namely West Java Province. After the Indonesian Independence from Dutch and Japanese Colonialism in 1945, the city experienced rapid development and urbanization, which has transformed Bandung from idyllic town into a densely populated urban area with an average population density of more than 14 thousands people per square km (Bandung Statistical Agency, 2011). Since 2008, the mayor of Bandung City is directly elected by the community and not longer nominated and selected by the city council members. In terms of administrative units, Bandung City is divided into 30 sub-districts and 151 wards, headed by sub-districts' and wards' leaders.

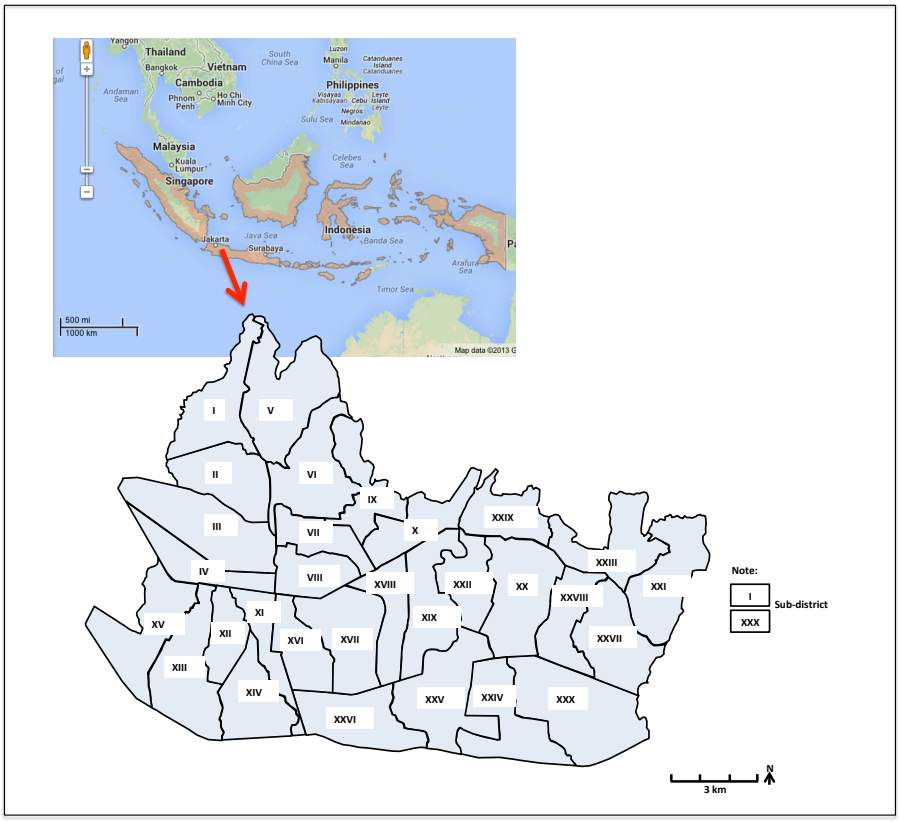


Figure 1.3: The location of Bandung City and its 30 sub-districts
(Source inset Map: Google Maps, 2013, Source Bandung Map: Bappeda Kota Bandung, 2010, modified)

The city is located in a large river basin, which makes the city susceptible to floods when the rainy season coupled with intense rainfall precipitation occurs. *Citarum River Basin* is one of the strategic Basins in West Java. *Citarum River* flows from the mountainous area in Bandung, through the three cascade dams: *Saguling, Cirata, and Jatiluhur*, before finally flows to Java Sea. Surface water from Upper *Citarum River Basin* is a plateau area surrounded by mountain range, which forms a basin, which flows into *Saguling Dam*. This geographical condition causes the rainfall runoff on the mountain range tend to flow into the basin area, resulting in high discharge surface flow during wet season. The high discharge unfortunately is not accommodated with adequate channel capacity, which in this case is the *Citarum River* of *Upstream Citarum River Basin*. Consequently, during the rainy season, flood disaster often occurs around the *Citarum River*, which flows through Bandung Regency. Heavy flood disaster in particular occurred in *Dayeuh Kolot Subdistrict* have brought great damages and affected Bandung City, which is located adjacent to the flooded areas, as the capital city of West Java Province where many important activities occur. As the main catchment area of *Saguling Dam*, the *Upper Citarum River Basin* also holds an important role for water supply in the downstream area. Lack of water supply from *Upper Citarum River Basin* during dry season might disturb water supply for irrigation area in *Karawang and Indramayu* as the satellite cities nearby Bandung. Figure 1.4 presents the trends of rainfall and discharge in *Upper Citarum River Basin*. During the last two decades, the average of monthly rainfall during the wet season is increased, which shows that the change of climate is intervened.

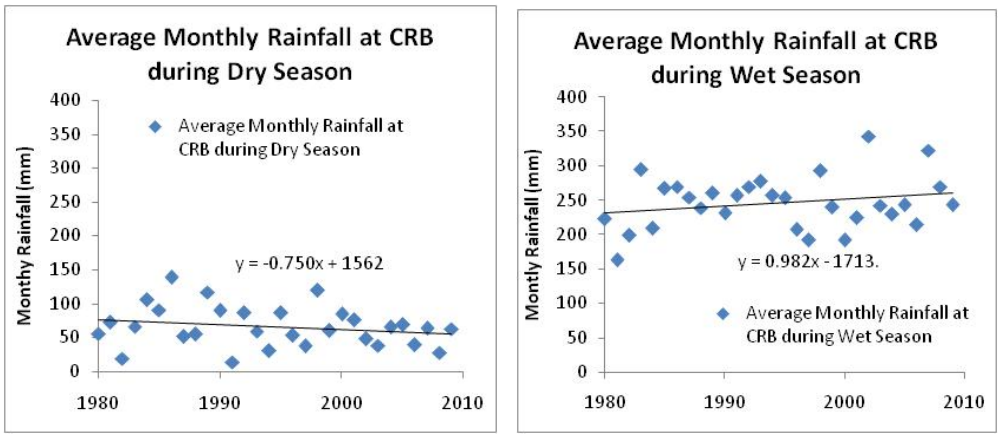


Figure 1.4: Trends of rainfall and discharge in Upper Citarum River Basin, West Java-Indonesia during dry and wet season (Source: Kusuma et al., n.d)

The study by Kusuma et al. (n.d), revealed that Climate Change Mitigation, which in Indonesia is mainly associated with flood in wet season and drought in dry season has to deals with common problems. These are for example: 1) lack of hydrological data; 2) high discrepancy in hydrology/drainage computation result using the common computation method; 3) unreliable design of drainage facilities, etc. Therefore, Kusuma et al (nd) emphasizes the importance of solving these issues for Climate Change Mitigation in the future, especially in *Citarum River Basin*, where Bandung City is located.

In addition, the lack of drainage system due to high total population and urbanization, made Bandung City increasingly experienced regular floods, especially the local inundations. Moreover, These current frequent flooding and inundations affect people and cause economic damages to Bandung and its citizen. This was observed as the current phenomenon that occurs in medium size cities in Indonesia, which have the potential as the growing cities; not only in Bandung but in other cities as well, such as Semarang (Marfai and King, 2008). This provides the background why to carry out a study of resilience to climate-related disaster, particularly in Bandung City.

Bandung Construction and Water Service recorded 26 out of 30 sub-districts are usually inundated during high precipitation, with 68 locations or spots identified through the city (*Dinas Bina Marga dan Pengairan Kota Bandung in Bappeda Kota Bandung 2010*). The local government took up necessary countermeasures for flood risk reduction, yet the measures are more structural mitigation and do not directly address the communities' specific needs. What the community needs is a system of communication that enhances their coping capacity for a more resilient community. Bandung City's existing level of community resilience has to be measured and communicated widely, and this can be done through resilience assessment and risk communication at the community level, which this study endeavors to address through the following objectives.

1.3 Research Objectives

The aim of this research is to understand the linkages between emerging urban risks, increasing trends of climate-related disasters, and resilience through risk communication. The research objectives are as follow:

1. To assess disaster resilience of urban area at city and its sub-city entities towards climate-related hazard such as high frequent and low consequent floods
2. To identify risk communication approaches at community level to enhance the resilience
3. To formulate effective risk communication approaches for a disaster resilient community

Addressing the above objectives, the study is posing following key questions.

1.4 Research Questions

The study possess following key questions that need to scrutinize through research activities. These are as follow:

1. To what extent are city and its sub-city entities resilient to climate-related disasters?
2. What are the risk communication approaches in the community that can enhance the disaster resilience?
3. How is the effective risk communication approach contributes to disaster resilience?

The study advanced few methodologies to answer above questions and is illustrated in below section.

1.5 Research Methodology

To achieve the objectives and to answer the key questions, the study utilized quantitative and qualitative methods. Workshop, questionnaire surveys, semi-structured interviews, and Focus Group Discussion, are advanced to obtain primary data. Literature reviews and secondary data were gathered from documents such as academic journal papers, reports, and publications. These documents are analyzed to complement the empirical data (Figure 1.5). The primary phase of this study included an extensive literature review to develop in-depth understanding of the key concepts in disaster management, particularly on the emerging risks and increasing trends of climate-related disasters in an urban context. How urban areas preparing and coping with those issues and be resilient towards disasters in the future through risk communication approaches, is imperative to be investigated.

The second phase of the study is acquiring the primary data to delve into disaster resilience and risk communication. Questionnaire surveys were conducted with CDRI tool (Climate-related Disaster Resilience Index) and SIERA (Social Institutional Economic Resilience Activities) approach. Whereas CDRI was used to analyze the resilience assessment in Bandung City and its sub-city entities (30 sub-districts) at government level and SIERA was used to analyze the risk communication approaches through three Community-Based Society Organizations (CBSOs) such as Women

Welfare Associations (WWAs), Youth Unions (YUs), and Faith-Based Organizations (FBOs) at the community level (151 wards).

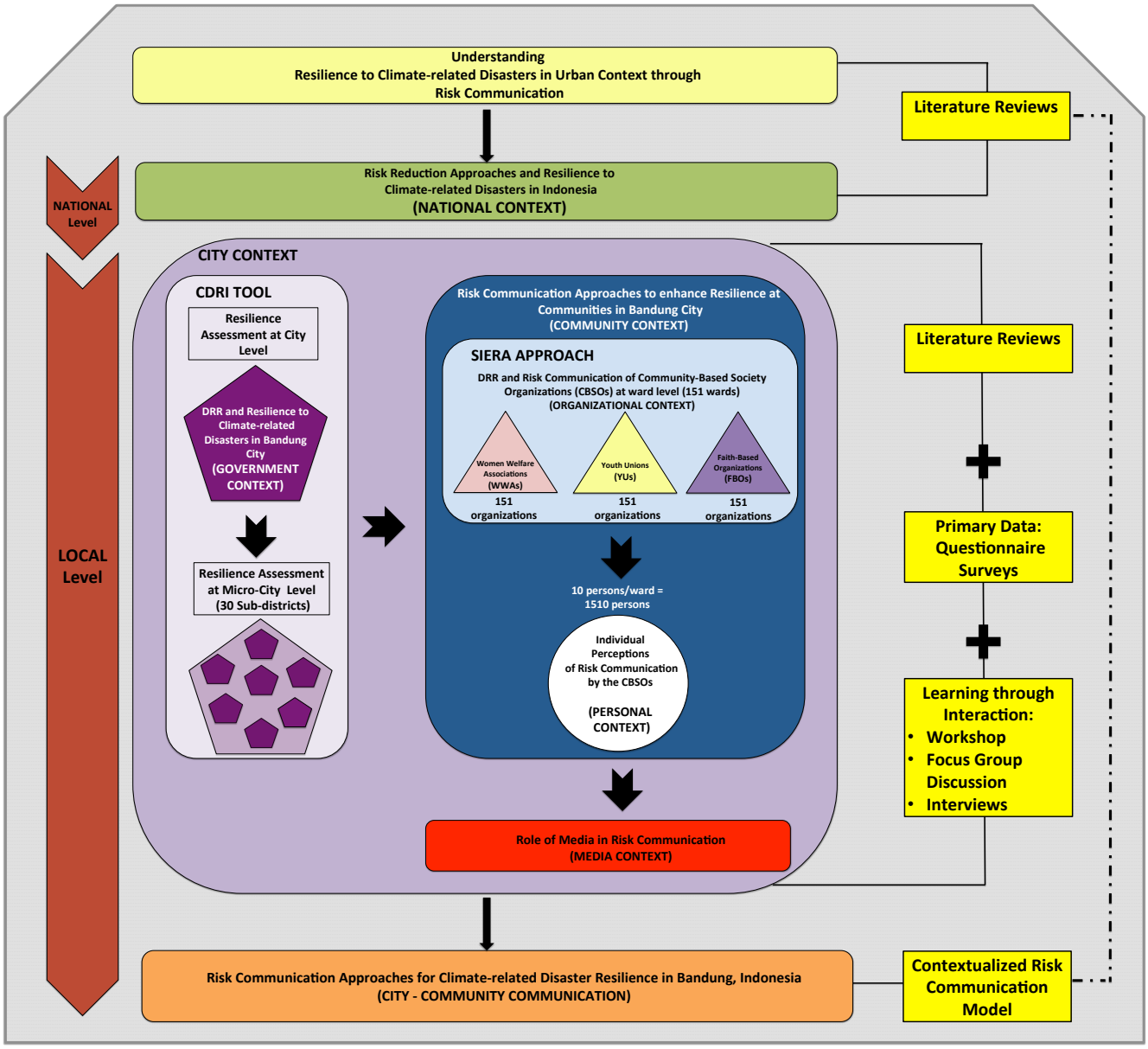


Figure 1.5: Research Framework of dissertation for enhancing climate-related disaster resilience through effective risk communication in Bandung, Indonesia

Subsequently, to understand the individual perceptions of risks and risk communication in Bandung City through the three CBSOs, individual questionnaire survey was conducted in all wards of the city. Moreover, a Focus Group Discussion was held with CBSOs and local authorities to collect first-hand data on risk communication interfaces at communities, where problems and solutions of disaster risk communication in Bandung City are pinpointed through a Problem Tree analysis. Lastly, semi-structured interviews were utilized to extract insights on the role of media in Bandung as risk communicators. These methods are further illustrated and discussed in Chapter 4, 5,

and 6. The study thus consists of different methodologies and approaches to collect primary data. First, research-related literature was reviewed to gain a preliminary understanding of resilience to climate-related disasters in the urban areas context through risk communication. Secondly, different types of questionnaire surveys generated primary data. And thirdly, workshop, FGD, and interviews are used to support the in-depth analysis of enhancing resilience, local risk communication approaches and the role of media in risk communication. All in all these steps are conducted to formulate a contextualized risk communication approaches for climate-related disaster resilience as the final output of the study. Table 1.1 summarizes the surveys (fieldworks) with respective collected sample and data.

Table 1.1: Summary of field works with collected data and sample

Fieldwork	Methodology	Stakeholder
Resilience Assessment	**Climate-related Disaster Resilience Index (CDRI)** ▪ Workshop ▪ Questionnaire Survey	▪ City Government (Bandung City Development and Planning Agency) ▪ Sub-district Government (N=30)
Risk Communication Approaches at Community Level	**Social-Institutional-Economic Resilience Activities (SIERA) Approach** ▪ Questionnaire Survey ▪ Focus Group Discussion	Community-Based Society Organization (CBSO) at wards ▪ **Women Welfare Associations (N=119/151)** Community-Based Society Organization (CBSO) at wards ▪ **Youth Unions (N=145/151)** Community-Based Society Organization (CBSO) at wards ▪ **Faith-Based Organizations (N=151/151)** Community member ▪ **Individual at wards (N=1510)**
Role of Media in Risk Communication	**Interview**	Media ▪ **Commercial Radio (N=2)** ▪ **Community Radio (N=2)** ▪ **Campus-Based Radio (N=1)** ▪ **Newspaper (N=2)** ▪ **Television (N=2)**

Figure 1.6 illustrates the timeline of data collection through fieldworks and respective research activities.

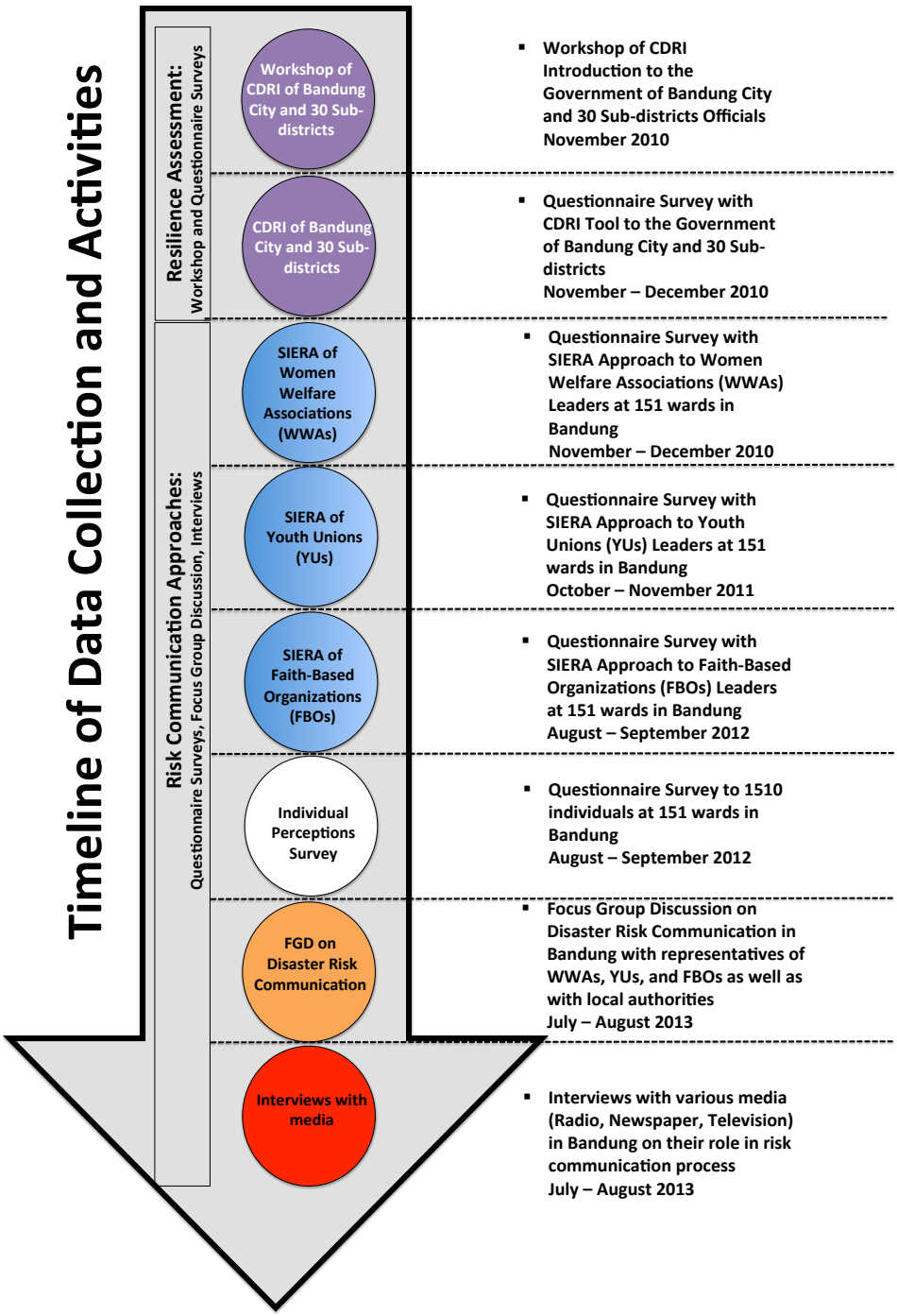


Figure 1.6: Timeline of data collection and research activities

1.6 Structure of the Dissertation

The dissertation is divided into four parts and eight chapters as illustrated in Figure 1.7. In Part 1, this introduction chapter presents the problem statement, which is followed by the objectives, hypotheses, and research questions of this dissertation. To complement this chapter, the adopted research framework aims to highlight different methodologies that were applied in this research. In Chapter 2, the trends of emerging urban risk and increasing climate-related disasters focusing on Asia are observed. Furthermore, the concept of resilience is transformed to become applicable to allow understanding the ability and capacity of city and communities to manage and respond

to the increasing climate-related disasters trends through risk communication approach and media involvement at the local level. In Chapter 3, the overview of risk reduction approaches and frameworks for climate-related disaster resilience at the national context are investigated to identify opportunities on how to way forward the risk reduction efforts and resilience down to local level. It provides the opportunity in identifying local initiatives.

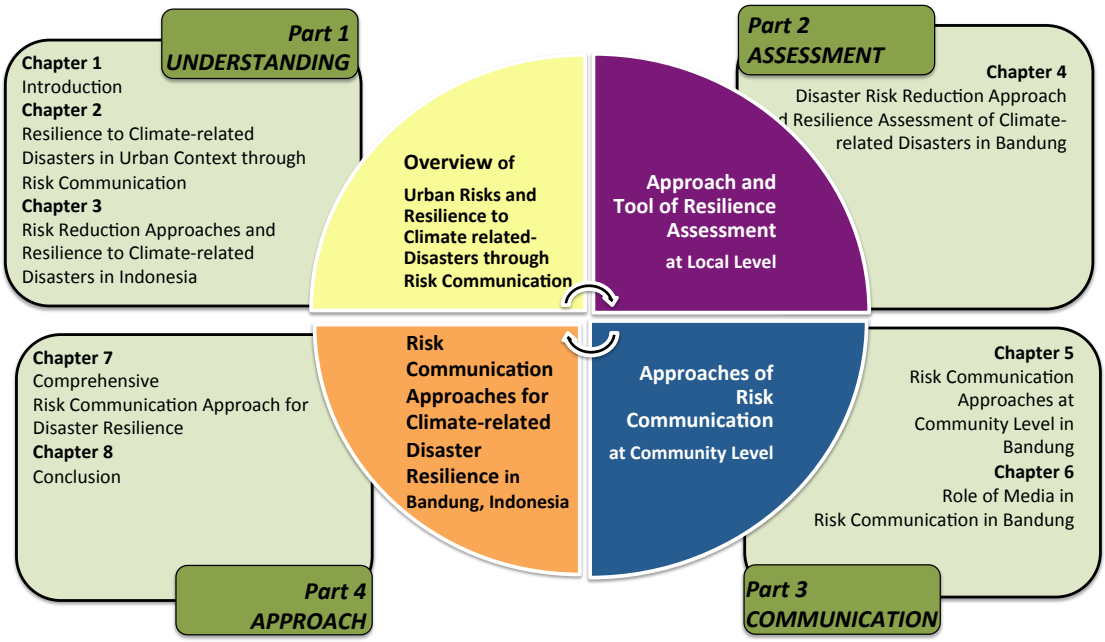


Figure 1.7: Structure of Dissertation

In Part 2, to extend the understanding of resilience and risk communication approaches at the local level; firstly in Chapter 4, the resilience of Bandung City to climate-related disaster is assessed at the city level, advancing the CDRI tool. It allows analyzing the weakness, strength, and capacities of a city to cope with climate-related disaster, secondly, the resilience is further assessed at sub-city level to localize potentials and actors that might enhance the resilience, communicate disaster risks further down to wider communities, and engage them in risk reduction actions.

In Part 3, Chapter 5 and 6 are the follow-ups of resilience assessment in Bandung (Chapter 4). Thereby, risk communication approaches at community level are further investigated as well as various media involvement in the risk communication process in Bandung. This is imperative to identify local risk reduction actors, communicators, and motivators for the community to take actions in enhancing the resilience. The involvement of media in risk communication process in the city is crucial and highlights their role in Bandung.

In part 4, the opportunities and challenges of the key findings of resilience assessment at city and sub-city level, as well as risk communication approaches through CBSOs and media from the earlier chapters are discussed in Chapter 7 and concluded in Chapter 8. These key findings are put into the context of presented model of comprehensive risk

communication approach for disaster resilience in an urban area; contextualizing the communication process between city and community and vice versa in enhancing the resilience to climate-related disasters in Bandung and trigger both parties, government and communities in taking actions.

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Chapter 2
Resilience to Climate-related Disasters in Urban Context through Risk Communication

"A tornado of thought is unleashed after each new insight. This in turn results in an earthquake of assumptions. These are natural disasters that re-shape the spirit."
~Vera Nazarian

Chapter 2
Resilience to Climate-related Disasters in Urban Context through Risk Communication

This chapter provides the overview of risks and impacts of climate-related disasters due to climate change in urban areas. Firstly, the emerging risks are revisited in relation to the stresses from climate change, focusing on the urban areas located in the Asian region. Secondly, the concept of resilience used in the urban context is linked to how the risk and resilience of cities can be measured and assessed. Thirdly, the chapter illustrates the importance of local level implementation of disaster risk reduction and potential local actors that can communicate risks and enhance the resilience. Lastly, the tool, such as media, to communicate risk information and messages to wider community and its role in risk communication and resilience is discussed. Risk communication is the way in which decision-makers communicate with various interested parties about the nature and level of risk, and the risk reduction strategies to reduce the risk. Therefore, the purpose of risk communication is to help in the planning of the risk assessment and to convey the results of the risk assessment in a way that effectively supports risk management decisions. Involving the community, establishing and maintaining relationships, and networking with other partners (e.g., agencies, organizations, officials, the media) are key elements in a risk communication strategy. Tailoring communications to the cultural diversity of the community is important because it may help establish the trust necessary to complete a risk assessment that meets all stakeholder and community needs. Risk management rooted voluntary measures will support an effective risk communication. Therefore, it is essential to illustrate the literature background of the research that increased trend of population and climate-related disasters in urban area are forcing cities and its citizen to be resilient and pointing the need of strong risk communication at the local scale.

2.1 Urban Disaster Risks and Climate Change

The United Nations International Strategy for Disaster Reduction (UNISDR, 2009) defines the terminology of disaster risk as follow: *"The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period." "The definition of disaster risk reflects the concept of disasters as the outcome of continuously present conditions of risk. Disaster risk comprises different types of potential losses, which are often difficult to quantify. Nevertheless, with knowledge of the prevailing hazards and the patterns of population and socio-economic development, disaster risks can be assessed and mapped, in broad terms at least."*

Wahlström (2009) mentioned that developing countries would suffer the most from climate change, since they are disproportionally affected and have intrinsic vulnerabilities to hazards and have to struggle in increasing the capacity for risk reduction measures. However, by contrast, Wahlström also mentioned that even in the largest and wealthiest countries, which have diversified economies and risk transfer mechanisms, the loss has topped an amount of billions of US dollars, as was the case with 2005 Hurricane Katrina in USA. It has been confirmed with facts over the last two decades (1988-2007) that 76% of all disaster events were hydrological, meteorological, or climatological in nature. How the urban areas, cities can measure their capacity for risk reduction and resilience to climate-related disasters, will be described in the later section. In urban areas, the disaster risks are multi-faceted and increasing as results of various economic, social, natural, physical infrastructures, and other stresses that create cities more vulnerable to disasters (Sharma et al., 2011; Joerin, 2012; Prashar, 2012). To

understand the underlying risks to climate change and its related disaster, the following sections outline the emerging (scale and character) of urban risks, which are alarming in cities at present state. Thus cities pose urgent challenges of climate change. Cities concentrate wealth, people and productivity, but they also inhibit vulnerability to natural disasters and to long term changes in climate. Rising sea levels will affect million of people living in coastal cities. Similarly, migration, changes in land use, and spatial development are likely to increase vulnerability of populations to changes in weather and climatic conditions (Hoornweg et al., 2011).

The following sections are characterizing and describing the urban scale and its susceptibility to emerging risks and climate-related disasters.

2.1.1 Climate-related Disasters in Urban Areas

Pacione (2009) defined urban as a physical entity and the urban as a quality. The urban as a physical entity includes population size, economic base, administrative criteria, and functional definitions. In contrast to the definitions of the city as a physical entity, the concept of the urban as a quality is related more to meaning of urban places and the effect of the urban *"milieu"* (environment) on people's lifestyles (and vice versa). Pelling (2003) states urban areas more to its function that can be defined by their economic functions; where secondary (industrial, manufacturing) or tertiary (service) sectors dominate over the primary (extractive agriculture, forestry, mining, etc.) sectors found in rural areas, by population density or size or simply by administrative region.

Although every city has an individual character, urban areas also exhibit common features such as residential space, transportation lines, economic activities, service infrastructure, commercial areas, and public buildings. In the contrary, cities also exhibit common problems to varying degrees, including inadequate housing, economic decline and poverty, health, social polarization, traffic congestion, and environmental pollution (Pacione, 2009). These have influenced the urban change. Moreover, there are other global factors that trigger this change. Pacione (2009) outlines these factors such as economic – technological – demographic – political – cultural – and environmental change. For example, the impacts of environmental change on planetary scale such as global warming due to greenhouse effect may require the construction of coastal defenses of cities in South East Asia like Bangkok and Jakarta from the danger of climate-related disaster such as inundation. In addition, on natural phenomena scale such as geophysical disasters like earthquake, tsunami, and volcanic eruptions; they force the change of urban areas in terms of abandonment of settlement. Thus, the urban changes are characterizing the risks in cities. Throughout this study, the use of environmental is referred to natural risk, hazard or climate-related disaster. According to IPCC (2001, cited in Pelling, 2003), it is difficult to separate the human and 'natural' causes of hazard and disaster events. Pelling (2003) emphasizes that human action led to global climate change and sea level rise.

Southeast Asia is one of the most dynamic, fast-growing regions in the world. In contrast, its long coastlines, high concentration of population and economic activity in coastal areas make them highly vulnerable to climate change (Zhuang et al., 2013).

Zhuang, Suphachalasai, and Samson (2013) mentioned that over the past few decades, the region has seen higher temperatures and a sharp rise in the frequency of extreme weather events, such as floods, droughts, and tropical cyclones. Therefore, responding to climate change means taking both mitigation in terms of risk reduction and adaption. The following section will highlight the vulnerable setting of urban areas, including Southeast Asia region, to climate-related disasters.

Urban Setting

The development of cities at the coastal areas, which is exposed to climate-related disasters, such as hydro-meteorological hazards, especially in the developing countries is started back at the colonial time (Pelling, 2003). These sites offer external power access to fertile soil and fresh water for agricultural production (Satterthwaite, 1998). Surjan et al. (2011) mentioned that urban centers contain a large proportion of the people most at risk from the effects of climate change is bringing (increased intensity of storms, flooding, and landslides). While Sharma et al. (2011) stated that megacities in the region (population more than 10 million) are the most visible sites of risk. As countries define "urban" settlements in very different ways, for example for the urban flooding is hard to define in a consistent manner. Urban areas always present some risk of flooding when rainfall occurs. Buildings, roads, infrastructures and other paved areas in cities prevent rainfall from infiltrating the soil, thus producing more run-offs, particularly in poorly governed cities. Urban settlements also contain major economic and social attributes and asset bases of any national population, so that urban flooding, by causing damage and disruption beyond the scope of the actual floodwaters, often carries more serious consequences for communities (Huq et al., 2007; Jha et al., 2012). Jha et al. (2012) in the Guide report mentioned that urban settlements of all types, from small villages and mid-sized market towns and service centers are very much affected by floods. For example along the Indus River, to the major cities, megacities and metropolitan areas like Sendai, Brisbane, New York, Karachi and Bangkok, all of which were struck by recent floods. Huq et al. (2007) added that in Asia, several large cities such as Kolkata, Hoi-Chi-Min, and Shanghai are located in the floodplains of major rivers like the Ganges-Brahmaputra, the Mekong, and the Yangtze, thus made them vulnerable to floods and sea-level rise.

Moreover, cities, which are located on Low Elevation Coastal Zone (LECZ), an area less than 10 meters above the sea level, are at risk from the increased frequency and intensity of extreme weather events (Huq et al., 2007). IPCC (2001) emphasized as well that river deltas are among the world's most valuable, heavily populated and vulnerable coastal systems. Munich Re (2013) has pinpointed the recent climate-related disaster (hydro-meteorological and climatological) events that impacted most of coastal cities around the globe during 2012 (Figure 2.1).

Additionally, from urban setting and urban planning context, it shows that the tendency of cities to be located and expanded on the riverbanks or coastal areas for economic reasons makes them more vulnerable to flood disasters. As example, the form and structure of informal settlements can vary from one urban context to another; however they remain 'illegal constructions'. In the urban mega cities in Southeast Asia, such as in Manila, Mumbai and Jakarta, almost 25 to 30% of the population lives in these informal

settlements, and are exposed to different types of disasters like flood and typhoons (Surjan and Shaw, 2009). The major cities in Asia are either located in the flood plain or in the coastal areas. Recent study (McGranahan et al., 2007) shows that nations with largest urban population in the Low Elevation Coastal Zone (LECZ) are China, India, Indonesia, and Japan. In brief, cities with its population and assets that are concentrated in hazard prone areas are becoming more susceptible to disaster (Quarantelli, 2003).

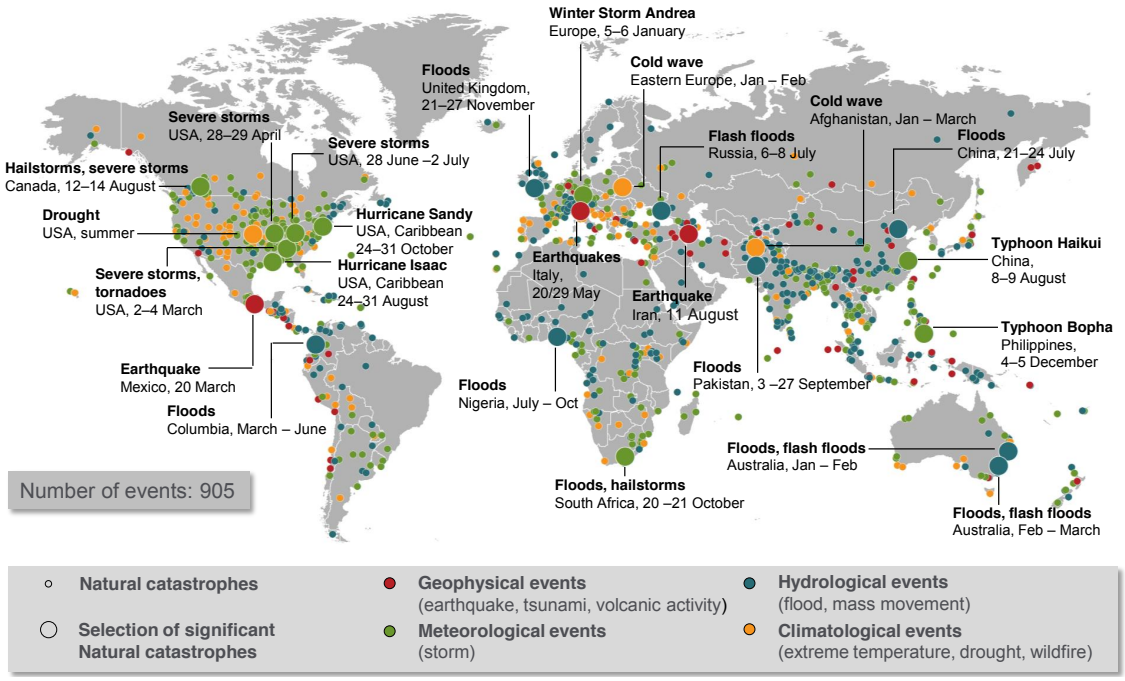
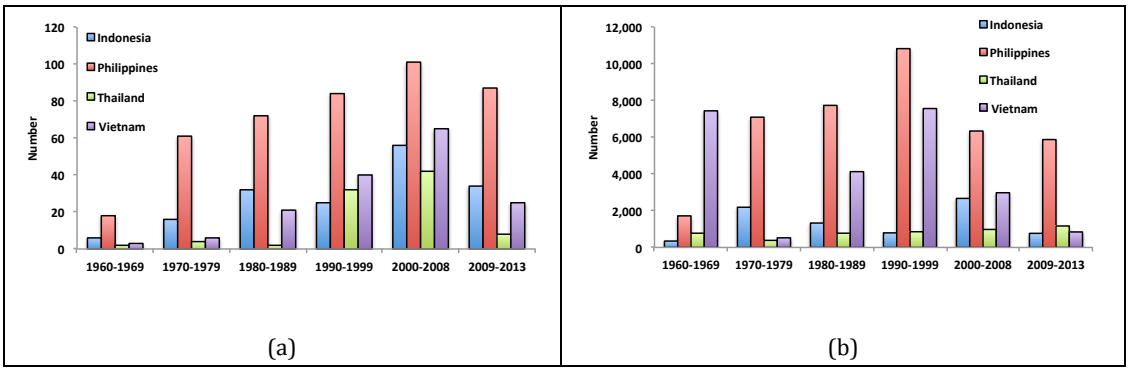


Figure 2.1: World Map of Natural Disasters in 2012 (Source: Munich Re, 2013)

As an example, climatic change is already evident in the Southeast Asia region (Zhuang et al., 2013). Previously mentioned that this has lead to massive flooding, landslides, and droughts, causing extensive damage to property, assets and human life. Following figures (Figure 2.2) shows exemplary the extent of floods/storms in the most populated country of Southeast Asia such as Indonesia, Philippines, Thailand, and Vietnam.



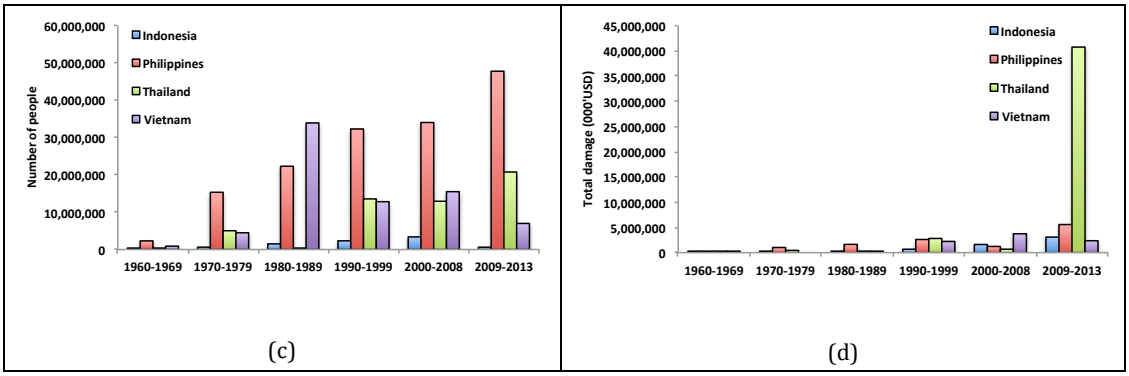


Figure 2.2: Impacts of floods in the most populated countries in Southeast Asia:(a) Number of floods/storms, (b) Number of deaths due to floods/storms, (c) Number of people affected by floods/storms, and (d) Estimated total damage from floods/storms (data analyzed, Source: CRED/EM-DAT, 2013)

It can be seen from above figures that the trends in every category is increasing. For example, the high number of people affected by the floods and storm in the Philippines is marked due to *Haiyan Typhoon* that struck the country recently (November, 2013). The same applies for the high total damage that was experienced by Thailand Floods in 2011. Complex infrastructure and urban assets are factors that were at risks and exposed to these climate-related disaster. For better understanding, following section is scrutinizing the additional factors of urban areas and its emerging risks to climate-related disasters.

2.1.2 Urban Growth and Emerging Risks

Satterthwaite (1998, p11) argues: *"the key problem (underlying urban risk) is not population growth alone, but a combination of the fast expansion of informal settlements, overcrowding or declining treatment districts, failure of city authorities to ensure sufficient water supply, sanitation, waste collection, health care etc., and the failure of city authorities to adapt their institutional frameworks in order to deal with rapidly changing city form and content."* Urban areas are increasingly becoming sites of environmental risks for their citizens (IFRC/RC, 1999). The rapid spatial expansion of cities and a rapid increase in the proportion of national population residing in urban areas at risk explains the growth in urban disaster. Clark (2000) and Hildebrand (2001) mention the statistics for urban growth (Table 2.1).

Table 2.1: The statistics for urban growth

Period (Year)	Issues
1975 - 2000	Sums up 52% million new urban dwellers were added each year, where as 87% of these in developing countries
2000	More than 50% of world's population lived in urban settlements for the first time
2000 - 2015	Sums up 65 million are added annually, where as 93% in developing countries
2015 onwards	90% of population growth in developing countries will be urban

Source: Clark (2000) and Hildebrand (2001) cited in Pelling (2003)

Subsequently, according to United Nations' report of World Urbanization Prospects (UN, 2012a), the world urban population is highly concentrated in few countries. In 2011, about three quarters of the 3.6 billion urban dwellers on earth lived in 25 countries,

whose urban populations ranged from 31 million in Ukraine and 682 million in China. China, India, and the United States accounted for 3.7 per cent of the world urban population. Most of the 25 countries with the largest urban populations are highly urbanized, but eight countries have levels of urbanization ranging from 28 per cent to 51 per cent, which includes the most populous countries in the world, such as Bangladesh, China, India, Indonesia, Nigeria, and Pakistan. As the consequence, over the next four decades, Africa and Asia will experience a marked increase in their urban populations (Table 2.2).

For instance, in Africa, the urban population is likely to treble and in Asia it will increase by 1.7 times. By mid-century, most of the urban population of the world will be concentrated in Asia (53 percent) and Africa (20 percent). With the exception of Africa and Oceania, all major areas are expected to have smaller rural populations in 2050 than today.

Table 2.2: Total urban populations by major area, 1950-2050

Major Area	Population (millions)				
	1950	1970	2011	2030	2050
TOTAL Population					
Africa	230	368	1,046	1,562	2,192
Asia	**1,403**	**2,135**	**4,207**	**4,868**	**5,142**
Europe	547	656	739	741	719
Latin America and the Caribbean	167	286	597	702	751
Northern America	172	231	348	402	447
Oceania	13	20	37	47	55
URBAN Population					
Africa	33	87	414	744	1,265
Asia	**245**	**506**	**1,895**	**2,703**	**3,310**
Europe	281	412	539	573	591
Latin America and the Caribbean	69	163	472	585	650
Northern America	110	171	286	344	396
Oceania	8	14	26	34	40
RURAL Population					
Africa	197	282	632	818	927
Asia	**1158**	**1629**	**2312**	**2165**	**1833**
Europe	267	244	200	168	128
Latin America and the Caribbean	98	123	124	116	100
Northern America	62	61	62	57	51
Oceania	5	6	11	13	15

Source: UN (2012a)

Figure 2.3 illustrates the predictions of world and Asia urban rural population 1950 to 2030. According to UN (2012a), the world urban population has become bigger than in rural area since around the year 2009. It is predicted that in Asia around 2020 the urban population will cross the rural population (Figure 2.3), thus making the urban growth as the foremost underlying urban risks. Pacione (2009) stated that the cause of urban growth is the result of a combination of natural increase of the urban population and the net in-migration to urban areas (urbanization). These two major processes reinforce each other. The urbanization is illustrated in following section. Consequently, the urban growth has the implications to the environmental change in cities, which includes various factors and inhibits environmental risk that causes cities susceptible to disasters.

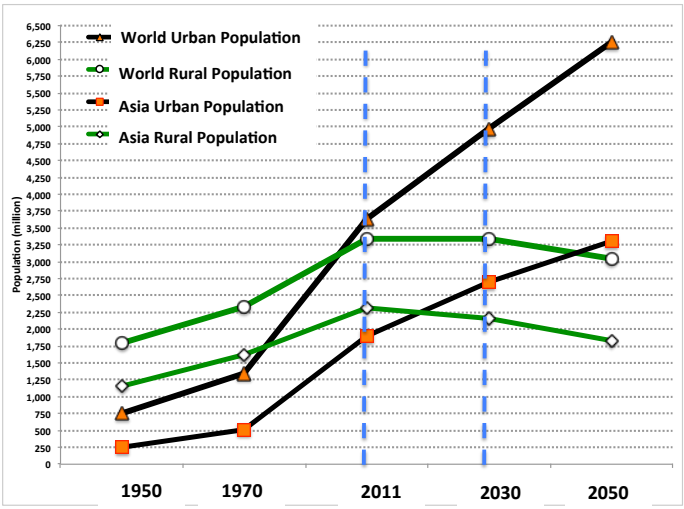


Figure 2.3: Urban and rural population in World and Asia (data analyzed, Source: UN, 2012a)

Those factors such as urbanization, poverty, community's poor health condition, changes in the land use, poor infrastructure and services, poor sanitation and solid waste management, and lack of urban governance are some of factors that shape urban risks. These factors are briefly discussed in the following sections.

Urbanization

The fact that the world is becoming increasingly urbanized is recognized by the United Nations (UNFPA, 2007) in the State of the World Population Report as the "The Urban Millennium." In year 1950, 30% of the world's population lived in cities and as of recently, the population has reached up to 50%, marking the year 2007 a turning point in the history of urban population growth (Bigio, 2003; Kreimer et al., 2003; UN-HABITAT, 2007). By year 2030, the United Nations expects more than 60% of population to be living in cities (Munich Re, 2005). And as mentioned by Surjan and Shaw (2009), by year 2050, the world's urban population is expected to grow by 3 billion people. Most of this growth will take place in developing countries, with the urban population in cities and towns doubling. Figure 2.4 illustrates the global urbanization rates, spanning over a period of 100 years.

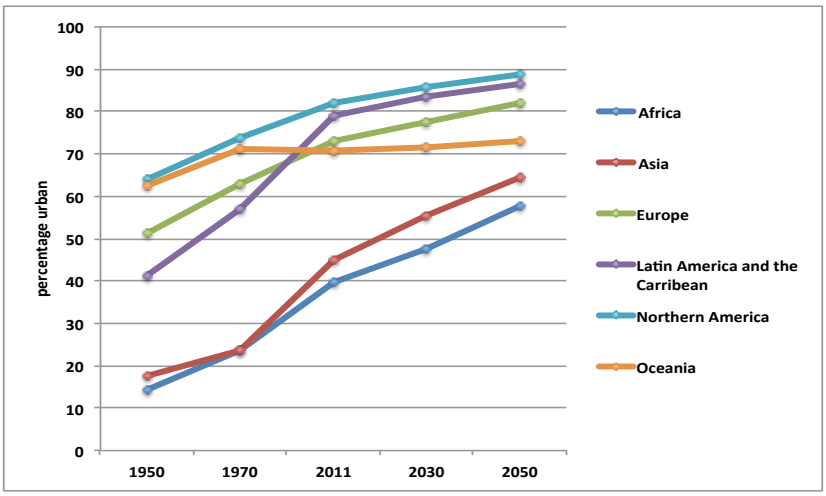


Figure 2.4: Global urbanization rates in 1950-2050 (data analyzed, Source: UNPD, 2011)

Viewing regional-wise, six Asian developing countries are experiencing rapid urbanization, includes Indonesia, and other countries, such as Bangladesh, China, India, Pakistan, Philippines, and Vietnam (ADB, 2004). Figure 2.5 shows urbanization in Jakarta, Indonesia.



Figure 2.5: Urbanization in Jakarta, Indonesia
(After the largest Islamic Religious holidays, people outside Jakarta remains in the city)
(Photo courtesy: Indonesia Public Holiday, 2012)

When a climate-related disaster occurs, such as flood, the socio-economic well being of urban areas are compromised. One of many important issues that denote the climate change vulnerability and its adaptation is urbanization. High-density population, which results to higher exposures, characterizes urban areas and the combination of high vulnerability and exposure causes higher degree of urban risk (Hardoy, Mitlin, and Satterthwaite, 2001). In a context of increasing urbanization, with a number of large high density settlements, Asia cities has diverse perspectives on the issues of vulnerability and adaptation to climate change, and the human security implications. Population densities in Asian cities tend to be much higher, and most large cities are key centers of economic growth that becomes a magnet for rural population in search for employment and livelihoods (Parthasaranthy, 2013). Thus, existing urban-planning, socio-economic and ecological problems made these cities vulnerable and exposed to climate-related disasters (Razafindrabe et al., 2009; Prasad et al., 2009).

Poverty

Form the earlier section it is known that economic transformation has affected migratory flows from the rural of the out fringes of the cities. These changes have increased urban population densities, and enhanced urban-rural nexus and flows of all kinds, such as social, cultural, financial-economic, technological, and to some extent, ideological (Parthasaranthy, 2013). These lead to a certain extent that the rural poor have become urban poor. However, despite the considerable economic dimension and well-established infrastructure, the urban poor remain marginal economically and increasingly vulnerable to climate-related disasters. Thus, the poverty and inequality have pushed the urban poor to live and work in hazardous locations, in areas with poor

sanitation, with implications for health, social conflicts and high exposure to natural disasters (Kreimer et al., 1992; McGranahan et al., 2007). As the consequent, this nexus between the poverty, inequality, and vulnerability, has been exacerbated by increasing climate change related risks.

Though the urban poor are quite diverse across regions, countries and even within cities, they tend to face a number of common deprivations, which affect their day-to-day life. The main issues raised in the literature include Baker's (2008) in a World Bank Report noted key issues for the urban poor. These are the following i) limited access to income and employment, ii) inadequate and insecure living conditions, iii) poor infrastructure and services; iv) vulnerability to risks such as natural disasters, environmental hazards and health risks particularly associated with living in slums, v) spatial issues which inhibit mobility and transport; and vi) inequality closely linked to problems of exclusion.

It is estimated that 60 percent of the urban population in Asia can be classified as poor, accounting 800 million with the vast majority of these living in hazardous locations (ADB, 2007; Prasad et al., 2009). Although Indonesia, the most populous country in Southeast Asia, its poverty rate has been reduced from 54 percent in 1990 to 21 percent in 2005, however a megacity like Jakarta faces great challenge in terms of poor access to services, such as access to clean water (McGranahan et al., 1999). For the poorer majority, uneven distribution of pipe water service made them rely on well and aqua privies. It is an important issue for them on how to increase the available supply of piped water. In terms of disaster, the poor people have very little option concerning where to live but to occupy marginal spaces where high risk is embedded, such as people who live in poor settlements at *Ciliwung Riverbanks* in Jakarta (Figure 2.6)



Figure 2.6: Poor settlements at Ciliwung Riverbanks in Jakarta, Indonesia (Photo courtesy: Photo Okezone Indonesia, 2013)

For example, the ability of the poor to pay for less flood risk and less polluted settlement is low. It is more beneficial to stay at the riverbanks, thus flood risks are not equally distributed to all people. Informal settlements in Jakarta, Indonesia near the *Ciliwung* expose to risks more than others. Findings from 2007 Jakarta Flood showed that the poor people occupy informal settlements, and the majority of the 400 thousand people affected and 74 casualties are to some part from *Ciliwung* neighborhoods such as *Kampung Melayu*, whereas the water level reached 11 meters high (Lassa et al., 2013).

Health

Many impacts of climate change and natural hazards on the urban poor are most notable in risks to public health. Exposure to changing weather patterns in temperature, precipitation, sea-level rise, and more frequent earthquakes and landslides have direct consequences for people's health: morbidity and mortality. Many communicable diseases are highly sensitive to changing temperatures and precipitation (Baker, 2012). These include vector-borne diseases, such as malaria and dengue, and water-borne diseases, such as diarrhea and cholera. The pathogens that cause these diseases thrive in living conditions characteristic of those typically found in slums, such as lack of hygiene in urban slums in Delhi (Figure 2.7). Worse, their impact is also likely to be more severe in populations with a preexisting burden of disease (IPCC 2007). While research on the impact of climate change on vulnerable populations is still in early stages, the link between urban poverty and ill health is already well established. In its Fourth Assessment Report, the IPCC has warned that changing weather patterns are altering the distribution of some infectious-disease vectors and worsening existing health conditions. The report also predicts that adverse health impacts of climate change will be greatest in low-income countries, and the urban poor in all countries will be at greater risk apart from the elderly, children, and coastal populations (IPCC 2007).



Figure 2.7: Lack of hygiene in urban slums in Delhi, India
(Photo courtesy: Delhigreens, 2009)

World Health Organization (1999) noted that at present, more than one third of the urban population in Africa, Asia, and Latin America live in housing of such poor quality with such inadequate aforementioned items (poor provision of water, etc.), where their lives and health are constantly under threat. In every city, there is a considerable range

of various pollutants that contribute to disease. Some pollutants have health impacts in particular periods. When a particular weather conditions, such as during high rainfall, flooding spread faecal matter all over the flooded areas and pollutes water sources in cities poor-equipped to deal with flooding (WHO, 1999).

There are two significant health problems that cities are dealing with. One deals in terms of environmental problems and impacts to health issues in urban areas of Africa, Asia, and Latin America. The second is problem in all cities all over the world that affects a high proportion of the world's urban population and has health implications, which have been underestimated. Every year, in developing countries, more than 5 million people die from illness linked unsafe drinking water, improper excreta disposal, and unclean domestic environments. In addition, more than 300 million urban dwellers lack a water supply and similarly, more than 600 million urban dwellers lack provision for sanitation that is easily accessible. Moreover, more than 1.5 billion urban dwellers are exposed to levels of air pollution (WHO, 1999). Therefore, it is imperative to address this issue collectively, by engaging relevant stakeholders in promoting health risk reduction through campaign at the household level. For example, one might considerate to include a community-based group in alleviating this issue.

Changes in the land use

The rising demand on housing and available land is emerged from the urbanization (UNISDR, 2009). More people due to migration require more land to live, require more living space in an already densely populated area (Figure 2.8) Consequently, urban green spaces are turned over to impervious spaces, of which for instance, precipitation are not permeated to the soil and create inundation following heavy rainfall events. For example, the 2007 Jakarta massive flooding was due to lack ability of city in absorbing the water due to uncontrolled urbanization in the city suburbs. Among other, the traditional water catchment area in northwest Jakarta, located near the international airport has been reduced substantially (Steinberg, 2007).



Figure 2.8: Densely constructed buildings and settlements in Jakarta, Indonesia (Photo courtesy: Merdeka, 2013)

Moreover, the number of people living in slums is on the rise all over the developing world. Increasingly, as cities grow, residents who cannot afford to live elsewhere consume marginal land. This land is often on steep hillsides, flood plains, coastal zones, or situated near hazardous waste, putting residents at high risk from the impacts of climate change and natural hazards (Baker, 2012). One recommendation would be better policies for land use planning and management that will have the biggest impact. As cities grow, they expand into marginal areas such as flood plains, water catchments, and steep hillsides, requiring land-use planning to consider flood, seismic, and other hazard zones when determining where new development should be permitted. Efficient transport systems can thus make land available in new areas by enabling access and mobility, thereby reducing incentives to develop in vulnerable locations (Baker, 2012).

Infrastructure and Services

Urban society depends heavily upon the proper functioning of infrastructure systems such as electricity, water supply, transportation networks and basic services in the health sector. Normally invisible, this reliance becomes evident when transportation systems failed during 2011 Bangkok Flood (Figure 2.9). Moreover, because of their network properties, infrastructure damage in one location can disrupt service over an extensive geographic area. Therefore, the damages due to disasters are way beyond. The societal disruption caused by infrastructure loss is therefore disproportionately high in relation to the actual amount of physical damage (Chang, 2009).



Figure 2.9: Transportation networks affected by 2011 Bangkok Flood, Thailand (Photo courtesy: Mail Online, 2011)

For example, critical facilities, such as hospitals, play a crucial role in the socioeconomic and psychological recovery of the population after a disaster. Hospitals are considered important due to their roles in saving lives in the affected population and must be able to withstand hazards and remain functioning during and after a disaster. For instance, the 2004 Indian Ocean Tsunami severely affected 61 percent of hospitals in Aceh whose ability to function came to a halt in the crisis situation (United Nations 2009 in Mulyasari et al., 2013). Therefore it is imperative to have prepared and adequate

infrastructure and services that can significantly reduce the disaster risk (IFRC/RC, 2010).

Sanitation and Solid Waste Management

Urban sanitation problems are technically, socially and managerially complex. Building up over many years as cities develop rapidly and often informally, the result is often a mix of on-site and off-site infrastructure, some of it obsoletes and much of it poorly maintained, with only a small safely. Rarely do cities present a blank canvas upon which new infrastructure and services can be drawn. Planning for citywide sanitation improvements is a daunting task (WSP, 2011). Indonesia has for decades experienced the challenges outlined above. While 73 percent of urban households have access to a private toilet facility, severe under-investment in public sanitation infrastructure has resulted in one of the lowest sewerage coverage levels in Asia. Dense housing areas and severe seasonal flooding, exacerbated by the clogged drains with uncollected solid waste, has added to the problem. Figure 2.10 shows an example of post-flood untreated waste in sewerage at the heart of Jakarta. Against this backdrop of very limited progress, the Indonesia Sanitation Sector Development Program (ISSDP) operated from 2006 to 2010. By the time the program ended in January 2010, Government commitment to urban sanitation had grown increasingly: 12 cities had developed city sanitation strategies and started to implement them, government budgets for sanitation had increased by 300 percent, and a national roadmap entitled "Accelerated Development of Sanitation in Human Settlements 2010-2014" containing commitments to scale up the ISSDP approach in over 300 cities had been formally adopted by the Government.



Figure 2.10: Post-flood untreated waste in sewerage at the heart of Jakarta, Indonesia (Photo courtesy: Kompas, 2012)

Managing solid waste is another problematic urban services, typically absorbing up to 1 per cent of GNP and 20 to 40 per cent of municipal revenues in developing countries (UN-HABITAT, 2010). Solid waste management provides employment for up to 6 workers per 1,000 populations, a figure that could represent up to 2 per cent of the national workforce. Even so, the service is frequently inadequate, with more than half the refuse generated in urban areas remaining uncollected, and large areas of cities

receiving no regular attention (UN-HABITAT, 2010). Consequently, the service provided in a majority of developing country cities and towns can, at best, be described as unreliable, irregular and inefficient.

These both emerging urban risks need to be managed soon in order cities become resilient to disasters.

Urban Governance

Cities are vulnerable to the effects of natural and human made disasters due to a complex set of interrelated emerging risks that needs to be looked into by a wide range of disciplines, sectors, levels, and institutions (ADPC, 2010). This year sees an unprecedented level of attention on urban governance and sustainable urban development. It is seen in the new campaign that is being launched by the United Nations International Strategy for Disaster Reduction (UNISDR), "*Making Cities Resilient*", which seeks the commitment of mayors, city leaders and local governments to concrete measures to reduce disaster risk, and to work on their implementation with community organizations, the private sector and national governments.

For example, the quality and capacity of local government in a city have an enormous influence on the level of risk that its population faces from disasters and, in particular, on whether risk-reducing infrastructure serves everyone including those living in low-income areas. Local or municipal governments also influence whether provision has been made to remove or reduce disaster risk from events such as floods and large-scale fires or to build into the city the capacity to withstand potential disaster events (IFRC/RC, 2010). For example, Markina City Government in Philippines collaborated with Department of the Interior and Local Government – National Capital Region (DILG-NCR), and Disaster Risk Reduction Unit in 2012 community-based flood disaster risk reduction and management (Figure 2.11)



Figure 2.11: Department of the Interior and Local Government – National Capital Region (DILG-NCR), and Disaster Risk Reduction Unit, conducted Training on Community-Based Risk Reduction and Management (CBDRRM) for flood preparedness at Barangay Tumana, Marikina City, Philippines (Photo courtesy: LGRC, 2012)

Pelling (2003) mentioned that since the mid-1990s, the good governance agenda, which cuts across localization that refers to those processes that shift from the power downwards from centralized to local actors, has placed emphasis on participatory development (Mercer, 2002; Mohan, 2002). For instance, disaster risk management is a systematic process that takes all these risks into consideration, and draw on the capacities, innovations and synergies available to lessen the impact of hazards. Drawing from this theory, information withhold central role to power and planning in urban settlements (Ostrom et al., in Pelling, 2003). Analyzing the role and actors in disaster risk information involves not only individual decision-making process but collaborative as well. Local government as one of the actor has the capacity to contribute to resilience building to disasters (Pelling, 2003).

The new agenda in urban governance makes the local government a more prominent actor. It facilitates grassroots actors, such as Community-Based Society Organizations (CBSOs) and liaise between grassroots and other actors, and above all, to strengthen the engagement of urban citizens in the democratization process (Solway, 1994; Gilbert et al., 1996; McCarney, 1996; Pelling, 2003). Box 2.1 and Box 2.2 are the examples of urban governance in disaster in Indonesia, although not related to climate-related hazard event, and Philippines as the most prone and largest countries in Southeast Asia.

Drawing from the two lessons above, urban governance and disaster encompass types and functions of actors that are engaged, focusing on local government and grassroots, such as CBSOs. Local government can oversee the provision of basic services, regulating when necessary; and grassroots actor have local knowledge and energies to help sharpen local mitigation interventions (Pelling, 2003).

Box 2.1: Good governance and disaster risk reduction in Aceh

Good governance and disaster risk reduction in Aceh

According to the Centre for Research on the Epidemiology of Disasters, more than 19 million of Indonesia's 210 million people have been affected by 309 disasters in the last two decades. Aceh, the westernmost province of Indonesia, is inhabited by some 4 million people. On 26 December 2004, Aceh was struck by an earthquake measuring 9.0 on the Richter scale and the subsequent tsunami left 130,000 people dead, 37,000 missing and an additional 500,000 people displaced. Damage and losses were estimated at USD 4.8 billion. Aceh was also suffering from a 30-year conflict that had claimed the lives of 15,000 people by the time a peace agreement was signed in August 2005.

The international and national shift in paradigm from focusing on disaster response to enhancing disaster risk reduction underpins the reform process in Indonesia. Collaboration 3131 between the government, civil society organizations and international agencies led to a disaster management law, which was enacted in 2007. The law authorizes the creation of a National Disaster Management Agency (BNPB), which reports directly to the president of Indonesia and has a mandate to coordinate all contingency, preparedness, mitigation, prevention, disaster management training and disaster risk reduction activities (i.e., risk assessment and mapping). The law also addresses and regulates the development and application of disaster management and disaster risk reduction plans at national and local levels. Following passage of the law, the president issued Presidential Regulation 8/2008, which formally established the BNPB. Soon afterwards, the minister of home affairs issued Decree No. 46/2008 mandating the establishment of local disaster management agencies in3131313131 all provinces by the end of 2009. The law has been further clarified with additional governmental regulations regarding the participation of international and non-government actors in all phases of the disaster management cycle.

The Aceh provincial government now includes disaster risk reduction as one of the province's seven development priorities, and has introduced measures to mainstream disaster risk reduction into all development sectors, including policy framework, setting up a local disaster management agency, developing a local action plan and standard operating procedures, and increasing partnerships with civil society organizations. The provincial government has also pursued other initiatives, such as implementing the Aceh Green Program (mangrove plantation, reforestation), improving spatial planning and building codes, introducing disaster risk reduction into school curricula, and constructing or improving infrastructure with disaster mitigation functions (such as river and coastal embankments, drainage and access to evacuation buildings).

Promoting disaster risk reduction initiatives in Banda Aceh

The city of Banda Aceh is the capital of Aceh province and inhabited by some 219,619 people. It was among the most severely affected municipalities during the 2004 earthquake and tsunami. In line with the disaster risk reduction framework at national and provincial

Good governance and disaster risk reduction in Aceh
levels, the Banda Aceh city government has also integrated disaster risk reduction into its development plan, which includes the city's spatial planning. While a city disaster management agency has not yet been set up, the city government has already developed a contingency plan and standard operating procedures for disaster response, both of which have been tested through several simulations (including the Indian Ocean wave exercise drill in December 2009). The drills involved all stakeholders including government, civil society organizations and community members. *In addition, the Banda Aceh government has worked closely with civil society groups, including the Red Cross and Red Crescent, to promote community awareness on disaster risks. It has also instituted various measures to mitigate disaster risks, including the integrated community based disaster preparedness and school-based disaster preparedness programmes implemented by the Indonesian Red Cross Society (PMI), improved access to evacuation buildings and fire brigades trained and equipped to take action at any time. The city's mayor and deputy mayor have demonstrated their support and commitment by attending several disaster risk reduction-related activities. Finally, the city government has established a strong partnership with PMI, which has trained and equipped disaster response teams (known as SATGANA), which are ready to respond to any emergencies. With financial and technical assistance from the American Red Cross' tsunami recovery programme, the PMI is implementing its integrated community-based risk reduction programme in Banda Aceh. The programme, which seeks to enhance the capacity of vulnerable communities to reduce the risk and minimize the impact of disasters, has four objectives:* *1. Build disaster preparedness and response capacity of targeted communities* *2. Develop disaster management capacity of targeted schools by conducting disaster preparedness and response sessions for students* *3. Enhance PMI's disaster management capacity at national, provincial and district/sub-district levels* *4. Strengthen the capacity of the local government's disaster management and research in disaster risk reduction* *The programme helps communities to identify potential risks and hazards in their villages by establishing community disaster management committees and disaster response teams, which are trained in disaster risk reduction issues and disaster response skills. It also supports communities with mitigation activities, contingency funds and disaster drills and works to improve their awareness of disaster risk reduction issues. In addition to schools and communities, the programme works closely with local government and civil society organizations to strengthen government disaster management capacity.*

Source: IFRC/RC, 2010

Collaboration between the actors, particularly when grassroots actors (CBSOs) are involved ans can provide opportunities for learning how to access resources, with which to claim rights for local risk reduction.

Box 2.2: Local governance and community resilience in the Philippines

Local governance and community resilience in the Philippines
Experience from the Philippines has shown that involvement of citizens in disaster management enhances local coping capacity. It also strengthens local capacity by institutionalizing the participatory principle in local governance. In the Philippines, national, regional, provincial, city/municipal and local/village governments and officials are legally required to organize disaster coordinating councils (DCCs). In most cases, local authorities do not receive any dedicated funding for this and, party as a result, most DCCs are little more than organizations in name alone. Where DCCs are most effective they have encouraged citizen participation. An example of success comes from Talba, a small settlement in central Luzon. *The settlement was threatened by flooding from a nearby river. During periods of risk, municipal and local authorities kept in close contact, but otherwise the DCC was not functional, it had no members and officials did not know how to operationalize the structure. A NGO with experience in disaster management was requested by a health service NGO working in Talba to assist in training and setting up disaster management group, which become known as the Barangay Disaster Response Organization. This group share information with the local government-supported DCC, but both was separate organizations. In 1995 a flood destroyed the settlement. At this time, the government communication system failed, and it was the parallel community system that provided sufficient warning and organized evacuation. The Barangay Disaster Response Organization also augmented the delivery of health services and during reconstruction secured the provision of water, electricity, and health services.* *In the example of Talba, the local government and community disaster organizations complemented each other. The local authority was open and prepared to work, with a citizens' organization instead of perceiving it as a rival.*

Source: ADPC (year unknown in Pelling, 2013)

Pelling, 2003 emphasized that partnerships and participation of grassroots actors offer considerable opportunities for building community resilience in the city as an integrated part of participatory urban development. Exactly the above thought is the center point of this study and will be explored in the following chapters.

2.1.3 Impacts of Climate-related Disaster Risks to Urban Areas

Previous sections have illustrated the emerging urban risks, which are the risk drivers and taken shape as stresses to cities. Conversely, impacts from climate change and its related hazards are shocks due to their unexpected occurrence. Several Asian cities experience the decreasing of their natural resilience between 2010 and 2013. This was showed by the second climate-related disaster resilience assessment under the Climate and Disaster Resilience Initiative 2 – Capacity-building Program of Kyoto University and partners (Kyoto University et al., 2013). It implies that cities in Asia are experiencing these shocks, impacts from climate-related disasters, and exacerbated cities' resilience to these events.

Wisner et al. (2004) illustrated the theoretical understanding between stresses and shocks in PAR (Pressure and Release) Model. It pointed out that the higher intensity of number of pressures (stresses) may overwhelm a defined system of city, if additional unexpected pressures (shocks) are added to it. Accordingly, the linkage between stresses and shocks, leading to disasters is likely to occur if various systems (physical, social, economic, institutional, and environmental) within a community fail to cope with specific natural hazards (Joerin, 2012; Sharma et al., 2011; Comfort et al., 1999; Hewitt, 1997) (Figure 2.12).

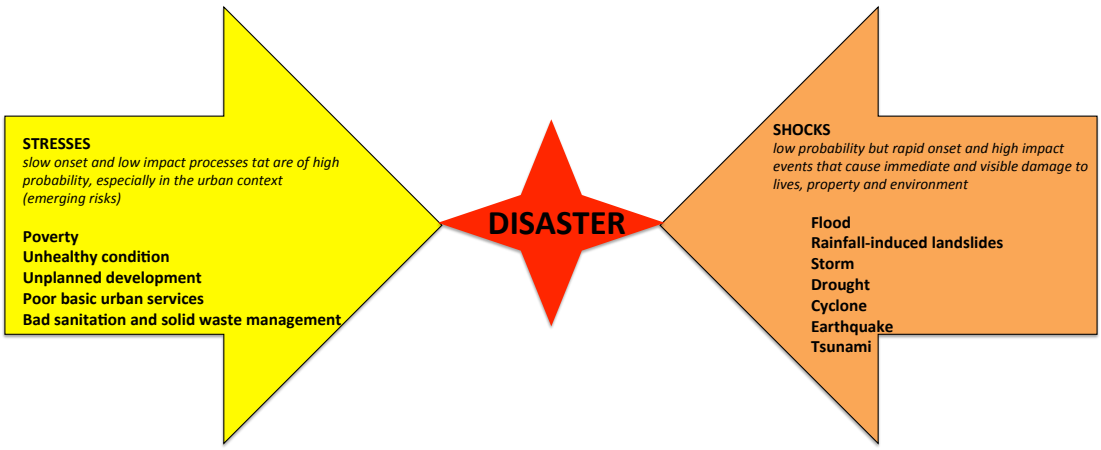


Figure 2.12: Stresses and Shocks in the urban areas (Modified, source: Sharma et al., 2011)

Climate change and its collateral events such as climate-related disasters are generally accepted as a serious threat to the economics, societies, and the natural human environment of the Asia-Pacific region, including Southeast Asia (Ardiansyah and Putri, 2013). Climate change and its related-disasters is increasingly framed as security threat since its impact projected to affect entire economic, reshape the coastal territories of cities, and erode ecosystems to the extent that they would fail to serve the societies depending on them (Adger, 2010). Mazo (2009) even mentioned that it is not seen as singular threat to human security, but as multiplier to existing social, economic, and political/institutional insecurities. These existing insecurities are such as follow: poverty, weak governance and resource management problems (Brown and McLeman, 2009; Mazo, 2009).

Moreover, Lacy (2005) raised that Intergovernmental Panel on Climate Change (IPCC) assessment reports helped to eliminate certain levels of uncertainty with climate science, which was the key to the adoption of climate change and its related disasters as security issue. However, in Southeast Asia, scholars and policy-makers have concluded that climate change has potential implications for security. They suggest that further information is needed, particularly to assess how and where the impacts of climate change, including its related disasters, as well as the potential for socio-economic stress (ASEAN Regional Forum, 2009). Below sections illustrate those impacts in further detailed.

Impacts to Physical Aspect

Previously, various risk drivers in cities, such as urbanization, urban poverty, decline ecosystem, unplanned growth, etc. characterize cities in developing countries, including Southeast Asia. These drivers significantly impacted to physical aspect of cities. To alleviate these risks, sustainable development is needed to mainstream in this sector. Urban infrastructures, for example energy (electricity), water, and sanitation systems, urban flooding drainage, and coastal defenses, are critical in mediating the relation between climate change and cities. Inadequate provision of infrastructure or its poor maintenance can exacerbate the impacts of climate change and the vulnerability of urban populations (Bulkeley, 2010). Thus, a solid physical infrastructure is crucial for urban areas to absorb climate-related disasters and for instance, needs to meet highest building and engineering standards. Studies from Canon et al. (2003), Gaillard et al. (2008), and Twig (2007) emphasized on post-disaster livelihood assessments, such as on the need people to have secure electricity and water supply to recover quickly from a disaster.

Impacts to Socio-Economic Aspect

It is evident in earlier sections that population in Asian cities tend to be much higher and most large cities are key centers of economic growth, which constitute a magnet for large sections of the rural population in search for employment and livelihoods (Parthasaranthy, 2013). It is also evident that in recent years a number of Asian cities have been affected by adverse climatic events and other natural disasters, from floods, landslides and earthquakes, to diseases and epidemics resulting in high loss of lives and property. Studies in Parthasaranthy (2009) show that while different sections of the population were affected, the poor and the socially marginalized that are living in environmentally risk-prone areas – were more affected than others. This includes children and women, the elderly, migrants, the socially marginalized. Cited from Morrow (1999: 1): "*disaster vulnerability is socially constructed, i.e., it arises out of the social and economic circumstances of everyday living … certain categories of people, such as poor, the elderly, women-headed households and recent residents, are at greater risk throughout the disaster response process.*" However, Parthasaranthy (2009); Uitto, 1998; Wisner, 1998 raised that their problems and special needs are usually ignored in disaster management and risk reduction strategies. Therefore it is imperative to assess the resilience of these vulnerable groups and seek appropriate strategies for that.

Moreover, not only economists have adopted a broader approach focusing not just on technologies but also on the broader range (environment and access to resources which condition risk), but sociologists and anthropologists as well, have studied the social

construction of risk and risk perceptions, especially with reference to climate change and its related disasters (Parthasaranthy, 2013). Therefore, socio-economic, and cultural factors influence and shape the characterization of risks and the selection of risk management and reduction strategies. This means that disaster knowledge, risk awareness, and associated strategies of assessing and dealing with risk, influence the course and decision-making process of dealing with climate-related disasters. Various scholars stressed as well the beneficial support of strong social capital, social networks, and disaster awareness among communities to not only withstand a disaster, but also to better respond to it (Cannon et al., 2003; Paton, 2003; Murphy, 2007).

Impacts to Institutional Aspect

With reference to climate-related disasters, the stress has been on techno-centric and technocratic to improve the efficiency of warning systems, evacuation, and relief and rehabilitation measures. Participatory and community-based strategies have been widely discussed but yet are to be mainstreamed in planning and implementation of a wide scale (Parthasaranthy, 2013). Study from Parthasaranthy (2013) denotes that strategies for mitigation and adaptation, especially in the Asian context, are largely borrowed from foreign contexts, with little effort to indigenize or evolve locally appropriate mechanisms and processes to reduce the vulnerability. An understanding of social hierarchies, social diversity, social divisions and inequality is rarely factored into risk reduction policies, institutional structures and mechanisms. Therefore institutional ways are needed to respond climate change and its related disasters across diverse socio-demographic and politico-economic contexts.

Furthermore, the mainstreaming of climate change adaptation, alongside with effective emergency management are two aspects which require a strong institutional set up to ensure their implementation before, respectively their functioning during a disaster (McEntire, 2001; Trohanis et al., 2009). Therefore, the ability of the institutions to cooperate with other stakeholders (communities, NGOs, private organizations, etc.) and to provide good governance is imperative for authorities in before, during, and a disaster.

2.1.4 Context of Urban Resilience to Climate-related Disasters

The aforementioned sections highlighted various emerging urban risks and its impacts to cities. This section denotes briefly the context of resilience of urban areas to climate-related disasters. This is essential in order to consecutively assess cities' resilience in different aspects that include in cities' systems (physical, social, economic, institutional, and environmental). Thereupon, the context of urban resilience is based on the inherent capacity of cities to bounce back, or recover, after disasters. The context of resilience is closely related to risk reduction, and therefore it is appropriate to understand risk reduction tools and methods in order to be able to build resilience in cities. Joerin et al. (2012) developed a tool, named CDRI (Climate-related Disaster Resilience Index) on how to assess and evaluate the resilience of a city, which will be discussed later in more detail in Chapter 4.

The Context of Resilience used in the Study

The term resilience has been defined and described in different ways by various scholars. The first terminology of resilience is introduced by Holling (1973) in the field of ecology. Holling (1973) defined resilience as the amount of disturbance that can be sustained by a system before a change in system control of structure occurs. It could be measured by the magnitude of disturbance the system can tolerate and still persist. Over the years, the resilience concept has evolved, transformed and included socio-economic and institutional aspects into it. Table 2.3 shows some of the author's literature findings on resilience definitions and concepts. The majority of these definitions and concepts are compiled from Manyena (2006).

Table 2.3: Findings of resilience concept

Reference	Resilience Terminology	Source
Holling, 1973	Resilience defines as the amount of disturbance that can be sustained by a system before a change in system control or structure occurs. It could be measures by the magnitude of disturbance by the system that can tolerate and still persist. **[Resilience as a system]**	Manyena (2006)
Wildavsky, 1991	Resilience is the capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back. **[Resilience as a capacity]**	
Dovers and Handmer, 1992	Resilience adopted as a useful concept for defining responses to ignorance, uncertainty, and risk. **[Resilience as for responses to uncertainty and risk]**	Dovers and Handmer (1992)
Holling et al., 1995	Resilience is the buffer capacity of the ability of a system to absorb perturbation, or the magnitude of disturbance that can be absorbed before a system change its structure by changing the variables. **[Resilience as buffer in absorbing disturbance]**	Manyena (2006)
Horne and Orr, 1998	Resilience is a fundamental quality of individuals, groups, and systems as a whole to respond productively to significant that disrupts the expected pattern of events without engaging in an extended period of regressive behavior. **[Resilience as individuals, groups, and system responses]**	
Mallak, 1998	Resilience is the ability of an individual or organization to expeditiously design and implement positive adaptive behaviors matched to the immediate situation, while enduring minimal stress. **[Resilience as the ability of individual/organization in implementing adaptive behavior]**	
Miletti, 1999	Local resiliency with regard to disasters means that a locale is able to withstand and extreme natural event without suffering devastating losses, damage, diminished productivity, or quality of life without a large amount of assistance from outside the community. **[Resilience as the ability of implementing local actions in withstanding natural events]**	
Comfort, 1999	The capacity to adapt existing resources and skills to new systems and operating conditions **[Resilience as capacity to adapt]**	
Paton, Smith, and Violanti, 2000	Resilience describes as an active process of self–righting, learned resourcefulness and growth – the ability to function psychologically at a level far greater than expected given the individuals capabilities and previous experience. **[Resilience as learning active process, capacity of individuals from past experience]**	
Adger, 2000	Unveiled the term social resilience or socio-ecological resilience to describe the interconnections between human beings and disruptions in different environments, ranging from social, economic, political and natural. **[Resilience as description of interconnections between human and natural system]**	Adger (2000)
Carpenter et al., 2001	Interpreting socio-ecological resilience as a system, which has the following properties: ▪ The amount of change a system can undergo and still remain within the	Carpenter et al. (2001)

Reference	Resilience Terminology	Source
	same domain of attraction ▪ The degree to which the system is capable of self-organization ▪ The degree to which the system can build the capacity to learn and adapt **[Resilience as interpretation of socio-ecological system]**	
Patton and Jonhston, 2001	Resilience involves enduring that community members have the resources, capacities, and capabilities to utilize physical and economic resources in a manner that minimizes disruption and facilities growth. **[Resilience as community capacities]**	Patton and Jonhston (2001)
Folke et al., 2002	In the context of sustainable development, resilience is conceived as a process. **[Resilience as description of as sustainable development process]**	Folke et al. (2002)
Kendra and Wachtendorf, 2003	The ability to respond to singular or unique events **[Resilience as the ability to respond]**	Manyena (2006)
Cardona, 2003	The capacity of the damaged ecosystem or community to absorb negative impacts and recover form these. **[Resilience as the capacity of ecosystem/community to absorb impacts]**	
Pelling, 2003	The ability of an actor to cope with or adapt to hazard stress **[Resilience as the ability of actor to cope/adapt hazards]**	
Godschalk, 2003; Valle and Campanella, 2005	Describe communities are key actors in shaping the overall resilience of a system like a city. **[Resilience as description of the key actors risk reduction actions in city]**	Godschalk (2003), Valle and Campanella (2005)
Klein et al., 2004	The concept of adaptive capacity, which has emerged in the context of climate change, and can be adopted as the umbrella concept, where resilience will be one factor influencing adaptive capacity. **[Resilience as the capacity to adapt to climate change]**	Klein et al., 2004
Adger et al., 2005	In the context of disasters, abilities of adaptation and learning are widely	Adger et al. (2005)
Folke, 2006	regarded as key elements characterizing a resilient system. **[Resilience as key elements in disaster management]**	Folke (2006)
Manyena, 2006	Disaster resilience is seen as the shield, shock absorber or buffer that alleviate the outcome to ensure small-scale negative consequences. **[Resilience as shield, shock absorber activities in disaster]**	Manyena (2006)
	Disaster resilience can be viewed as the intrinsic capacity of a system, community or society subject to a shock or stress to adapt and survive by changing its non-essentials attributes and rebuilding itself. **[Resilience as community's capacities]**	
Resilience Alliance, 2007	Defines the resilience in three characteristics: ▪ The amount of change the system can undergo and still retain the same controls on function and structure ▪ The degree to which the system is capable of self-organization ▪ The ability to build and increase capacity for learning and adaptation **[Resilience as the ability to adapt and capacity building]**	Resilience Alliance (2007)
Twigg, 2007	Capacity and coping capacity often mean the same as resilience in everyday usage. Meaning of resilience is placing larger emphasis on what communities can do for themselves and how to strengthen their capacities. **[Resilience is community's capacities]**	Twigg (2007)
Cutter et al., 2008	Resilience is associated to aspects of adaptive capacity. **[Resilience as adaptive capacity]**	Cutter et al. (2008)
Norris et al., 2008	One path towards community resilience is the prevention of disaster-related health or mental problems among community members and the other path have been concerned with community resilience through effective organizational behavioral and disaster management. **[Community resilience]**	Norris et al. (2008)
UNISDR, 2009	Defines the resilience as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner. Including through the preservation and restoration its essential basic structures and functions. **[Resilience as the ability of community to absorb, accommodate to and recover efficiently and timely from effects of hazard/disaster's impact]**	UNISDR (2009)
Sapountzaky, 2012	Defines resilience as: ▪ An outcome of the "flip" side of vulnerability ▪ As a process **[Resilience as the opposite of vulnerability and process to decrease the vulnerability]**	Sapountzaky (2012)

Reference	Resilience Terminology	Source
Djalante et al., 2012	Strong relationships of resilience with vulnerability and adaptive capacity could make its concept very relevant in the field of disaster risk reduction (DRR). **[Resilience related to DRR]**	Djalante et al. (2012)
Béné et al., 2012	Resilience is confirmed with the fact that people, irrespective of their backgrounds and experience, work together based on the above meaning. Concept of resilience assembles a number of people, institutions, and organizations as it creates communication between disciplines and among communities as it offers common grounds through a dialogue. **[Resilience relates to communication]**	Béné et al. (2012)

Table 2.3 has showed that the term resilience of various scholars that are revisited, are not solely applies for ecological or socio-ecological approaches. Other resilience terms was also applied in disaster context (see UNISDR, 2009 in Table 2.3). A major driver to address the vulnerability and resilience of cities is enabled through the international recognition that actions to reduce the risks of countries to potential disasters need to be addressed more comprehensively. This was manifested in a policy document, named Hyogo Framework for Action (HFA) that was adopted by the 168 countries in 2005 (Joerin and Shaw, 2011; Matsuoka and Shaw, 2011). The HFA will guide governments to develop frameworks that address disaster risks and lead the countries to resilience building; consequently five priorities of action define the overall framework (UNISDR, 2007).

Further, resilience and its related terminologies such as vulnerability, capacity, coping strategies, and sustainability must be understood and accommodated in risk communication. Twigg (2007) (Table 2.3) mentioned that in everyday usage, ‘‘capacity’’ and ‘‘coping capacity’’ often mean the same as ‘‘resilience.’’ Twigg focused on the meaning of resilience of placing larger emphasis on what communities can do for themselves and how to strengthen their capacities. Moreover, Sapountzaki (2012) (Table 2.3) stated that regardless of the scientific field and context where the term is found, resilience is defined in two ways. Firstly, resilience is expressed as the opposite side of vulnerability. The relationship between vulnerability and resilience perceived as opposite to each other was also stated by Kasperson and Kasperson (2001) in Sapountzaki (2012). They stated that when the social system becomes vulnerable, it loses the resilience. Secondly, resilience is considered as a ‘‘process’’-related definition. Sapountzaki (2012) (Table 2.3) also defined resilience as ‘‘a process of self-organization and self-change in an attempt to retain essential functions or structure under the circumstances of whatever stress or perturbation.’’ Other scholars like Cutter et al. (2008) (Table 2.3) explained that community resilience to disasters within hazards research is generally focused on engineered and social systems. It includes pre-event measures to prevent hazard-related damage and losses, which can be called ‘‘preparedness,’’ as well as post-event strategies to help cope with and minimize disaster impact. A strong argument of the linkage of resilience and risk reduction is mentioned by Djalante et al. (2012) (Table 2.3). They mentioned the strong relationships of resilience with vulnerability and adaptive capacity could make its concept very relevant in the field of DRR. Thus, reducing disaster risk is about reducing the underlying causes of risks, which are closely related to vulnerability.

However, increasing the resilience also means looking at what is available and accessible to individuals, households, and eventually communities and building on those existing capacities. Subsequently, Béné et al. (2012) explain how resilience relates to communication. The concept of resilience has a ''pragmatic'' advantage due to its relatively loose meaning, which is ''the capacity to absorb shocks.'' It is confirmed with the fact that people, irrespective of their backgrounds and experience, work together based on the above meaning (Béné et al. 2012). Thus, the concept of resilience assembles a number of people, institutions, and organizations as it creates communication between disciplines and among communities as it offers common grounds through a dialogue. Resilience is closely related to sustainability. Folke et al. (2002) in Sapountzaki (2012) mentioned that resilience and adaptive capacities are seen as the key properties for sustainability. They concluded that being resilient is a main objective of sustainability and sustainable development. With disaster resilience in risk communication leading to sustainability in mind, how then can community contribute toward this aim? Moreover, Manyena (2006) elaborated that disaster resilience is seen as the shield, shock absorber or buffer that alleviate the outcome to ensure small-scale negative consequences. In addition, Patton and Johnston (2001) mentioned that resilience involves enduring that community members have the resources, capacities, and capabilities to utilize physical and economic resources in a manner that minimizes disruption and facilities growth. In other words, Manyena (2006) put that disaster resilience can be viewed as the intrinsic capacity of a system, community or society subject to a shock or stress to adapt and survive by changing its non-essentials attributes and rebuilding itself. Consequently, resilience in the context of this research is how urban communities in groups are concerned with disaster issues and carrying out disaster management through their effective organizational risk reduction behaviors. Thus, the concept of resilience is closely link to risk reduction. In this context, it is recognized that individuals, communities, cities, even nations have a degree of resilience which can be assessed, measured, and defined periodically. Exactly at the heart of resilience assessment, the next section illustrates ideas on the subject of the assessment of resilience to climate-related disasters.

Assessment of Resilience to Climate-related Disasters

Previously, context and understanding of resilience was defined. This section describes the needs of resilience assessment and measurement in urban areas. Joerin et al. (2012) developed a tool (CDRI) for the resilience assessment process, which will be utilized in this study. This will be discussed later in Chapter 4. This section aims to elucidate several points on the notions of measuring resilient urban areas.

The literature review draws not only on illustrating the resilience in the context of disasters but also its application in urban areas. If one takes a closer look on Godschalk's definition, a resilient city is "a sustainable network of physical systems and human communities". Similarly, Valle and Campanella (2005) regarded a disaster resilient city as "a constructed phenomenon, not just in the literal sense that cities get constructed brick by brick, but in a broader sense". Moreover, the World Bank (2009) defined that a resilient city "is able to sustain itself through its systems by dealing with issues and events that threaten, damage, or try to destroy it". The above mentioned descriptions highlight that some threat may challenge the well-being of a city, thus it underpin the

need to address various aspects of resilience that are challenged before the occurrence of a disaster (Joerin and Shaw, 2011). It has challenged various aspects that inhibit the emerging urban risks (earlier discussed in section 2.3.1 until 2.3.7). For example, provision of adequate urban services, such as electricity, water, solid waste, condition of road network, etc.), are likely to influence the potential of loss and harm due to disaster, and therefore, have the implications on the resilience of different stakeholders (i.e. institutions, communities) and how they respond in the aftermath of a disaster. An example of poor quality housing and building codes are not (well) implemented, the resilience will be lower and subsequently it reduces the responsive character to absorb a potential disaster. In the social aspect, if a community has large unemployment rates, its capacity to bounce back is limited. Similarly, if the ecosystems are in bad shape and has low quality levels like contaminated water bodies, a potential event of flooding may affect the health of communities and the wider natural environment. Therefore, the ability to respond is likely might be reduced (Joerin and Shaw, 2011).

Drawing from examples above, a comprehensive baseline assessment that addresses linkages between various actors, aspects of the physical, social, economic, institutional, and natural components of a city/urban area is indispensable. The resilience assessment will serve as a planning tool that has the objective to disclose the sectors that are less resilient or even not capable to of responding adequately in the event of climate-related disasters. Once the values of the assessment are revealed, the numerical value is not important; however what is far more important is the interpretation and subsequently the evaluation which sectors are particularly low or high in order to take actions in those sectors where needed the most. Aside from above reason, the interpretation of the assessment is also crucial due to the context of each city. Part of a city varies with regard to topographical aspects. Hence, the key aims of the resilience assessment are to reduce the risks and to construct urban area more prepared and capable of withstanding climate-related disasters. Thus, delineating the weaker and stronger sector by a resilience assessment might be the catalyst for risk reduction process at the local level.

2.2 Role of Local Governance in Disaster Risk Reduction

The question of resilience in the context of urban growth recognizes that disaster risk reduction is not limited to preparedness and response, but it is a key determinant for sustainable development. How cities grow – the strategic planning and design of spatial elements and their impact on the natural and built environments, the inclusion of the most vulnerable in urban planning — all dictate a city's capacity to absorb and recover from disasters, including those driven by an extreme climate (UNISDR, 2012a). All urban governments must ensure delivery continuity for essential services during and following crises, including access to clean, piped water, sanitation and waste management, transport and energy, and safe and affordable accommodation. In those cities where capacity to do this is limited, resources must be sought and applied to ensure these systems are resilient to whatever crises may emerge. This includes the essential elements of strengthened capacity for early warning, risk assessment, and information systems on disaster risk reduction

The importance and need of local level DRR is also stated by Matsuoka (2013); where hazards usually occur locally and many of the most effective tools to reduce vulnerability to hazards, such as land use regulation and building code enforcement are at the local level. Therefore, Matsuoka (2013) analyzed that local governments are regarded best positioned to implement DRR. Matsuoka (2013) also added that local level implementation is of fundamental importance, not only because it is closer to the communities, but because it is the accumulation of the basic environmental management and regulatory governance functions that are essential for effective DRR.

Despite arrays of wide spread agreement within literature that local governments have a vital role in DRR initiatives (Malalgoda, et al., 2010); Matsuoka (2013) analyzed that the major challenge of local government DRR is the limited capacity of local governments, where local capacity does not match local government responsibilities. Specifically, where capacity building for DRR in local governments is the key of area to enhance local DRR actions and to address challenges (UNISDR, 2011 HFA midterm review). Priority and budget are challenges in local government DRR capacity. It was noted in the Mid-term HFA review that number of countries had passed laws assigning local government's legal responsibility for DRR management without passing budget allocations for this responsibility. Thus the absence of a fiscal grant to achieve the mainstreaming required for effective action, unless local voices are sufficiently strong to advocate for prioritization of resources at the local government level in favor of DRR (Gupta and Leung, 2010 in Matsuoka, 2013).

Other challenge is decentralization. Parker (1995) defined it as a multi-dimensional process of shifting the focus of development from central planning and bureaucratic government agencies to community-based participatory system, which uses the full range of local public and private institutions. Consequently, the decentralization of responsibilities DRR requires the accompanying resources and capabilities to be effective (Matsuoka, 2013). Indonesia shows an example of progressive local risk governance approach, but it faces challenges such as operational inadequacies between the enactment and enforcement of DRR actions. It implies that there is lack of a predictable budget allocation corresponding with responsibilities and gaps in knowledge and information management (UNESCAP and UNISDR, 2012).

Lastly, coordination is also a challenge in local government DRR capacity. As DRR a cross cutting issue, it is crucial to have a multi stakeholder consultation among relevant sections and divisions within a local government from a comprehensive approach (Matsuoka, 2013). Multi stakeholder consultation in form of multi stakeholder platform that brings government and community closer is thus needed. Social demand for DRR, especially at the local level is closely linked to effective use of truly multi stakeholder consultative mechanisms and the involvement of community organizations (Serra and Chibay, 2011). Addressing the coordination challenge, a platform of multi-stakeholder will serve thus as an advocacy and coordinating tool of DRR in the local context. It streamlines the planning process so that DRR can be accepted as public value and be mainstreamed into city plans as well as day-to-day operations of constituted authorities and business (Matsuoka, 2013). A local platform is thus required for engaging actors in developing DRR strategies, capable of deciding what new instruments are needed to

deal with local demands and needs, and to support new kinds of interactions and communication channels between relevant stakeholders (UNISDR, 2011 HFA midterm review). This local platform strongly relates to risk communication, which is the focus of the whole study. Because in order to enhance local capacities as well as to foster both vertical (example from city to sub-city level) and horizontal (among relevant branches of local governments, agencies with community organizations and communities) communication to deal with DRR, resources should be devoted not too much to technical means but rather to long-term institutional innovations and learning at local level. Thus establishing local platform will not only fosters it functions, but it presents integrated solutions in addressing the challenges of local government DRR capacity (priority and budget, decentralization, and coordination).

Further on local government's role in DRR, Berke and Beatley (1992) in Berke (1998) outlined local government's growth management tools for natural hazard mitigation. Growth management itself is a set of techniques used by government to ensure that whilst the population grows in city, there are services available to meet their demands. These are traditional growth management - and risk reduction programs that typically use the same types of planning policies and implementation tools that can be adopted by local government. Table 2.4 presents seven major categories of plans and associated implementation growth management tools that can be applied by cities' government in mitigating natural hazards.

Table 2.4: Growth management tools for natural hazard mitigation

Plans and Implementation Tools	Application of Plans and Tools to Mitigation
Planning	
▪ Comprehensive of land use plan ▪ Hazard component of comprehensive plan ▪ Recovery/construction plan	Identify hazardous areas and adopt mitigation policies that guide development and redevelopment in hazardous areas.
Development regulations	
▪ Zoning ordinance ▪ Subdivision ordinance ▪ Fault setback ordinance	Control the type, location, and density of development in hazardous areas.
Building standards	
▪ Building codes ▪ Special hazard resistance building standards ▪ Retrofit standards for existing buildings	Strengthen existing development, and require new development to withstand hazards.
Land and property acquisition	
▪ Transfer of development potential from one site to another ▪ Acquisition for undeveloped lands ▪ Acquisition of development rights ▪ Building relocation ▪ Acquisition of damaged buildings	Remove existing development or prevent future development in hazardous area.
Policies for critical public facilities	
▪ Capital improvements programs ▪ Location requirements for critical facilities (hospitals, schools) ▪ Location of capital facilities (streets, water) in less hazardous areas	Direct new development away from hazardous areas (or at least do not induce new development in hazardous areas).
Taxation and fiscal policies	
▪ Impact tax to cover additional public costs of building in hazardous areas ▪ Reduced or below-market taxation for open space or non-intensive uses in hazardous areas	Maintain low density in hazardous areas.
Information and dissemination	
▪ Public information program ▪ Hazard disclosure requirements	Inform the public and those involved in real estate transaction about hazards.

Source: Berke and Beatley, 1992

Within each category, the table lists specific tools as well as different planning approaches and briefly describes how each can be applied to natural hazards risk reduction. The reason of describing the growth management tools developed by Berke and Beatley (1992) is that these tools include information and dissemination as part of risk communication process, which is the focus of this study and highlighted in the red box in the table; although based on this tool (Table 2.4), local government is described to have the maximum role in land and property acquisition, because local governments are equipped with tools and legal instruments such as wide range of policy and regulations. It highlights the essential of local authorities' task on planning and development as their jurisdiction and main functions, especially when dealing with vulnerabilities and risks to disasters in urban areas.

Urban risk, city planning and the role of local governments in dealing with risk reduction have been recognized as key factors to build resilient communities and nations since the beginning of the International Strategy for Disaster Reduction (UNISDR, 2010). The Hyogo Framework for Action (HFA) 2005-2015 considers that both communities and local authorities should be empowered to manage and reduce disaster risk by having access to the necessary information, resources and authority to implement actions. It underlines the local governance in DRR. The aforementioned poor urban governance, informal settlements on unsafe land, declining ecosystems and vulnerable rural livelihoods are main underlying risk drivers and need to be addressed to build safer cities. In the city, the local government must lead the effort, as their managerial role offers the best insight into what is needed at the local level. A stakeholder assessment will help public services identify their roles and responsibilities (within their development activities and control mechanisms), identify factors that contribute to risk and adopt appropriate measures to address these (UNISDR, 2012b). Following section illustrates the implementation of HFA at the local level.

2.2.1 Local Implementation of HFA

Section 2.2 has touched briefly the HFA, five specific priorities of action in building the resilience. The HFA appeals to national governments, while acknowledging the enabling support of international and regional players, to take action so that disaster losses, in terms of lives and social, economic, and environmental assets are substantially reduced by 2015. To help attain that outcome, it identifies five specific priorities for action. The five priorities are mutually exclusive, especially when focusing on the processes. The HFA five priorities for actions are as follow:

- HFA Priority for Action 1 (HFA-1): Making disaster risk reduction a priority
- HFA Priority for Action 2 (HFA-2): Improving risk information and early warning
- HFA Priority for Action 3 (HFA-3): Building a culture of safety and resilience
- HFA Priority for Action 4 (HFA-4): Reducing the risks in key sectors
- HFA Priority for Action 5 (HFA-5): Strengthen disaster preparedness for effective response

The HFA implementing guideline for national governments titled "Words into Action: A A Guide for implementing the Hyogo Framework was produced in 2007 by UNISDR and partners to be used as guideline on what processes government can take in order to

accomplish the five priority actions (UNISDR, 2007). While certain advancement on national government HFA implementation have been made and reported, there is a strong needs and demands for local governments to take comprehensive DRR actions have been recognized. It is at the local level that the impacts of a disaster are most immediately and intensively felt (KU and UNISDR, 2010). Thus, local implementation of the HFA is significant to the reduction of risks and eventually to the resilience building.

Through this process, the decentralized local/city governance in DRR activities is strengthened, and stakeholder roles and responsibilities are identified, clarified, and eventually carried out. Each local entity/city is unique in its immediate long-term needs for DRR. The HFA will greatly increase in its importance if implemented by local/city governments who have access to those citizens and entities. To facilitate this process, the development of the HFA implementation guideline for local governments named "A Guide for Implementing the Hyogo Framework for Action by Local Stakeholders" emerged under the initiative called ISDR Asia Regional Task Force on Urban Risk Reduction (RTF-URR), which is one of the regional thematic platforms on the ISDR system. This "Guide" with its 20 tasks interprets "Words into Action" to use for local-level implementation by customizing the guidelines made for national level. This Guide serves as development planning at the local/city governance. It will streamline the planning process so that DRR can be accepted as a public value and be mainstreamed into local/city plans as well as day-to-day operations of constituted authorities and business. Table 2.5 illustrates the 20 tasks and its tools, drawn from five HFA priorities to be implemented by local stakeholders, in this regard, the local government.

HFA-2 related to risk assessment and early warning is highlighted in red box. It is the priority of action that this study is focused on. It shall support local government in the establishment of initiation of community risk assessment and develop communication and dissemination mechanisms for DRR and early warning (Task 5 and Task 8). Thus risk communication is part of resilience building and local government is an indispensable actor in the process.

Table 2.5: Tasks and tools drawn from five HFA priorities to be implemented by local stakeholders

Tasks	Tools
HFA-1 related: Local/city governance	**HFA-1: related tools**
Task 1. Engage in multi stakeholder dialogue to establish foundations for DRR Task 2. Create or strengthen mechanisms for systematic coordination for DRR Task 3. Assess and develop the institutional basis for DRR Task 4. Prioritize DRR and allocate appropriate resources	▪ Focal point for DRR ▪ Multi stakeholder dialogue ▪ DRR framework and action plan ▪ Stakeholder engagement/coordination mechanisms
HFA-2 related: Risk assessment and early warning	**HFA-2: related tools**
Task 5. Establish and initiative for community risk assessment to combine with country assessments Task 6. Review the availability of risk-related information and the capacities for data collection and use Task 7. Assess capacities and strengthen early warning systems Task 8. Develop communication and dissemination mechanisms for DRR and early warning	▪ Risk communication and dissemination mechanisms for disaster risk information ▪ Early warning systems ▪ Community risk assessment ▪ Gap analysis (including risk-related information)
HFA-3 related: Knowledge management	**HFA-3: related tools**
Task 9. Raise awareness of DRR and develop education program on DRR in schools and local communities Task 10. Develop or utilize DRR training for key sectors based on	▪ Disaster information system ▪ Public disaster awareness raising program/strategy ▪ Training programs and networks in support of DRR

identified priorities Task 11. Enhance the compilation, dissemination, and use of DRR information	
HFA-4 related: Vulnerability reduction	**HFA-4: related tools**
Task 12. Environment: incorporate DRR in environmental management Task 13. Social needs: establish mechanisms for increasing resilience of the poor and the most vulnerable Task 14. Physical Planning: establish measures to incorporate DRR in urban and land-use planning Task 15. Structure: strengthen mechanisms for improved building safety and protection of critical facilities Task 16. Economic development: stimulate DRR activities in production and service sectors Task 17. Financial/economic instruments: create opportunities for private sector involvement in DRR Task 18. Emergency and public safety, disaster recovery: develop a recovery planning process that incorporates DRR	▪ Disaster recovery plan ▪ Environmental impact assessment ▪ Financial/economic instruments ▪ Poverty reduction program/strategy ▪ Promoting building safety protection of critical facilities ▪ Risk-sensitive urban land use planning ▪ Sectoral sub-work groups to stimulate DRR activities in production and service sectors
HFA-5 related: Disaster Preparedness	**HFA-5: related tools**
Task 19. Review disaster preparedness capacities and mechanisms, and develop a common understanding Task 20. Strengthen planning and programming for disaster preparedness	▪ Disaster preparedness planning and programming ▪ Capacity assessment of disaster preparedness and mechanisms

Source: (KU-UNISDR, 2010)

Consequently the Guide with its tasks will lead local governments in attaining the three strategic goals specified in HFA, in building the resilience nations and communities to disasters (Matsuoka and Shaw, 2011). These goals are as follow:

- The more effective integration of disaster risk considerations into sustainable development policies, planning, and programming at all levels, with a special emphasis on a disaster prevention, mitigation, preparedness, and vulnerability reduction
- The development and strengthening of institutions, mechanisms, and capacities at all levels, in particular at the community level that can systematically contribute to building resilience to hazards
- The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response, and recovery programs in the reconstruction of affected communities

Seeing the above the goals, it is evident the crucial role of local government in disaster risk reduction.

2.2.2 Making Cities Resilient Campaign

UNISDR has worked with partners in the ISDR system to build alliances with local government to promote disaster risk reduction at different levels (UNISDR, 2010), in response to the lack of a systemic approach to underlying risk drivers, which need to be addressed to build safer cities. In 2005 the ISDR Inter-Agency Task Force recommended the 2010-2011 global awareness campaigns to focus on urban risk issues and 'Making Cities Resilient'. This campaign builds on previous years' campaigns on disaster reduction education and safe schools and hospitals, which are also important themes for city resilience. In August 2009, an international Conference on "Building a Local Government Alliance for Disaster Risk Reduction" was held and hosted by the

Metropolitan City of Incheon, Korea, from which the main purpose and content of the 2010-2011 Campaign has emerged. Alliance Countries of UNISDR compiled and documented good practices of the role of local government in DRR (UNISDR, 2010). Following are major roles of local government in implementing DRR, emerged from the compilation of good practices to justify the importance of local government's involvement in DRR.

To play a central role in coordinating and sustaining a multi-level, multi-stakeholder platform to promote disaster risk reduction in the region or for a specific hazard

The active commitment and leadership of a local government is important for the implementation of any local disaster risk reduction measures to deal with different stakeholders and multiple layers of government. In many cases, a comprehensive disaster risk reduction measure takes long time to fully implement, and the leadership of the local government is particularly crucial to ensure the political momentum and support among external stakeholders throughout the process. For example, the provincial government in Jakarta, Indonesia, in partnership with the national, local and technical partners implemented a process to improve the flood early warning system. As the main owner of the early warning system, the province provided significant political and technical support and publicity.

It was highlighted that, in the context of megacities, the collaboration between provincial and city governments is very important in order to coordinate overlapping resources and responsibilities. Local governments surrounding the *Merapi* Volcano in Central Java, Indonesia give another example in forming multi-stakeholder forum against volcanic hazard around the city of Yogyakarta. It is concluded that a multi-stakeholder forum, which has significant coordination role, is effective for pooling resources and expertise, especially in encouraging cross-border and cross-sectoral risk management.

To effectively engage local communities and citizens with disaster risk reduction activities and link their concerns with government priorities

As the most immediate public service provider and interface with citizens, local governments are naturally situated in the best position to raise citizens' awareness of disaster risks and to listen to their concerns. Even the most sophisticated national disaster risk reduction measures (such as early warning systems) may fail, if communities are not properly informed and engaged. Likewise, community preparedness measures are sometimes as effective as costly public investments in reducing casualties from disasters, and local governments should play a central role in community education and training.

To strengthen their own institutional capacities and implement practical disaster risk reduction actions by themselves

As the governmental body responsible for the long-term development and viability of its area, a local government is required to consider and institutionalize disaster risk reduction in its day-to-day operations, including development planning, land use control and the provision of public facilities and services.

To devise and implement innovative tools and techniques for disaster risk reduction, which can be replicated elsewhere or scaled up nationwide

Because of its smaller scale and flexibility, a local government is better positioned than a national government to develop and experiment with various new tools and techniques, applying them to unique settings and policy priorities. Aside from the local implementation on HFA tool, local governments are also equipped by ten essentials for making cities resilient checklist in "Making Cities Resilient Campaign", launched by UNISDR as part of the Global Campaign 2010-2015 (UNISDR, 2012b) as the continuation from earlier 2010-2011 global awareness campaigns to focus on urban risk issues and 'Making Cities Resilient'. The rationale is that the increasing concentration of people, economic activities and assets in urban areas usually brings much increased disaster risks and also increasing climate change risks. Cities generate most of the world's wealth and innovation - but also waste, greenhouse gas pollution and many other causes of climate change and hazards. Many of the world's major metropolises are coastal cities prone to flooding and erosion. Many others are located in drought-prone areas and are already suffering from water scarcity. Table 2.6 shows the ten essentials for making cities resilient checklist.

Table 2.6: Ten essentials for making cities resilient checklist

Checklist	Essentials
1	Put in place **organization and coordination** to understand and reduce disaster risk, based on participation of citizen groups and civil society. Build local alliances. Ensure that all departments understand their role in disaster risk reduction and preparedness.
2	**Assign a budget** for disaster risk reduction and provide incentives for homeowners, low-income families, communities, businesses and the public sector to invest in reducing the risks they face.
3	Maintain up to date data on hazards and vulnerabilities. **Prepare risk assessments** and use these as the basis for urban development plans and decisions, ensure that this information and the plans for your city's resilience are readily available to the public and fully discussed with them.
4	Invest in and maintain critical **infrastructure that reduces risk**, such as flood drainage, adjusted where needed to cope with climate change.
5	Assess the safety of all schools and health facilities and upgrade these as necessary.
6	Apply and **enforce realistic, risk compliant building regulations and land use-planning principles**. Identify safe land for low-income citizens and upgrade informal settlements, wherever feasible.
7	Ensure that **education programs and training** on disaster risk reduction are in place in schools and local communities.
8	**Protect ecosystems and natural buffers** to mitigate floods, storm surges and other hazards to which your city may be vulnerable. Adapt to climate change by building on good risk reduction practices.
9	Install **early warning systems and emergency management capacities** in your city and hold regular public preparedness drills.
10	After any disaster, ensure that the **needs of the affected population are placed at the center of reconstruction**, with support for them and their community organizations to design and help implement responses, including rebuilding homes and livelihoods.

Source: UNISDR, 2012b

The bold text in the table above (Table 2.6) highlights the essential issues that shape a resilient, which needs to fulfill by the local government. Data showed in UNISDR (2012b) report that in August 2012, a total of 1,050 cities and local governments had signed on to the Campaign, and in doing so, have pledged to take steps to improve their cities' resilience to disasters. These include 29 role model cities that are recognized by the Campaign as exemplars in disaster risk management and reduction. These cities share their knowledge of best practices on a wide range of challenges, including flood management, early warning, earthquake reconstruction and legislation.

The examples above describe how important it is the role of local government in risk reduction for building the resilience to disasters, especially to the increasing climate-related disaster events.

2.3 Community-Based Disaster Risk Reduction and Management Approaches

Scholars define community in various ways. McMillan and Chavis (1986) described community as "a feeling that members have the belonging, a feeling that members matter to one another and to the group, and a shared of faith that members' needs will be met through their commitment to be together." Shaw (2006) has put more emphasis that community includes not only the people living in a certain location, but also the local government, local business sectors, local academic bodies, and nongovernment organization (NGOs). In recent years, as more research on development has been conducted, the approach to disaster risk reduction is becoming more relevant and essential related with community (Blaikie, Cannon, Davis, and Wisner, 1994; Quarantelli, 1989; Mileti, 2001; Mulyasari and Shaw, 2012). Community involvement is important in disaster risk reduction and management. Community-based Disaster Risk Management (CBDRM) is a process in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities (ADPC 2003). Scholars such as Shaw and Okazaki (2003), Twigg and Bhatt (1998) highlighted that more effort has been put into incorporating disaster management aspects into the holistic development of communities.

Disaster management should not be treated as one single issue, but it should be incorporated into socio-economic activities of local people (Maskrey, 1989). The rationale for community involvement or community-based activities is currently practiced (Twigg, 1999). It is mainly because community-based activities (and community-based organizations) are deeply rooted in the society and culture of an area and through these activities, people to express their real needs and priorities, allowing the issues, barriers, problems to address appropriately; hence response actions can be decided and implemented. Moreover, Twigg (1999) also argued that the existence of community-based (society) organizations allows people to respond to emergencies rapidly, efficiently, and fairly, and therefore available community resources (even it is limited) will be used economically.

Shaw and Takeuchi (2011) raised that it is common knowledge that people at the community level have more to lose because they are the ones directly hit by disasters, whether it is major or minor one. They are the first ones become vulnerable to the effects of such hazardous events. Therefore the concept of putting the communities at the forefront gave rise to the idea of Community-Based Disaster Management (CBDM). The core principle of CBDM is participation. Through the CBDM, the people's capacity to respond to emergencies is increased by providing more access and control over resources and basic social services. Reflecting back to the old roots and history, community-based approach is not new. Shaw (2012a) also mentioned that one should look back to the old and traditional approaches of risk reduction. Based from previous facts, CBDM had been a popular term in the later 1980s and 1990s, which gradually

evolved to community-based disaster risk management (CBDRM), and then to CBDRR. CBDRM and CBDRR are often used with similar meaning, which enhanced focus on "risk"; however as raised by Shaw (2012a), there still exists a thin line of distinction. CBDRR focuses more on pre disaster activities for risk reduction by the communities. On the other hand, CBDRM focuses a broader perspective of risk-reduction related activities by communities, both during, before, and after a disaster.

Thus, people in the community who suffer most disaster's adverse effects are using coping and survival strategies to face and respond to the situation long before help from outside (government and non-government organizations) arrives (Victoria, 2009). This leads to the fundamental of CBDRR that it requires people's participation and local actors within the community as the driving force of DRR. In CBDRR, the community members are the main actors. They sustain the DRR process and pursue disaster risk management activities. One the key success of CBDRR is that it often depends on the nature of local practices by the local communities. Therefore, traditionally, community groups, as the so-called Community-Based Society Organizations (CBSOs) has been practiced DRR; since these organizations have their presence at grassroot levels, and have proximity to the communities, they are well equipped and better positioned to conduct the DRR activities (Shaw, 2012b). It highlight that CBSOs owns base characters, which highlights the participation of different community types and groups and underpins that CBSOs are considered to be effective in bringing about change within the community at large, due to its nature of collective action around shared interests (Mulyasari and Shaw, 2012).

This study will focus on both CBDRR and CBDRM approaches, with the community-based society organizations (CBSOs) as one of the essential stakeholders in risk reduction and management activities. Following section will highlight CBSOs and risk reduction and management approach.

2.3.1 Community-Based Society Organization (CBSO) Approach

Community-Based Society Organizations are derived from the term "civil society". The understanding term of civil society has been given in many references. According to Kaldor (2003, p11), "civil society could be described as those organizations, groups and movements who are engaged in this process of negotiation and debate about the character of the rules — it is the process of expressing 'voice'." The civil society commonly embraces a diversity of spaces, actors, and institutional forms; varying in their degree of formality, autonomy, and power. Civil societies are often populated by organizations such as registered charities, development non-governmental organizations, professional associations, and community groups, such as women, youth, and faith-based or religious organization, as was also referred by Izumi (2012). Izumi (2012) also stressed that recently instead of using the term 'NGO', the term of 'civil society organizations' is often uses to describe the a group of organizations that includes both NGOs and other community groups, which imply that the roles of women's, youth's and faith-based organizations in disaster management have greatly increased (Izumi, 2012). Those groups are seeing as the nearest to the grass root level and therefore could best accommodate their aspirations and needs. While Kamat (2003) states that CBSOs

are locally based organizations seen as the champions of "bottom up" or "pro-people" development. Moreover, CBSOs have an active membership base among the particular community in which they belong, be it urban or rural. These "target" or "client" groups at the local level are themselves involved in decision-making processes and provide organizational direction that engages all other community members.

CBSO is different than non-government organization (NGO). Stressen (1997) in Izumi and Shaw (2012) defined NGOs as professionally staffed organizations aiming at contributing to the reduction of human suffering and to the development of poor countries. Thus, although both of organizations are related with and origin from civil society organization, but CBSO has an active membership base among the particular community in which they belong.

The CBSO owns base characters, which one of them highlights the participation of the community from earlier mentioned different types of community groups. Those groups are considered to be effective in bringing the change within the community at large, since its nature of collective action around shared interest. Bringing the change within the community includes the reduction of risk towards disasters or simply Disaster Risk Reduction (DRR). Combining the nature of CBSO and DRR, then Community-Based Disaster Risk Reduction (CBDRR) is formed to fulfill the needs of- and deliver services to the community and to mainstream DRR activities. As have been described by Clayton et al. (2000), providing social services has been a critical role that CBSOs have traditionally played, both in industrialized and developing countries. However, the key change that has taken place in recent years is that CBSOs are no longer just providing services to people that the government might has failed to reach, but they are now far more in the mainstream of development activities. The nature (close to the grass root), scale and profile of CBDRR; have been acknowledged and recognized by the government and by those recognitions enable them to mainstream and conduct activities in reducing the disaster risks targeting the beneficiaries for the communities.

One important notch of CBSOs is also to support relief works in the aftermath of disasters is widely recognized by many scholars as indispensable in providing quickly the needed help for affected populations (Matsuoka, 2013). Although the CBDRR is contributing positively to the communities, there are maybe shortcomings that could hamper their steps. For an example, the limited coverage – although the CBDRR could reach wider public, according to Robinson and White (1997) one of the shortcomings of the CBSO service provision is underlined by the limitation of coverage. CBSOs may be able to aim service delivery to poor people but the scale of their operations is limited and consequently many people do not benefit from them. The critical issue would be how to scale-up CBSO interventions in order to reach more people and, second, how to improve co-ordination between CBSOs and government in service provision, respectively on DRR. In relation to service provision, however, this is essential to ensure that CBSOs do not duplicate each other's efforts or concentrate all their efforts in the same geographical areas.

Another example that could be as shortcomings, is the quality of provision, which includes technical capacity and a quite amount of motivation to the communities that

are critical issues to the delivery of services. Noted again by Robinson and White (1997), the massive increase in the role of CBSOs in service provision in recent years raises questions about the capacity of CBSOs to deliver high-quality services. However, there is little evidence from developing countries on which a general statement could be made about whether or not CBSOs can provide better-quality services than the government. Despite a number of studies that draw attention to the shortcomings of government provision in health care, there have been few studies on the quality of health care services provided by CSOs. Green and Matthias (1997) mentioned also, the cases of CBSOs providing higher-quality health care than the government are generally due to greater access to resources, not to any intrinsic comparative advantage. They point out that the converse is also true and that when funding levels for CBSOs drop, the quality levels of health care also tend to fall. In spite of those examples of the shortcomings, CBSOs are definitely regarded as contributing and bringing the change to the communities.

2.3.2 Linking CBSOs' Activities with Disaster Risk Reduction

There are several types of CBSOs existing in the community. They can be as gender-based, such as women's associations; age-based group, such as youth's unions; and religious-based group, such as faith-based organizations (Mulyasari and Shaw, 2012). It may differ from one country to other or from one locality to other; however, these types of CBSOs are the major group of organizations in Indonesia.

In order to be successful linked with DRR, several factors are needed to be embedded in their activities. The linking factors for example are in the form of principles that are chalked out and offered by UNISDR (2007) and can be adopted as guidance. Many of them are explicitly recognized and emphasized in the HFA. Past experiences in disaster risk reduction have led to the development of those basic principles, underpinning the achievement of effective disaster risk reduction. Those factors are: (1) linking and integration into development planning; (2) capacity development, (3) decentralization; (4) public private partnership; and (5) community participation.

At first, primary responsibility for implementing measures to reduce disaster risk is done by the government. Disaster risk reduction has to be an essential part of a government's investment in sustainable development. The guidance set by UNISDR (2007) has also mentioned that the government has the power as well as the responsibility to protect their citizens and their national assets by reducing the risk of losses from disasters. The government, however, cannot do the work alone. Effective disaster risk reduction relies on the efforts of many different stakeholders, including regional and international organizations, civil society including volunteers, the private sector, the media and the scientific community. Particularly at this, CBSOs should point out and raised their voices to be heard and noticeable and be engaged by the government.

(1) Linking and integration into development planning

The first factor is that DRR must be integrated into development activities. Past disasters events are destroying lives and livelihoods and trapping many people in poverty. The government can minimize such losses by integrating disaster risk

reduction measures into development strategies, assessing potential risks as part of development planning, and allocating resources for risk reduction sector-wise. At this certain point, an opportunity gap exists that can be filled by the CBSOs to link and integrate those development strategies in their daily routine activities and programs. Introduce those strategies to the communities by means of chain reactions; hence wider public participation in DRR could be obtained.

(2) Capacity development

Capacity-development could be another entry point to link CBSOs' activities with DRR, since it is a central strategy for reducing disaster risk. Capacity development is needed to build and maintain the ability of people, organizations and societies to manage their risks successfully by them. This requires not only training and individuals to recognize and reduce risks in their localities. It also includes sustainable technology transfer, information exchange, network development, management skills, professional linkages and other resources. Thus capacity development needs to be sustained through institutions that support capacity-building and capacity maintenance as permanent ongoing objectives. CBSOs can be such institutions to have DRR invested in their activities and programs.

(3) Decentralization

The following factor is decentralization, where responsibility for disaster risk reduction ought to be decentralized. Many disaster risk reduction activities need to be implemented at provincial, municipal and local levels, as the hazards faced and the populations exposed are specific to particular geographic areas. Similarly, the administrative responsibilities to manage key risk factors, such as land-use zoning regulations are often devolved to such scales. In order to recognize and respond to these locally specific characteristics, it is necessary to decentralize responsibilities and resources for disaster risk reduction to relevant sub-national or local authorities, as appropriate. Moreover, decentralization can also motivate increased local participation. Therefore, the CSOs along with improved efficiency and equitable benefits from local services are suitable actors in communicating DRR to the communities at large.

(4) Public-private partnerships

Closing public-private partnerships are also an important tool for disaster risk reduction and linking factor of CBSOs activities with DRR. Public-private partnerships are voluntary joint associations formed to address shared objectives through collaborative actions. These collaborative actions may involve public organizations such as government agencies, professional and/or academic institutions, NGOs, and CSOs together with business organizations such as companies, industry associations and private foundations. Because the threats from natural hazards affect both public and private interests alike, private-public partnerships can offer opportunities to combine resources and expertise to act jointly to reduce risks and potential losses. They can thereby improve the resilience of communities. In general, closing a partnership with the authorities and business sector can be another factor in linking CSOs' activities with DRR.

(5) Community participation

Additionally, the foremost factor among them is that effective disaster risk reduction requires definitely community participation. CBSOs can better gather and mobilize the community to be participated in short amount of time, are the CBSOs. CBSOs are close to the grass roots people and being actually in the midst of communities. In addition, they have members that are considered to be prominent within the society and regarded as role models that could influence the behavior and perceptions of community at large and trigger risk reduction actions collectively.

In summary, Table 2.7 shows the example on how those linking factors of disaster risk reduction attribute to the exemplary CBSOs in Indonesia

Table 2.7: CBSOs and Attributing Factors for DRR

CBSOs	Attributing Factors for DRR				
	Integration into development planning	**Capacity development**	**Decentralization**	**Public-Private Partnership**	**Community Participation**
Women Welfare Associations	Evaluating the disaster management plan with ward and sub-district officers	Women disaster awareness courses	Collection and communication risk data at wards	Micro-credit and soft-loan system for women-headed households	Cultural events organization for fund raising
Youth Unions	Mobilizing youth in the participation of disaster management plan review	Youth disaster drills	Set-up disaster unit office with ward government	Engagement of private sector for young entrepreneurs	Mobilization of youth in volunteering
Faith-based Organizations	Engage the community in the participation of disaster management plan review	Training of Trainers for community safety campaign	Collective cooperative schemes at ward level	Linkage of rehabilitation and reconstruction subsidy	Informal community gathering for planning

Source: (Mulyasari and Shaw, 2012)

2.3.3 Tailoring CBSOs to Disaster Risk Reduction Activities

One of the community empowerment strategies is based on community participation (Kieffer, 1984; Paton and Bishop, 1996). Once the basis for empowerment is established, the next stage involves the identification of a community change agent. The involvement of community members is to provide mutual support and opportunities in lobbying the authority. Those can be found in the CBSOs, where collective efficacy might be a good-indicator of the level of cooperation and assistance available within a community and this, in turn, may be a measurement of the likelihood of the success of mitigation and risk reduction strategies. These all require collective and coordinated actions that are being adopted and implemented.

After elaborating the CBSOs issues and their details, there is no doubt that CBSOs are important in contributing the disaster risk reduction. This is emphasized by Victoria (2009) that whether a disaster is major or minor, of national or local proportion, it is the people at the community who will suffer most its adverse effects. People, collectively, use coping and survival strategies to face and respond to the situation long before

outside help from the government or non-governmental organizations arrive. The final step, after capitalizing the CBSOs for DRR, would be how to effectively mobilize those (CBSOs) so that it is tailored to the community's needs and improved towards enhancement.

One of the tailoring issues is gender. Gender is a core factor in disaster risk and in the implementation of disaster risk reduction. Gender is a central organizing principle in all societies, and therefore women and men are differently at risk from disasters. As Enarson (1998) argued that gender relations play clearly a role in the political economy of disaster, organizational relief and response, community leadership and mobilization, household preparation and family recovery and disaster survival strategies. Moreover Enarson (1998) also argued that more equitable social relations also support the development of more democratic and participatory disaster resilient-communities. In all settings - at home, at work or in the neighborhood - gender shapes the capacities and resources of individuals to minimize harm, adapt to hazards and respond to disasters. Gender terrain of disaster can help communities live more safely with hazard, respond to crisis and reduce the impact of future disasters (Enarson, 1998). It is evident from past disasters that low income women and those who are marginalized due to marital status, physical ability, age, social stigma or caste are especially disadvantaged. At the grass roots level, on the other hand, women are often well positioned to manage risk due to their roles as both users and managers of environmental resources, as economic providers, and as caregivers and community workers. For these reasons it is necessary correctly targeted at the most vulnerable groups and is effectively implemented through the roles of both women and men. That is exactly the entry point for one of the CBSOs, such as women associations come into play.

Another tailoring issue is that disaster risk reduction within CBSOs needs to be customized to particular settings. The CBSO in one area varies greatly in their political, socio-economic, cultural, environment and hazards backgrounds with other organizations. Measures that succeed in reducing risk in one setting may not work in others. Customizing involves making use of others' experience, for instance by reviewing the context of particular measures and the nature of good practices and lessons learned, and then tailoring these to implement policies and activities that are appropriate for the local contexts. An important aspect of customizing is an awareness of cultural diversity, recognizing the differences among groups of people in language, socio-economic and political systems, religion, ethnicity, their indigenous knowledge, and in their historical relationship with nature. Because understanding the patterns and behavior of social organizations within society is crucial in promoting positive perception and action for disaster education as part of disaster risk reduction (Takeuchi et al., 2011). In addition, local socio-political structures and cultural conditions, such as kinship arrangements, customary rights, community and family networks and systems of leadership, nearly always persist during times of stress, such as disaster. It is important to take these factors as a starting point and to build on them when designing and implementing new policies and practices for community based disaster risk reduction.

Those above-mentioned issues are necessary for the CBSOs to be worked in mobilizing the community for creating at the end the culture of safety and building safer communities through community-based disaster risk reduction actions. Arguments and points above have surpassed why CBSOs are important in DRR. As summarized by Smith (1997) that CBSOs are grassroots organizations as locally based, volunteer nonprofit associations that foster social support and mutual helping, stimulation and self-expression, health, sociopolitical activation, and other outcomes among members. Thus CBSOs are constituent driven and often use a bottom-up approach, which allows those affected by a problem or potential problem to be part of the solution. Research indicates that CBSOs are such as faith-based organizations are effective in addressing community needs (Homeland Security Institute, 2006; Smith, 1997), thereby communicating the community's concerns and risks.

A study by the Homeland Security Institute (2006), also noted that CBSOs were shown to be effective in providing services to the community that government was unable to provide, through their ability in communicating community's issues (needs, concerns, and risks). Consequently, Rowell et al. (2009) then defined CBSOs risk communication as a partnership, which enables public health and emergency preparedness practitioners to involve CBSOs serving disaster affected populations in risk communication activities in disaster situation. Rowell et al. (2009) also mentioned that effective CBSOs risk communication system facilitate the flow of necessary information to the affected populations. This CBSOs approach is further supported by recent study conducted to assess risk communication practices focused on at-risk populations (Meredith, et al., 2008). A key finding is noted that community-based participation strengthens emergency preparedness, response, and recovery for at-risk populations.

One credential point that is analyzed and confirmed from literature, is that in terms of communication for resilience, this aspect of subsidiarity can be applied to diffusion of information through the use of credible spokespeople and opinion leaders, such as in community-based society organizations, to transmit information and to receive and pass on feedback (Katz and Lazarsfeld, 1995; Nicholls, 2012). Thus it is essential to scrutinize the risk communication approaches at the local level. Since risk communication is part of risk reduction actions and integral part of risk management; the following section will look closely on risk communication part and how it supports to the reduction of risks and the overall resilience building at the local level.

2.4 Risk Communication

Risk communication is regarded as a step after an assessment and a step before appropriate actions are decided and taken in the risk reduction issue. It is also regarded as the last mile of the urban resilience assessment; in which how the risk and resilience information are collected at the root level conveyed to wider communities in cities that would trigger them in taking actions. Risk communication is the main focus in this study and the following sections are illustrating the related understanding and principles in risk communication.

2.4.1 Understanding of Risk Communication in Disaster Context

Risk communication is a new growing field in the social-scientific risk research (O'Riordan, 1983; Covello, et al., 1986; Davies et al., 1986; Plough and Krimsky 1987; Jungermann et al., 1991, Kasperson and Stallen, 1990). The emerging field of risk communication has emphasized the meaningful deliverance of technical information from risk experts to the public (Johnson, 1987). Later, the National Research Council in the US (1989) defined that "risk communication process is an interactive process of exchange of information and opinions among the individuals, groups, and institutions. It is a dialogue in which multiple messages are discussed." Subsequently, Leiss (1996) stated that risk communication may be defined as the flow of information and risk evaluations back and forth between academic experts, regulatory practitioners, interest groups and the general public. Covello and Sandman (2001) examined further that risk communication could be seen as treating the problems with the message or source, with the channel, and with the receiver. Thus, Aakko (2004) opined that risk communication combines elements of conflict resolution, public participation, and two-way messages, which warn people or motivate behavioral change about the issues that pose threat to health, safety, or environment from the sender to the audience.

In a more recent development, related to disaster and resilience, Höppner et al. (2010) highlighted the important means of risk communication in building the social capacity context; hence it is the crucial element of resilient societies. Risk communication in this study addresses the exchange information, knowledge, and attitudes between stakeholders and the affected public (community) and focuses on the actions towards risk reduction. For this reason, risk communication is determined as one the most important part of risk reduction in the overall disaster management. Risk communication is integrated in the Priority for Action two (Improving risk information and early warning) of five priorities of Hyogo Framework for Action (HFA) adopted by 168 states as the outcome of 2005 World Conference on Disaster Reduction in Kobe, after the 2004 Indian Ocean Tsunami. The HFA: "Building the Resilience of Nations and Communities to Disasters" is the commitment to attain nations in the risk reduction and losses (UNISDR, 2010).

The study is accounting risk communication for the social context of risk communication as has been opined by Johnson (1987). The social networks are advanced to pull out the extent, potential of arrangements and organizations in the community in undertaken actions to reduce the risk. Risk communication is considered as a preventive activity that prepares communicating actors for hazard events that enables them to better cope with hazard events and which helps to reduce adverse impact on community. Thus, this study distinguish risk communication from crisis and emergency communication that tend to focus only on communication activities during and in the immediate aftermath of hazard events. Therefore, in the disaster context, risk communication is of an essence to conduct in before, during and after an event (Lindell and Perry, 2004; Steinfuehrer et al., 2009). In understanding the risk communication in disaster context, the following section outline the most relevant developments that have engendered the move from simple to more complex understandings of risk communication.

2.4.2 Evolution of Risk Communication

Various scholars have traced the development of risk communication as an accepted concern in theory and practice. Frewer (2004) suggested that there has been a refocusing of the official goals of communication from changing public views on risk in the 1970s, to gaining public acceptance for the sources of risk and management, and more recently to the building of trust in risk management bodies. Plough and Krimsky (1987) have argued that it was the need for risk managers to gain public acceptance for policies and technologies that significantly stimulated the study of risk communication in the first place. However, some researchers have explicitly re-emphasized the communication of risks should not only focusing on advancing the trust, but it should build upon the facilitation between stakeholder and public dialogues as a contribution of to mutual learning and innovation (Irwin, 2006, Wynne, 2006).

Leiss (1996) has identified three phases of risk communication practice:
Phase I (1975 – 1984): One way communication to primarily convey probabilistic information to educate the public at-risk and to gain consent over risk management practices and measures.
Phase II (1985-1994): Persuasive communication to change people's risk related behaviors.
Phase III (1995 – current): An emphasis on two-way communication and exchange in which all actors should engage with and learn from each other, as also mentioned by Renn, 2005)

Table 2.8 illustrates the overview of developments that are assumed to have influenced the thinking about risk communication in general, and particularly in the field of natural hazards.

Table 2.8: Development of risk communication related to natural hazards

Issue	Development	Source
Technocratic approach to social science from late 1908s	• Risk communication move away from the dominate deficit-model (communication from a source of absolute authority to an audience that is assumed to de deficient in understanding of risks) to a communication model in which both experts and non-experts openly acknowledge the limits of their knowledge and engage in a mutual dialogue on the benefits and on acceptable risks • Incorporation of variety of values, knowledge and belief system broaden the societal basis of decisions on science and technology developments	Douglas and Wildavsky (1982), Beck (1986), Walker et al. (2010)
Triggered by regulatory scandals	• Scandals such mad cow disease, genetically modified food and dioxine crisis, academic studies found a decline of public trust in official bodies in European countries from the 1980s onwards • Public (mis)trust in authorities and science has been a key concern in the risk literature. • To restore trust, a call for greater stakeholder and public participation in risk management • Risk communication should enable mutual exchange of opinions and provide information in a transparent and open way	Lofstedt (2004)
Relationship between knowledge and behavior	• People select, interpret and evaluate information and uncertainty differently depending on their personal mental models, risk framings and situation • Knowledge on probability and dangerous hazards necessarily leads to specific protective behaviors • Attitude, motivational resources, capacities and norms determined knowledge transferred into action	Wachiger and Renn (2010)
Communication through	• Forum of open exchange arguments impacted participants' mutual	Chambers (2003),

Issue	Development	Source
dialogue	relationships (e.g. trust, willingness and ability to work together), mutual understanding	Delli Carpini et al. (2004), Parkins and Mitchell (2005)
Emergency recovery to prevention and preparation	• Fostering local sustainability and its widest sense (ecologic, economic, social, and cultural) seen as the best way to make communities resilient to natural hazards • Communication needs to be tailored to a variety of purposes and communication needs (prevention, preparations, warning, emergency response and recovery), and the characteristics and perceptions of actors (government, NGO, organizations, groups, public) at different levels	Mileti (1999); Walker at al. (2010)

2.4.3 Characterizing the Risk Communication Process

This section briefly reviews the key elements of risk communication. Key elements are the actors or communicators, purpose and content of the messages, as well as communication channels and tools.

Actors in the Risk Communication Process

The risk communication process occurs between individuals, private and public institutions, and groups, which take place within and across international, national regional, or local levels. It involved actors that are regarded as nodes in communication chains or networks between which information flows in one or many directions. The strength, frequency and direction of the information flow, and the centrality of the actors, whether one actor is more central because it communicates within all actors and whereas all others do only communicate with this central actor, are the defining characteristics of such networks. Table 2.9 depicts the general categories of actors in risk communication and their distinction in source or messenger, transmitters, and receivers of risk information (Gray et al., 1998; Renn, 2008). Interestingly, community leaders, such as in CBSOs are mentioned as information transmitters, underpinning the role of CBSOs in risk communication.

Table 2.9: The actors and its role in risk communication process

Function	Actor
Source of information	• Government (local and central) and regulatory agencies • Politicians • Scientists and experts • Interest groups • Eye-witnesses • Mass Media (e.g. local and national television, radio, and newspapers)
Transmitters	• Mass Media (e.g. local and national television, radio, and newspapers) • Institutions • Interest groups (e.g. trade unions) • Non governmental organizations • Community leaders
Receivers	• General affected public • Group members • Mass Media (e.g. local and national television, radio, and newspapers) • Institutions

Source: Höppner et al. (2010)

However, Höppner et al. (2010) mentioned that one actor could have multiple roles in the communication process. For example, the media can be the receiver and transmitter

of (scientific) communication as well as one that generates risk related information. Box 2.3 illustrates the importance of media in risk communication process.

Box 2.3: The media as a vital role in risk communication on natural hazards

The media as a vital role in risk communication on natural hazards
The media are the key mediators of communication between the public, science and the political and management spheres on collective challenges such as natural hazards and climate change (Beck, 1992). Mass media outlets such as television, the radio or the press make the same information available to various audiences, even across geographical and political borders. They hence act as 'social glue' with respect to the perception and interpretation of natural hazards in heterogeneous societies (Miles and Morse, 2007). *Mani scientists, particularly in the field of climate change, maintain that mass media portrayals can substantially influence their audiences' understanding of the issues at hand, related with attitude formation and policy agendas (e.g. Boykoff, 2007; Carvalho and Burgess, 2005; Doulton and Brown, 2009; Wilson, 2005). Withmarsh et al. (forthcoming, 2010) suggest that, with respect to climate change, long-term media campaigns can generate and sustain awareness across large proportions of the public, while the new interactive media can support the involvement of the public in decision-making. Regarding natural hazards recent research in Canada suggests that press coverage of flood events indeed affects readers' perception of risks and their preference for structural flood alleviation measures (Rashid, 2010). Yet, it is not only the perception of risk and hazards that can be influenced by media representations, but also the ways people evaluate other actors' (e.g. government, risk managers, scientists) handling of risks and the trustworthiness of their performance. Media coverage furthermore conveys different pictures of the people at-risk that can impact on their perception of their own responsibilities, their agency and their own capacities to manage risks and to cope with potentially hazardous events (Höppner, 2010).* *Whether the media actually set the agenda by constructing its own stories on hazards than reproducing the problem frames of other actors such as risk managers or scientists depends on many factors (Vasterman et al., 2005). Indeed, while in some cases the media disseminates official information to the public, in other cases it propagates its own problem definition, casual interpretations and recommendations for solving problems (Entman 1983; Lakoff 2010). Construction problem frames involves a process of information selection and weighing, which inevitably results in the amplification, and attenuation of risks of other aspects of perceived reality. At times, the alternative frames of different actors stand in conflict. For instance, while risk managers are interested in emphasizing prevention and reassurance, reporters are more likely to be drawn to sensation, conflict and drama (Vasterman et al., 2005). Journalistic norms such as newsworthiness and dramatization, special editorial practices and" ideological cultures" of media outlets are important factors that shape how the media frames issues and related coverage (Boykoff, 2007; Carvalho, 2007). Scale seems to be another factor in this respect. Wilkins (2000) shows that national media in the US tended to decontextualize flood events by focusing on the event rather than on its causes and mitigation measures. In comparison, local press coverage was more sustained and provided a more in-depth and context specific discussion.* *There are therefore downsides to media communication on natural hazards. Particularly in situations of potential conflict (e.g. due to different preferences for prevention measures) or in the aftermath of a disastrous hazard event so-called media hypes produce a considerable amount of coverage. By using these "windows of opportunity" such communication potentially gains the attraction and interest of a large audience. However, the ways hazards and issues are reported within these windows are usually vey narrow, focusing on "a small number of mediagenic topics and information…that jam the media" (Miles and Morse, 2007, p367). This leaves a little room for other actors (such as the government, risk managers, scientists) to bring in their own messages. Furthermore, media attention tends to focus on events rather than on sustaining awareness for the topic in 'quiet times' of no immediate danger. Sociologists have pointed out that in our post-modern 'risk society' (Beck, 1992) people feel threatened by myriad of risks that exist only in terms of knowledge. The constant dissemination of related information through various media might make people feel cognitively saturated and reduce their willingness and ability to process further messages. Finally, we should stress that the media is only one actor among others. It thus competes with other sources of information in the formation of people's perceptions (Wakefield and Elliot, 2003).*

Source: (Höppner et al., 2010)

Moroever, Höppner et al. (2010) mention that in some cases, the condition of actors might be even more complex in the field of disasters as actors with responsibility for, or with a stake in the handling of natural hazards and risks differ not only between risk management or governance phases (pre-assessment, appraisal, characterization/ evaluation, management) but also across risk phases before, during, and after a hazard event and across different spatial levels. Thus, there is a need of characterizing the actors of risk communication process before, during and after an event, which will be addressed in this study.

The Purposes and Functions in Risk Communication Process

The purposes of risk communication frame the risk reduction and eventually shaping towards risk management. Höppner et al. (2010) mention the ways risk communication may serve to: a) raise awareness, b) encourage protective behavior, c) inform to build up knowledge on hazards and risks, d) inform to promote acceptance of risks and

management measures, e) inform on how to behave during events, f) warn of and trigger action to impending and current events, g) reassure the audience (to reduce anxiety or 'manage' outrage), h) improve relationship (build trust, cooperation, networks), i) enable mutual dialogue and understanding, j) involve actors in decision making.

Not all communication aims for conveying information and knowledge only. It is also contextualized the social domain. Johnson (1987) argues that the social context of risk communication is as important as the technical issues. Messages are conveyed from person to person (one to one or many to many), what and how risk messages are received will be affected the recipients. The communication is also one approach to advance the development of social capacities that are needed to better prepare or cope with natural hazards at the individual, group, community, and organization level (Höppner et al., 2010). One factor, which is included in the social context of risk communication, is the social networks (Johnson, 1987). The extent, complexity, and membership of social networks can affect the speed and the accuracy with which messages about hazards are transmitted. Such networks, for example fabricated in groups in community, also affect message credibility. Johnson (1987) mentions a study done by Kiecolt and Nigg (1982) and Perry (1982) that ties to a place appear to increase actions such as evacuation, to reduce vulnerability to natural hazards. Thus, credible sources of evacuation warnings increase with community involvement and social connections.

In addition to the social context, Johnson (1987) also shed a light to economic resources in risk communication. In the face of natural hazards, people may live in clearly dangerous places or refuse to evacuate when warned of imminent disaster. Consequently, Susman et al. (1983) concludes that this non-rational behavior has been linked to a lack of the capital and organizational resources that would allow people to avoid or reduce their exposure to hazards. Moreover, despite risk communications, the expectation of post-disaster assistance, such as from the government can reduce hazard preparation is doubted. Conversely, the ability of resources can help people to reduce their vulnerability to natural hazards (Marston, 1982; Burton, 1978).

Lindell and Perry (2004) cited in Höppner et al. (2010) give examples of communication purposes and functions in different disaster risk cycle phases (Table 2.10) that can be advance in the social and economic context by groups in the community that inhibit social networks. It highlights thus CBSOs' approach in disaster risk reduction and management.

Table 2.10: Examples of communication purposes and functions in disaster risk cycle phases

Before the Disaster **Awareness and Preparedness**	**During the disaster** **Warning and Emergency Response**	**After the disaster** **Recovery and Reorganization**
• Awareness raising	• Warning of event, announcing emergencies	
• Encouraging specific protective behaviors	• Triggering behavioral response by people at-risk and those managing the risk, e.g. close flood barriers, begin to mobilize emergency resources	• Encouraging specific behaviors

Before the Disaster Awareness and Preparedness	During the disaster Warning and Emergency Response	After the disaster Recovery and Reorganization
• Information provision, where and how to get information, how to read information, on specific actions that can be taken	• Information provision and coordination, what to do and whom to contact	• Information provision and coordination of tasks
• Reassurance, outrage management	• Reassurance, outrage management	• Reassurance, outrage management
• Building authority and assigning responsibility, improving relationships and building trust	• Stimulating compliance with those in authority	• Building authority and (re-) assigning responsibility, improving relationships and building trust
• Keeping memory alive		• Keeping memory alive
• Pre-assessing, appraising, and evaluating risk, planning and implementing measures and communication		• Assessing the situation, planning and implementing recovery measures, evaluating performance of measures and communication
• Mutual understanding and learning (from different perspectives, types of knowledge and opinions)		• Learning from past event

Source: Höppner et al. (2010), adapted from Lindell and Perry (2004)

The following section explained how the purposes and functions in risk communication are delivered.

The Approaches, Channels and Tools in Risk Communication Process

The option of communication approaches, channels, and tools is determined by the purposes and functions of risk communication. The communication occurs in written, verbal, and non-verbally/visual. Furthermore, communication process can be a one-way approach, in which information is transferred in one direction, and a two-way communication approach, where information flows in both directions between the communicating actors. Höppner et al. (2010) further elaborates that two-way communication takes a non-dialogical form if one actor consults the other and a dialogical form if actors engage in an interactive exchange of information. This study focuses on the communication process through risk reduction activities, which emphasized the latter from of dialogue in the risk communication process. The channels of the communication are taken in form of face-to-face (direct) or mediated (indirect). These channels target specific or expanded audience that consist one, few or many actor(s). As per time-wise, communication is also distinguished between one-off, repeated or more continuous activity. Becker et al. (2009) developed different approaches of communication according to the direction of the information flow and the number of actors (Figure 2.13).

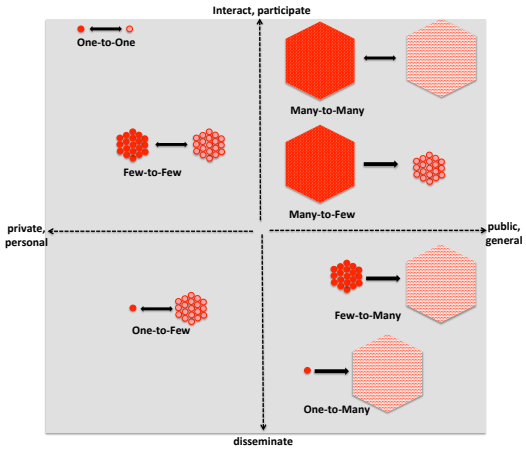


Figure 2.13: Approaches of Communication (modified, Source: Becker et al. 2009)

Burgess and Chilvers (2006) outline the examples of communication channels and tools according to the purpose and the direction of communication (Table 2.11). Although Tapsell et al. (2005) provides summary technology-centered tools to disseminate flood warnings, McCarthy (2007) lists intra- and inter-organizational communication tools in flood warning, prevention and response. However, a comprehensive overview of risk communication tools for climate-related disasters are under-researched, thus this study focuses also on the elaboration of thorough approach for this purpose.

Table 2.11: Communication channels and tools according to the purpose and the direction of communication

Purpose and direction of communication	Description	Tools
Information provision (also education) One-way communication	At a distant/indirect communication of information with no feedback mechanism	▪ Leaflets, brochures, information packs, video, newsletters ▪ Reports, documents, protocols ▪ Exhibition/displays (non-staffed) ▪ Advertising ▪ Media (TV, radio, newspaper) ▪ Internet (information provision)
Information seeking/consulting, non-dialogical two-way communication	▪ Communication to receive feedback from all types of actors ▪ Communication is either indirect or face-to-face	▪ Site visits ▪ Exhibitions/displays (staffed) ▪ Open house ▪ Consultation document ▪ Internet (Information feedback) ▪ Free telephone line (automated and staffed) ▪ Telephone conferencing ▪ Public meeting ▪ Public inquiry/hearing ▪ Deliberative opinion poll
Dialogue, two-way communication	▪ Enable mutual exchange and understanding – engage participants in interactive framing appraisal in processes and/or the evaluation and prioritization of options ▪ Identify areas of consensus and differences on issues	▪ Committee Advisory Committee ▪ Meeting ▪ Visioning ▪ Deliberative Workshops ▪ Internet Dialogue ▪ Consensus building/conference and mediation ▪ Deliberative Mapping ▪ Citizen panels ▪ Citizen juries

Source: Burgess and Chilvers (2006)

A final observation from the literature review at this point is that, it seems to be a common sense that risk communication needs to employ and combine a variety of communication channels and tools to be effective (Tapsell et al., 2005). For example, Wagner (2005) recommended for hazard prone communities to complement/permanent continuous/permanent communication through "quiet wit nesses" such as high-water marks, or objects that indicate the areal extension of past hazard events and information boards located next to eye-catching structural measures, with occasional exercises by fire or civil protection services. While the first may help to keep memory and knowledge of past events alive, the latter might additionally stimulate people's interest in taking preventive actions.

Message

The style and content of a message can have an effect on public response (Sorensen (2000). Developing and presenting a message is hence key for making communication effective. As a universal principle, the content has to fit the needs of the audience and the requirements of the risk communication situation. Sorensen (2000) for example holds that across the spectrum of natural hazards each public warning message should include the nature, the location, guidance, time and the source of the expected hazard event or risk. Transparency (includes openness, honesty and comprehensiveness) in communication appears to be the single most called for principle of good communication not only with respect to natural hazards but with respect to environmental issues in general. It is said to have crucial implications for the trustworthiness of communicators and the credibility of their messages. This implies that the content of communication is not only on what is known but also on uncertainties and what is unknown.

Moreover, messages are always embedded in wider frames of meaning that include semantic roles, relationships between roles, and relations to other frames. It means that carefully planning and actively reflecting on these frames when designing messages seems to be key in good communication systems (Lakoff 2010). Lakoff (2010) argued further that good communicators need to combine frames and messages "that are needed in the long run, as well as those needed to battle the right on issues of the day". The lesson for risk communication on natural hazards is that the effectiveness of short-term communication frames such as immediate warning may depend on the prior effectiveness of long-term frames such as risk communication to better prepare people for future events.

2.4.4 Conceptual Approaches to Risk Communication

Extensive literature has advanced an array of approaches to risk communication, each stemming from different disciplinary backgrounds and highlighting different aspects of, and implications for, communication practices. The approaches reflect the different needs and purposes of risk communication. Most common approaches to risk communication according to Lundgren and McMakin (2009) are described as general approaches that some are listed in Table 2.12. The other approach is more specific that is used in the communication of natural hazards.

Various approaches from handbooks and practical guides to risk communication have proliferated with a trend towards combining single approaches to benefit from their respective strengths and ultimately to increase the effectiveness of risk communication. However, a single threat binds them together that it should jointly promote three principles (Fischhoff, 2006 cited in Wardman and Lofstedt, 2009): (1) create appropriate communication channels, (2) manage risks well and communication credibly, and (3) deliver relevant information in a concise and comprehensive way.

Gutteling and Wiegman (1996) propose a systematic planning approach to risk communication, which involves the systematic planning of information transfer, based on scientific research, to prevent, solve or mitigate the risk problem with adjusted and

customized information (messages) for specific target groups. At the same time, the author in this study emphasizes the concept of Höppner et al. (2010) that risk communication is a social process in which different types of communication (i.e. one-way, two-sided or multi-sided dialogues) will be applied depending on the circumstances and the phase of the planning process. Table 2.12 shows the general approaches of risk communication from various sources, compiled from Höppner et al. (2010).

Table 2.12: General approaches of risk communication

Risk Communication Approaches	Understanding	Reference
Communication process approach	Proponents of this approach are interested in studying the single components of the risk communication process: sender, message, receiver, and their mutual relationships. These works are largely influenced by classical communication studies and depart from an understanding that each component of the model has to be taken into account when developing communication	Lundgren and McMakin, 2009
Mental model approach	The desire to better understand which information the audience needs to come to informed decisions. It is all about remedying a public deficit for a comprehensive discussion on how to assess the characteristics of the audience and its communication needs.	Plough and Krimsky 1987; Morgan et al. 2001; Lundgren and McMakin 2009;
Culture and ethnicity approach	Risk communicators need to understand the general characteristics of the ethnic subcultures in affected communities. Cultural norms, language mastery, household structures and role obligations can affect whether people receive information, their response time and as to how they interpret the situation.	Lindell and Perry, 2004
Crisis communication approach	The purpose of communication is to trigger appropriate behavior in cases of emergency. The risk managing organization 'knows what is best for the audience' and essentially gives them only the information they need to quickly master the emergency situation, e.g. to leave for a safe place.	Lundgren and McMakin, 2009
Hazard plus outrage approach	This approach focuses on the handling of emotions as reactions to risk situations and management actions	Lundgren and McMakin, 2009
Social network contagion approach	Advocates suggest that, rather than targeting individuals, risk communicators should think and work through the social networks of communities. The underlying assumption is that people rely more on advice, opinions and behavior from people that surround them in their daily lives. A promising way to get across messages and to encourage specific actions in the face of risk might thus be to team up with 'key social leaders'.	Lundgren and McMakin, 2009
Convergence communication approach	Communication as an iterative long-term processes in which values (culture, experiences and background) of the risk communication organizations and the audience affects the process of communication. Involving the audience in a lasting dialogue rather than through one-off and one-way communication. It might help to anticipate and mediate conflicts (arising from different values or interests) among organizations and people involved.	Rogers and Kincaid 1981; Lundgren and McMakin 2009
Social constructionist approach	▪ Held notion that objective knowledge and the scientific community and experts exclusively provide assessments of risk, while others (e.g. stakeholders, the public) contribute subjectivities such as values, beliefs and emotions. Proponents stress that, in fact, all actors contribute both knowledge and subjectivities and thus affect the assessment, evaluation and further management of risks. ▪ Understand that knowledge, values, perceptions etc. are shaped by the social and cultural context they are embedded in. ▪ A main task of risk communicators should hence be to facilitate communication to mutually elicit, understand, and learn from alternative rationalities (for instance technical and experiential, scientific and social) and different forms of knowledge in a two-way rather than a one-way process.	Lundgren and McMakin, 2009
Social trust approach	This approach rests upon the idea that people's trust in risk managing institutions is a major mediator of their risk related perceptions and behaviors	Cvetkovich and Earle, 1995; Cvetkovich 2000;
Social amplification of risk approach	This approach holds that, in societies, risks are communicated by different sources (e.g., government officials, non-state actors and NGOs, the mass media, members of the public) and transmitted by a number of entities that deliberately or accidentally amplify or attenuate the risks and potential impacts of hazard events (especially the media and personal networks).	Kasperson et al. 1988

Source: Höppner et al. (2010)

The author does not attempt to conceptualize on one approach for the study at this stage; rather it gives an overview of various approaches in risk communication. However, critical questions such as in which situations can communication be limited to a one-way mode and who decides on what and how much information should be released, and to whom are utmost important to be clarified in this study. For example, the social network contagion approach (Table 2.12) provides the understanding that risk communicators should think and work through the social networks of communities. The underlying assumption is that people rely more on advice, opinions and behavior from people that surround them in their daily lives.

Lundgren and McMakin (2009) mentioned that successful risk communication works across messages and encourages specific actions in the face of risk might and that thus has to be teamed up with 'key social leaders'. This supports the notion of what is mentioned earlier about CBSOs risk communication. CBSOs are community organizations that are headed by community leaders, who are influential to mobilize community members to bring change in their neighborhoods. This risk communication approach is important to have a focused and effective risk communication that serves to ensure that on receipt of some information; communities (the public) will behave in away where appropriate and effective steps to reduce and mitigate the risk are taken (Yamada et al., 2011; O'Sullivan et al., 2012).

However, O'Sullivan et al. (2012) researched on enhancing flood resilience through improved risk communications, warned that ineffectual communications or breakdowns in the channels along which information is conveyed, have been cited as significant factors in the inadequate of failed response to previous disaster events (Horner and Walsh, 2000; Pitt, 2007; Gheytanchi et al. 2007). Reasons for these are that at one end of the spectrum, the complex social dynamic between government, responsible authorities and the communities (public at large) is at the forefront of the decision making process and in some opportunities, the political and social consequences of conveying the risk directs the communication process (Terpstra et al., 2009; Martens et al., 2009; United Nations, 2006 in O'Sullivan et al., 2012).

At the other end, a failure by the public to simply comprehend received information can be of an issue (Twigger-Ross et al., 2009, Du Plessis, 2002; Faulkner et al., 2007). It implies that the distrust and low confidence levels in authorities that provide information, sometimes compounded by the misleading or contradictory information reported in media, can also serve to diminish community response to flood risks (Basher, 2006; Renn and Levine, 1991; Martens et al., 2009, United Nations, 2006; Miles and Morse, 2007). Therefore, any or a combination of these factors may potentially contribute to the community being poorly informed of a flood risk (O' Sullivan, et al., 2012). It compromises thus an opportunity for maximizing the levels of resilience. Therefore, effective communication between relevant stakeholders and the community (public at large) is a marker point for the development of flood risk management plan in enhancing the resilience.

In relation to enhancing resilience through risk communication, it needs to keep in mind effective communication approaches at the local level that are argued earlier. It implies

that it needs to focus on effective communication with communities seeking to reduce risks, adapt to, and be resilient in the face of, new and difficult circumstances in times of disaster. It also attempts to examine barriers and challenges that risk communicators; CBSOs thus, face in contributing to such adaptation, by providing local risk reduction actions as examples on how these might be overcome. The whole discussion provided in the dissertation is in the context of natural hazards, such as a climatic events leading to disasters, before, during, and after an event, which the need of resilience is at greatest. Therefore, the following section illustrates a glimpse of literature analysis on communication approaches for natural hazard.

Communication on natural hazard approaches

Communication frameworks and tools especially developed for the field of natural hazards is limited. A recent study from CapHaz-Net (Social Capacity Building for Natural Hazards Towards More Resilient Societies) by Höppner, Brüdl, and Buchecker (2010) on risk communication and natural hazards mentioned that although communication frameworks and tools for natural hazards are hardly to find, however, the term risk communication appears often in risk literature and more recently in risk management frameworks, such as the OECD framework on Critical Components for Managing Catastrophic Risks (Kleindorfer et al., 2009) and the Cycle of Integrated Risk Management by the Swiss National Platform for Natural Hazards (PLANAT). These frameworks acknowledge the importance of communication, however what will the communication look like is unclear.

To come close to the purpose of this study and the aims of this section, the author briefly illustrates the approach that is highlighted by Höppner et al. (2010), which is inspired from the CapHaz-Net WP1 report on social capacity building by Kuhlicke and Steinführer (2010), and from Powell and Colin (2009). The approach is distinguished between knowledge capacities (e.g. on hazards, on how to act), attitudinal/motivational capacities (awareness, motivation to act), social/organizational capacities (e.g. trust, relationships), and psychological capacities (e.g. to cope with stress, anxiety) at individual, community and organization level (Table 2.13).

Table 2.13: Level at which social capacity building can occur for risk communication

Organization level	Community level	Individual level
▪ The defining characteristic of this level is that actors belong to "cooperation structures within formal- institutional structures and systemic functions, with clearly defined strategic goals, explicit benchmarking processes (milestones) (Matthiesen 2005). ▪ Such formal organization structures may exist in different sectors: the public, the private and the voluntary sectors.	This level focuses on local communities and summarizes the actors from the organizational level (public, private & voluntary sectors) as well as individuals. It concentrates, above all, on the interaction and forms of cooperation between the different actors in a specific locality (e.g. village or an urban neighborhood).	This level includes individuals or a collective body of individuals (e.g. households, schools etc.). The defining characteristic of this level is that actors are formally not organized with respect to hazard and risk management efforts.

Public Sector	Private Sector	NGO
Organizations from the public sector, which are directly or indirectly involved in disaster and risk management. They may include governments, ministries, ad- ministrations, planning agencies, local authorities, public services, fire brigades, etc.	Companies in the private sector. They may be insurance companies but also other companies formally or informally involved in risk and disaster management e.g. privately owned utility or infra-structure companies. It may also include companies ex- posed to natural hazards.	Non- governmental organizations from civil society (voluntary sector) involved directly or indirectly in disaster and risk management. They may include NGOs, foundations, community groups, activist groups, Union and interest groups.

Source: Kuhlicke and Steinführer (2010)

Based on the segmentation approach, the study of Höppner et al. (2010) has divided into three type of communication. These types of communication are as follow:

(1) Communication to raise awareness and to change risk related behaviors

O'Neill's (2004) defined a framework in the context of flooding at the community level. O'Neill (2004) suggested that according to the characteristics of the audience, different communication tools are needed and the goals of communication vary. He suggested further that social capacity building in communication is needed to raise awareness and behavior change (Table 2.14) (O'Neill, 1994). Accordingly, people differ in their willingness to actively manage rather than denying risks and to adopt or change behaviors. The propensity to proactively engage with risks affects the time people need to adopt protective behaviors. O'Neill (2004) also suggested the relatively small number of people in a community with a high willingness to invest time and energy in adopting actions should be involved from the very start of a community program and in more participatory, face-to-face way benefit from their knowledge, creativity and time when developing community approaches.

Table 2.14: Social capacity building in communication to raise awareness and behavior change

Involvement in the Participatory Process	
Individual Level	**Community Level**
Knowledge capacities ▪ Build individual knowledge on risks and ways to act and the ability to find and under- stand information.	
Attitudinal/motivational capacities ▪ Develop attitudinal/ motivational resources such as self-confidence in know- ledge and personal abilities to critically analyze information and to creatively engage in finding solutions to a problem; build a personal sense of responsibility.	
Social/organizational capacities: ▪ Develop communication, organization and leadership skills; planning and outreach skills.	Social/organizational capacities: ▪ Develop local ownership of the communication program; build networks between community individuals, groups and organizations.
Psychological capacities: ▪ Develop capacities and re- sources needed to better cope with the psychologically adverse effects of hazard events.	

Social Marketing Techniques
Individual Level
Knowledge capacities: ▪ Building up knowledge on ways to act; ability to find and understand information
Attitudinal/motivational capacities: ▪ Raised awareness; interest and motivation to act; build a personal sense of responsibility

Source: O'Neill (2004) in Höppner et al. (2010)

The approach suggested that the small group of people who are involved through a participatory process at the beginning of the communication program may co-define what capacities are needed in a community and by which means they should be developed. This implies that CBSOs have an important role to play in risk communication.

(2) Communication to enable mutual understanding and dialogue

In the field of natural hazards, such communication may serve for different purposes. The model focuses on dialogical two-way communication between experts, decision makers, and key stakeholders. It also attempts to involve citizens or wider public in interactive communication process. Table 2.1.5 shows the social capacity building for this model

Table 2.15: Social capacity building in communication to enable mutual understanding and dialogue

Individual Level	Community Level
Knowledge capacities: Learning about other actors with a stake in the handling of risks, what they know, what they think and why; knowledge on risks, hazards and prevention measures	
Social/organizational capacities: Develop communication, organization and leadership skills; planning and outreach skills.	Social/organizational capacities: Develop local ownership of the communication program; build networks between community individuals, groups and organizations.
Psychological capacities: Develop capacities and re- sources needed to better cope with the psychologically adverse effects of hazard events.	

Source: Kolkman et al. (2005), Burgess et al. (2007), Kenyon (2007), Scolobig et al. (2008), Frazier et al. (2010) in Höppner et al. (2010)

(3) Communication to improve relationships and coordination

Drawing on that on intra- and inter-organizational communication approaches McCarthy (2007) showed that communication on risks between and across the spectrum of risk managing entities before, during and after flooding events (based on his study of risk communication on floods between management bodies at the national level in the UK), is as much about defining and improving relationships as it is about conveying information and direction. This approach has a clear links to social capacity building. Building up human resources and relationships within and between organizations is central to this approach. Developing these resources and relationships

is therefore vital to better and more efficiently use information/knowledge and to coordinate/structure actions. Table 2.16 shows the social capacity building for this approach.

Table 2.16: Social capacity building in communication to improve relationships and coordination

Individual Level	Organization Level
Knowledge: ▪ Learn where to get data, how to use it and whom to contact	Knowledge: ▪ Learn to work together to achieve shared goals
Social/organizational: ▪ Communication and organization skills, improved relationships (establishing and stabilizing relationships based on trust and experience)	Social/organizational capacities: ▪ Ability to manage/share information and to coordinate tasks, establishing and multiplying formal and informal communication channels within and between organizations

Source: McCarthy (2007), Bouwen and Taillieu (2004) in Höppner et al. (2010)

Having briefly outlined and analyzed the approaches of risk communication on natural hazards, one last essential factor is the involvement of media. The vital role of media in risk communication on natural hazards is stated in Box 2.4 as the key mediators of communication between public, scientific forum, and the political and management spheres on collective challenges such as natural hazards and climate change. Traditional media outlets such as radio, newspaper, and television develop the same information available to various audiences, even across the geographical and political borders.

For example, communities in flood risk areas are not homogeneous and are comprised of individuals varying social and demographic profiles; they have different expectation on receiving communications and warnings. Thus, media in this view, act as social glue with respect to the perception and interpretation of natural hazards in heterogeneous societies (Miles and Moore, 2007). Addressing this, therefore advancing multiple channels of communication in disseminating flood risk information is perennial. Therefore, further discussion and analysis of media in risk communication that will eventually reduce the risk and enhance the community resilience is required. Below section thus illustrates more the role of media in risk reduction and communication in the context of enhancing the resilience.

2.5 Role of Media in Disaster Risk Reduction and Risk Communication

The media can influence political decisions, change public attitudes, and save people lives. Exploring the root causes of disasters and their social dimensions lead to disaster risk reduction stories. By asking questions such as: Why are disasters happening? How can we prevent disasters? Who is responsible? Jonathan Baker, as a prominent broadcaster and editor has raised the responsibility of media in disaster reporting (UN, 2012b). His views, cited from the United Nations Report, can be seen in Box 2.4.

Box 2.4: The responsibility of the media in disaster reporting

The responsibility of the media in disaster reporting by Jonathan Baker

Whether we like it or not, the way a media organization responds to a disaster will be driven first and foremost by how strong a story they think it is. To put it crudely: How bad is it? When reports come in of a catastrophic flood or an earthquake, the journalistic instinct will be to ask questions like these:

- *How many people are dead, injured, made homeless? (Enough to mean that I have to run the story)*
- *Are people from my own country likely to be among the victims? (If not, am I interested?)*
- *What are the video pictures like? (If they're good, I might run them, regardless of the answers to the previous two questions)*
- *Should a journalist be sent to the scene, and if so, how far away is it, how long will it take to get there and how much will it cost? (My budget's always under pressure)*
- *Will my audience be interested in the story? (And will they care?)*
- *What other news is there today? (I never have enough room for all the news I want to carry)*
- *Might I win an award for covering this? (That would be nice)*

These are the selfish, but perfectly understandable reflexes of news people the world over, be they employed by commercial or public service organizations. And even when a disaster satisfies these editorial requirements, it cannot be guaranteed to command any volume of coverage. A famine in Africa might fall off the editorial list on the grounds that it has been going on for a long time and is likely to continue for some time. Or, there is nothing "new" to say, and there is a sense of helplessness that no one can do anything to prevent it. Widespread flooding in Bangladesh, for example, might not figure in an editorial discussion because of the regular, seasonal nature of such occurrences – it's not news. This may perhaps sound callous, and it is certainly depressing, but surely it is also inevitable. By some computations, there is, literally, a disaster for every single day of the year. Many will pass virtually unnoticed. Most will receive news coverage in the region in which they occur, but few will feature on a global news agenda. Frustratingly, those that do will not always be the ones most deserving of attention. Think of the huge international coverage given to the floods in Mozambique some years back. Was that a reflection of the number of dead, the number of homeless, economic or environmental damage? It was surely a lot more to do with all those dramatic pictures of helicopters plucking people to safety, and the story of the woman who gave birth in a tree while awaiting rescue.

The UN guidebook provide powerful arguments intended to change that mindset, helping journalists focus on prevention rather than cure, on early warning and explanation, and on subsequent efforts to rebuild and recover. It is much harder to sell these stories to news organizations that are conditioned simply to reporting events as they occur, and which have a limited attention span and little interest in context or background. But many will see it as part of their responsibility to take a broader and more multifaceted approach to their journalism.

And that broader approach should also drive their actual reporting of an event. If the reportage will be seen or heard in the affected area, there is obviously a huge public information remit for the media. This could take many forms – details of which areas are worst affected, weather forecasts, where to find shelter, water, food and other necessities. To this might be added news of the hospitals treating victims, and where it is possible to find news of people who might have been caught up in the disaster.
This primary phase of the disaster coverage will often see the media, governments, emergency services and relief organizations working together to get the maximum amount of information to the maximum number of people. All of this is a legitimate, indeed obligatory, part of the media's reporting effort. To this extent, everyone is a public service broadcaster in these circumstances. Sometimes, audiences will want to know what they can do to help – with money, food, clothing, medical supplies – and the coverage can advise them on what is most needed and how it can be conveyed to the disaster zone. Audiences will also want to know more about what has happened and why. Many disasters can be traced to a cause, man made or natural. People the world over were desperate to know the cause of the tsunami, which had such a devastating impact over such a wide area. Mudslides can sometimes be linked to deforestation many miles upstream. Increasingly, people look for links to global warming and climate change. Often, too, there is a natural human desire to hold someone accountable, to find someone to blame. Did a government ignore calls for early warning systems, or skimp on defenses against hazards? Did it turn a blind eye to excessive logging or toxic emissions from a chemical plant? Did a company ride roughshod over safety regulations because they would have hit profits? Were the forest fires started on purpose?

All of these are important areas for journalistic exploration, not least because they contribute towards efforts that can be made either to prevent such a disaster ever happening again or – if that's not feasible – mitigating the effects, should it strike again in future. News organizations should feel the need to keep returning to stories to make sure that promised new regulations have indeed been put into place, that overseas aid has gone to those who most need it, that reconstruction is proceeding at a reasonable pace. Holding people accountable for their areas of responsibility is one of the basic purposes of a properly functioning media.

From all of which it will be evident that even given their blinkered and highly subjective response to a disaster, the media can and should take a prominent role in bringing it to public attention, support the relief effort by the rapid dissemination of information, explain the background and causes, and hold people to account for their actions. These are responsibilities that most news organizations would recognize and readily accept.

Source: UN (2012b)

In the course of the last three decades, broadcasters, magazine editors, newspaper journalists and bloggers have helped make dramatic changes in social attitudes to drinking, smoking, diet, HIV and AIDS and the environment (UN, 2012b). If DRR becomes a normal part of the national, civic and media agenda, it will be because of systematic, measured and sensible reporting by responsibly minded people in the media. Below is a list of ten good reasons why mass media ought to report on DRR. The author has adopted these ten reasons from the UN guidebook on journalists in covering

disaster risk reduction news (UN, 2012b) and emphasizing these with other sources. These reasons may not be taken as a concluded form, but they give one an overview on why the media hold an important role in risk reduction information dissemination. These reasons are as follow:

1. Natural hazards are on the rise and will continue to make news

Natural hazards are likely to remain among the most challenging issues in the future as poverty, urban risks, climate change and environmental degradation expose more people to an entirely new scale of devastation. Disaster risk reduction stories do not need more money or manpower; they require another mindset, established information sources and a good understanding of the "process" behind every disaster.

2. DRR is a political issue

As disasters continue to rise and people demand more action from their governments to take preventive action, DRR is likely to become a significant political issue in the years to come. As populations are increasingly affected by climate-related disasters, such as sea-level rise, floods and droughts – which can contribute to economic and political instability – most disaster-prone countries will be less inclined to accept the recurrence of disasters fatalistically and will urge for more political commitment. The increasing damage from disasters both within and beyond national boundaries will also make the case for closer regional and international collaboration. ASEAN countries have called for making the HFA a binding document (UN, 2012b; Matsuoka and Shaw, 2011).

3. DRR is an economic issue

Disasters are costing more and have long-term economic impacts on both developed and developing countries alike. Disasters caused USD 109 billion in economic damage in 2010, three times more than in 2009 (UN, 2012b). The 8.8-magnitude earthquake that struck Chile in February 2010 cost USD 30 billion, although Haiti's earthquake was the deadliest event of 2010, killing more than 250,000 people, its economic toll was USD 8 billion (UN, 2012b). To add, in developing health facilities, enormous investment is required, such as cost of reconstruction and recovery (Mulyasari et al., 2013a). The Icelandic volcano crisis in April 2010 cost airlines more than USD 1.7 billion in lost revenue (IATA, 2010 in MercoPress, 2010). Finally, the damage of recent January 2013 Jakarta Flood mounted up to USD 2 billion (IRIDes, 2013).

4. DRR is a human right issue

Governments have the primary responsibility of protecting their citizens against disasters. Recent humanitarian crises caused by disaster situations have raised new challenges, in particular in relation to the protection of the basic human rights of disaster-affected populations and victims at times of disasters. While the concept of human rights protection is widely acknowledged as a crucial element of humanitarian strategies in times of emergency and disaster situations, the longer-term aspects linked to the promotion and definition of a human rights-based approach in disaster prevention and reduction is still limited.

5. DRR is an environmental issue

Environmental management has an important role to play in reducing many of the risks posed by natural hazards. Ecosystems act as natural, dynamic barriers that can help protect vulnerable communities from at least some of the impacts of climate change (Uy, 2013). DRR is likely to become more mainstreamed into the sustainable development agenda and climate change negotiations, which already receive significant media coverage.

6. DRR is a cultural issue

People have different perceptions of disasters and react in different ways. Some people ignore hazards and believe they are inevitable, while others believe that they are an act of God or nature and that there is nothing they can do. But many societies realize that hazards can be identified and disasters prevented. Using traditional knowledge, people in many regions have adapted building design to withstand earthquakes, or to survive flooding. People also confront hazards in different ways according to the traditions of their culture. When the Indian Ocean tsunami hit in December 2004, over 250,000 people were killed throughout Asia, but only seven died out of a population of approximately 83,000 on *Simeulue* Island, Aceh-Indonesia, just 40 km from the epicenter of the earthquake (UN, 2012b). Nearly the entire population on the island survived thanks to knowledge of previous tsunamis, handed down from each generation to the next; people sensed they had to evacuate and go towards higher ground to survive.

7. DRR is a gender issue

In poorer countries, women and children tend to be the most affected by disasters. In many countries, the vulnerability of women is much greater because of their subordinate position in the family, lack of control over the means of production, restricted mobility, limited facilities for education, lack of employment, and inequalities in food intake relative to men (Mulyasari et al., 2013b). For example, as a result of Cyclone Nargis in 2008 in Myanmar, twice as many women died as men in the 18-60 age groups (UN, 2012b). Other example could highlight women's success stories in reducing risks in their neighborhoods, taking shape as risk reduction drivers. By highlighting examples of women leaders in their communities across Asia and Africa, it can be very attractive stories, contributing to women's empowerment in the development.

8. DRR provides good investigative and in-depth stories

Journalists do more than just break the news. There are many ways of getting disaster risk reduction into the public consciousness, ways that can inform, educate and raise awareness and concern about one particular threat. They can question the performance of governments, and alert and help a particular vulnerable audience to cope with a potential disaster. They can draw attention to vulnerability, and warn of "disasters in the making" based on risk assessments. Such reports raise the controversial elements of governance, corruption, budgetary mark-up, and potential danger.

9. DRR is NOT only a disaster story

DRR stories do not just have to be about the disasters themselves. Covering current risks and dangers, commemorating past disasters, reporting on disaster recovery and

reconstruction efforts as well as on positive measures that can save lives, such as education and traditional knowledge, can be good stories too. The story of *Tilly Smith*, a young English girl on vacation in Phuket, Thailand, during the 2004 tsunami is one of them. *Tilly* had a geography lesson in school on tsunamis before going on vacation; therefore she saved hundreds of people in her hotel (UN, 2012b).

10. DRR is everybody's business

As "mirrors of the society", the media has a responsibility to raise the profile of disaster risk reduction issues among the public at large. Media played an essential role in raising awareness about the dangers of AIDS and road safety and diminishing the number killed every year by these two threats. No one would stop using seat belts or condoms because they have never had an accident or never contracted HIV. In the same way, no one should fail to take care of their homes, workplaces or children's schools because they have not suffered floods or earthquakes. Media can help make everybody a risk reducer and make the world safer against disasters. Media have also another main role in the early warning chain, as they are often the first ones to issue early warning messages.

Drawing from the above reasons, it is evident that media has influential role in dissemination of risk information and may change people's behavior in perceiving the risks. This may lead at the end of taking proper actions in responding the risks. At last, the section below briefly illustrates the types of media and its impacts in risk communication.

2.5.1 Media Organizations and Risk Communication

News media channels that are available to large segments of the population, including television, radio, newspaper, and Internet, are the largest source of information in the society (Lundgren and McMakin, 2013). These media organizations can choose among several roles or level of participation, to address a given-risk related issues. Participation can span wide range from least to most involvement. These are as follow: (1) reporting-existing information, (2) influencing the way an issue is portrayed, (3) independently bringing an issue to the public's attention a stand on an issue.

Many factors affect which role, or combination of roles, media organizations take (Lundgren and McMakin, 2013). One factor is the type of communication situation, such as care, consensus, or crisis. For example, when a crisis presents imminent danger, reporters are likely to start with reporting existing information, when the public must be alerted quickly to protect themselves. At the later stage, media organizations may turn to a more investigate role to attempt to uncover the factors that led to crisis and emergency. This role may involve working with official investigating organizations, citizens' groups, policy makers, and others to describe a more complete picture of the risk, its causes, and its potential solutions. Lundgren and McMakin (2013) has illustrated the lowest – and highest participation end of the scale, those responsible for communicating risks may be interviewed by reporters or otherwise asked to provide information for a story. In addition, those who are communicating risk may need to seek media representatives to provide information on breaking news or current events.

In care communications, media organizations may choose to take and active role in reducing risk. In this role, media organizations often describe the negative consequences of the risk to community and suggest ways that individuals, groups, and entire communities can act to reduce risks. This approach casts media organizations in a stakeholder role, in which they participate with others in characterizing the problem and its potential solutions. At the highest-participation end of the scale, Lundgren and McMakin (2013) describe that individual editors or producers occasionally feel that a particular issue is significant enough that their organizations must be more involved. This often involves an issue that affects the community, affects many stakeholders with different opinions about the risk, and requires a consensus decision informed by many views.

What we call traditional media (radio, newspaper, and television) thus can trigger people to act. Bandura (2001) studied the social cognitive theory of mass communication. Because of the influential role the media play in society, understanding the psychosocial mechanisms through which symbolic communication influences human thought, affect, and action is opined important. It describes then the social cognitive theory that people are self-organizing, proactive, self-reflecting, and self-regulating. It is thus human self-development, adaptation, and change are embedded in social systems. Therefore, personal agency operates within a broad network of socio-structural influences (Bandura, 2001). The relation of media with social cognitive theory accords a central role to cognitive, vicarious, self-regulatory, and self-reflective processes. An extraordinary capacity for symbolization, such as media, provides people with a powerful tool for comprehending their environment and creating and regulating environmental events that touch virtually every aspect of their lives. Bandura (201) further explained that most external influences, by way of media, affect behavior through cognitive processes rather than directly.

Therefore, cognitive factors partly determine which environmental events will be observed, what meaning will be conferred on them, whether they leave any lasting effects, what emotional impact and motivating power they will have, and how the information they convey will be organized for future use. It is with symbols, through media, that people process and transforms brief experiences into cognitive models that serve as guides for judgment and action. Through symbols inhibits in media, people give meaning, form, and continuity to their experiences. Consequently it reaches to the beginning of the argument that media can trigger people to act.

Other important impact of media communication to human behavior on risk and resilience is that people do not live their lives in individual autonomy. They have to work together to secure what they cannot accomplish on their own. Bandura (1999, 2000) explained that social cognitive theory provides in media, extends the conception of human agency to collective agency. It is how the more effective groups judge themselves to be, the higher their collective aspirations, the greater their motivational investment in their undertakings, the stronger their staying power in the face of impediments, thus the more robust their resilience to adversity, and the higher their performance accomplishments. Thus media communication considerably supports the risk reduction and resilience.

A major significance of media lies in its tremendous reach and psychosocial impact. Unlike learning by doing, which requires altering the actions of each individual through repeated trial-and-error experiences, in observational learning a single model of media communication can transmit new ways of thinking and behaving simultaneously to countless people in widely dispersed locales. There is another aspect of media that magnifies its psychological and social impact. During the course of their daily lives, people have direct contact with only a small sector of the physical and social environment. They work in the same setting, travel the same routes, visit the same places, and see the same set of friends and associates (Bandura, 2011). Consequently, people's conceptions of social reality are greatly influenced by conditional experiences—by what they see, hear, and read— without direct experiential correctives. To a large extent, people act thus on their images of reality.

Following sub-section is an example of media communication in the form of Public Service Announcements (PSA/adds) that provides public with images of reality and serves the risk communication process.

Public Service Announcements

According to Lundgren and McMakin (2013), Public Service Announcements (PSAs) are advertisements that serve the public interest. PSAs educate and raise awareness about significant social issues in a way that will change attitudes and behaviors and create positive social change. PSAs are not intended to promote a commercial product or brand and usually put out by government and nonprofit organizations. PSAs are common in care communication, such as in crisis communication, and such as in disaster issues. Lundgren and McMakin (2013) mentioned an example of Federal Emergency Management Agency telling people how to get help after a flood. Television and radio are the most common media outlets, but newspapers, magazines, and website may accept PSAs as well.

Most PSAs run as community service at no charge by the media, but some media run in purchased time and space. Some nonprofit organizations and government agencies purchase media time and space for some of their PSAs, which give them more control over placement and scheduling. Nowadays, most stations are setting their own standards on what constitutes fulfillment of their public service programming responsibilities to their local communities. Some stations may run their own community-affairs programming instead of PSAs. Others air public-service-type messages from paying advertisers and use on-air promotions featuring their own network TV icon or stars. Stations may also run PSAs in the early morning hours when the spirit of audiences run high to obtain positive impact. To summarize, the PSAs may be one strategy in an overall risk communication program.

Below section illustrates a glimpse of the influence of media in risk communication that is captured from literature review. It completes the understanding of the role and need of media in risk communication and its impacts to people's behavior towards the risks.

2.5.2 Influence of Media in Risk Communication

One of many psychological theories, such as on social behavior, was cast long before the advent of extraordinary advances in the technology of communication. As a result, they give insufficient attention to the increasingly powerful role that media plays in present-day human lives. Whereas previously, media influences were largely confined to the behavior patterns exhibited in one's immediate environment, the accelerated growth of video delivery technologies has vastly expanded the range of models to which members of society are exposed day in and day out (Bandura, 2001). As the consequent, new ideas, values, behavior patterns, and social practices, are now being rapidly diffused worldwide by media in ways that foster a globally distributed consciousness (Bandura, 1986, in Bandura, 2001). Because the media occupies a major part of people's everyday lives, much of the social construction of reality and shaping of people consciousness occurs through electronic acculturation. At the societal level, the electronic media (such as radio and television) of influence are transforming how social systems operate and serving as a major vehicle for sociopolitical change (Bandura, 2001). Therefore, the study of acculturation in the present electronic age, such media as of today, must be broadened to include electronic acculturation.

There are some media effects that influenced people's behavior towards risks, punctuating the observation learning from media. These are compiled from Bandura's work (2001):

1. Attention

Attention processes determine what is selectively observed in the abundant media influences to what extent the information is extracted from ongoing-modeled events. Media influence the cognitive skills, preconceptions, and value preferences of the observers. Others are related to the salience, attractiveness, and functional value of the modeled activities themselves. Still other factors are the structural arrangements of human interactions and associational networks, which largely determine the types of models to which people have ready access. Thus media has great influence to what people are observing and the usage of a particular media is driven by people's interaction in communities and what is their common use of media in their social networks.

2. Retention

People cannot be much influenced by observed events if they do not remember them. Retention involves an active process of transforming and restructuring information conveyed by media into rules and conceptions for memory representation. Retention is greatly aided by symbolic transformations of modeled information into memory codes and cognitive rehearsal of the coded information to people's mind.

3. Behavioral changes

Media messages are translated into appropriate courses of action. This is achieved through a conception-matching process in which conceptions guide the construction and execution of behavior patterns that are then compared against the conceptual model for adequateness. The behavior is modified on the basis of the comparative information to achieve close correspondence between message and action.

4. Motivational process

Social cognitive theory distinguishes between acquisition and performance because people do not perform everything they learn. Three major types of incentive motivators influence performance of observationally learned behavior: direct, vicarious, and self-produced. People are more likely to exhibit modeled behavior if it results in valued outcomes than if it has unrewarding or punishing effects. People are motivated by the successes of others who are similar to themselves, but are discouraged from pursuing courses of behavior that they have seen often result in adverse consequences.

For example, media, such as television, provide the best access to the public through their strong drawing power. For this reason, television is increasingly used as the principle vehicle of justification. Struggles to legitimize and gain support for one's values and causes and to discredit those of one's opponents are now waged more and more through the electronic media (Ball-Rokeach, 1972; Bandura, 1990; Bassiouni, 1981 in Bandura, 2001). Because of its potential influence, the communication system itself is subject to constant pressures from different factions within society seeking to affect their ideology. Research on the role of the mass media in the social construction of reality carries important social implications. And why is that? Because, televised representations of social realities reflect ideological bents in their portrayal of human nature, social relations, and the norms and structure of society (Adoni & Mane, 1984; Gerbner, 1972 in Bandura, 2001). Televised influence is best defined in terms of the content people watch rather than the sheer amount of television viewing. More particularized measures of exposure to the televised fare show that heavy television viewing shapes viewers' beliefs and conceptions of reality (Hawkins & Pingree, 1982 in Bandura, 2001).

Moreover, alternative theories about how media communications relate to public attitudes and behavior were tested by Watt and van den Berg (1978). They explained the conceptions that media influence people directly; media influence opinion leaders who then affect others; media have no independent effects; media set the public agenda for discussions by designating what is important but do not otherwise influence the public; and finally, media simply reflect public attitudes and behavior rather than shape them. The direct-flow model from media to the public received the best empirical support. In this study, the behavior was highly publicized and could bring benefits without risks. When the activities being advocated require the investment of time and resources, and failures can be costly, people are inclined to seek verification of functional value from other sources as well before they act.

Chaffee (1982) reviewed substantial evidence that calls into question the prevailing view that interpersonal sources of information are necessarily more persuasive than media sources. People seek information that may be potentially useful to them from different sources. The relative importance of interpersonal and media sources of information in initiating the adoption process varies for different activities and for the same activity at different stages in the adoption process (Pelz, 1983). People are initially reluctant to adopt new practices that involve costs and risks until they see the advantages that have been gained by early adopters. Thus, in effecting large-scale changes, communications systems operate through two pathways. In the direct

pathway, communications media promote changes by informing, enabling, motivating, and guiding participants. In the socially mediated pathway, media influences are used to link participants to social networks and community settings. These places provide continued personalized guidance, as well as natural incentives and social supports for desired changes (Bandura, 1997 in Bandura, 2001).

The major share of behavior changes is promoted within these social specific environments. Therefore, people are socially situated in interpersonal networks. When media influences lead viewers to discuss and negotiate matters of import with others in their lives, the media set in motion transactional experiences that further shape the course of change. This is another socially mediated process through which symbolic communications exert their effect. In highlighting the influence of media, the evolving information technologies will increasingly serve thus as a vehicle for building social networks (Bandura, 2001) in communities. Therefore, media influence as well the interconnectedness among people, linking communities across organizations and geographical locations to achieve a common goal. Thereby, media helps in communicating risks in regard to disaster risk reduction and has influential role to play in enhancing the disaster resilience.

2.6 Key Message

Summarizing the sections earlier, this chapter has revisited literature on the increasing of global climate-related disasters trends, emerging risk issues in urban context and its concept of resilience through risk communication by local actors and media. The next stage of understanding the enhancement of climate-related disaster resilience through effective risk communication in Bandung, Indonesia is by visiting the risk reduction efforts and resilience on national context. Indonesia is a multi-hazard prone country with above 40 percent its cities are located on the coastal areas, thus susceptible to climatic events. Revisiting the risk reduction approach at national context in the next chapter will considerably help in identifying entry points and opportunities of local level implementation of disaster risk reduction. It will point the way towards the establishment of more localized institutional framework of disaster risk reduction and the identification of local actors in risk communication, which may enhance the resilience.

2.7 Key Findings of Chapter 2

There are key findings that are submerged from the literature review that support and link to current study. These are summarized in the Table 2.17 below.

Box 2.5: Key findings of Chapter 2 and the link to current study

Highlights
2.1 Urban Disaster Risks and Climate Change ▪ Emerging urban risks, such as urbanization, urban setting, poverty, health, lack of sanitation and solid waste management exacerbated the cities, especially in developing countries ▪ Increasing trends of climate-related disasters in urban areas. Cities need to adapt and resilience to disasters due to climate change ▪ Urban stresses (slow onset and low impact processes tat are of high probability, especially in the urban

context) coupled with shocks (low probability but rapid onset and high impact events that cause immediate and visible damage to lives, property and environment) leading to disasters if various systems, for example in physical, social, economic, institutional, and natural dimensions within a community fail to cope.

- City and its people have to be resilient to cope with disaster. The context of urban resilience is based on the inherent capacity of cities to bounce back, or recover, after disasters.
- Baseline resilience assessment that addresses linkages between various actors and aspects is indispensable to identify the weakness, strength, and capacities to be disaster resilient.

2.2 Role of Local Governance in Disaster Risk Reduction

- Need of local level disaster risk reduction
- Local governments regarded as best positioned to implement DRR due to closer to communities and due to the accumulation of the basic environmental management and regulatory framework and governance functions
- Decentralization and coordination in the form of multi-stakeholder platform brings local government and community closer, pointing the importance of local governance and local platform in DRR
- Engaging communities with DRR activities and link their concerns with government priorities

2.3 Community-Based Disaster Risk Reduction and Management Approaches

- Disaster management should not be treated as one single issue, but it should be incorporated into socio-economic activities of local people (linking communities' activities with disaster risk reduction)
- People, collectively use coping and survival strategies to face and respond the disaster situation. These local actors are elaborated as Community-Based Society Organizations (CBSOs) in reducing the risks
- CBSOs are effective in addressing community needs, thereby communicating community's concerns and risks
- The linking factors of CBSSOs' activities with DRR include the integration into development planning, capacity development, decentralization, public-private partnerships, and community participation

2.4 Risk Communication

- Risk communication is taking the shape of interaction platform of exchanging information and opinions of risk reduction issues among the individuals, groups, and institutions
- Effective communication between relevant stakeholders and the community is a marking point for the development of disaster risk management plan in enhancing the resilience
- Social networks are extremely important to pull out the potential of arrangements and organizations in the community in communicating risks and undertaking DRR actions
- Risk communication is considered as a preventive activity that prepares communicating actors for hazard events that enables them to better cope with hazard events and which helps to reduce adverse impact on community. Therefore in this context, risk communication does not focus only on communication activities during and in the immediate aftermath of hazard events, but it is the conduction of conveying information before, during and after a disaster event

2.5 Role of Media in Disaster Risk Reduction and Risk Communication

- Media is not only a tool to convey information and messages to public, but media influences people's behavior towards the risks, in terms of motivating people to act towards the risk
- In the context of socially pathway of risk communication and resilience, media influences are utilized to link participants to social networks and community settings
- Media in risk communication on natural hazards act as the key mediators of communication between public, scientific forum, and the political and management spheres on collective challenges such as natural hazards and climate change.
- Traditional media outlets such as radio, newspaper, and television develop the same information available to various audiences, even across the geographical and political borders, but affect people in various forms (promoting DRR actions, generate knowledge, and trigger people to act)

Link to current study

- The increasing climate-related disasters and the underlying risks in urban areas are the driving force for cities in taking actions towards resilience
- Underlines the importance of local disaster risk reduction actions by local government and communities in enhancing the resilience
- Risk communication is integral part of risk management, thereby local actors in communicating risks will contextualize risk reduction actions and thus enhancing the community resilience
- Media does not only serve as tool in conveying risk information but trigger people's behavior in taking risk reduction and thereby enhancing community resilience

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Chapter 3
Risk Reduction Approaches and Resilience to Climate-related Disasters in Indonesia

"Prepare for the unknown by studying how others in the past have coped with the unforeseeable and the unpredictable."
~General George S. Patton

Chapter 3
Risk Reduction Approaches and Resilience to Climate-related Disasters in Indonesia

This chapter provides the overview of natural disasters, including climate-related disasters risks in Indonesia due to the changing climate. Therefore, it is important to illustrate and examine the disaster risk reduction governance at the national level as well as the institutional framework for both disaster risk reduction and climate change adaptation in institutionalizing local initiatives. Thereupon, the disaster risk reduction and climate-related disaster resilience assessment needs to be conceptualized and implemented at the local level. This underlines the essence of a risk assessment carried out close to the disaster affected and paving its way to enhance community resilience.

3.1 Natural Disasters in Indonesia

The increasing exposure of populations and economic assets in Asian and Pacific countries is having an extensive effect on the growing disaster risks of the region. Coupled with mega-disasters, the impacts of smaller but equally destructive disasters also increasing. The negative consequences of development, including unplanned urban growth and a combination of concentrated and marginalized populations are primary drivers of greater disaster exposure (UNESCAP and UNISDR, 2012).

The Asia-Pacific region accounted for more than 63 percent of global human fatalities from disasters between 1970 and 2013. Figure 3.1 illustrates the sub regional distribution of these fatalities based on data compiled by the international database of the Centre for Research on the Epidemiology of Disasters (CRED/EM-DAT) accessed in October 2013. The graph illustrates that the most people killed in the specified hazards were inhabitants of Southern, Eastern (most of them are the casualties from the 2011 Great East Japan Earthquake and Tsunami), and South-Eastern Asia (Indonesia, Thailand, Philippines, Vietnam, etc.) accounting for nearly half of the disaster fatalities in the entire Asia-Pacific region. Although the Global Assessment Report (GAR) 2011 suggests that deaths due to disasters are declining globally, but the number concentrated in the region remains enormous (UNISDR, 2011a).

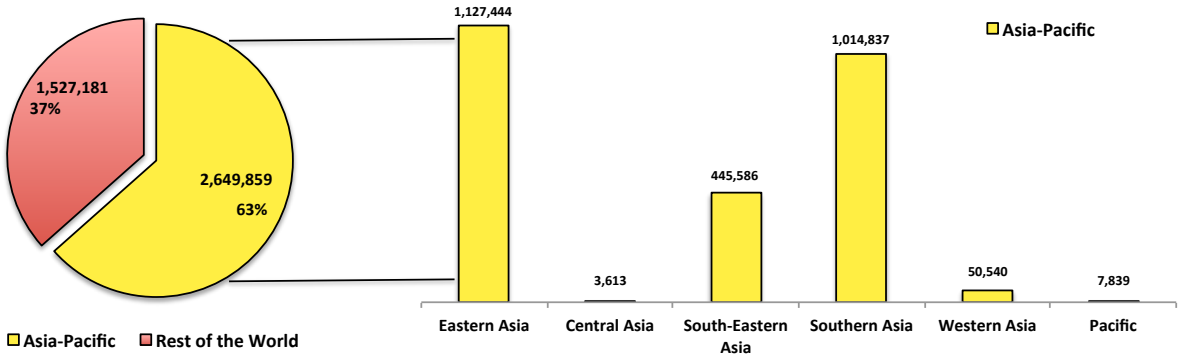


Figure 3.1: Global and Asia-Pacific disaster fatalities, 1970-2013
Data Analyzed based on CRED/EM-DAT (Source: CRED/EM-DAT, 2013)
** Natural disasters (Climatological, Geophysical, Hydro-meteorological) only, excluded biological and technological disasters*

Moreover, the most number of the total affected people by disasters over more than 100 years are in the Asian region. When one excludes the 2011 Great East Japan Earthquake and Tsunami, South-Eastern Asia region, after Southern Asia, withholds the largest amount number of the total affected people by disasters, and confirming the most affected by the hydro-meteorological disasters, such as flood, mass movement wet, storm, drought, extreme temperature, and wildfire (CRED/EM-DAT, 2013) (Figure 3.2). In addition, the economic losses from disasters in the Asia-Pacific region, also for the period of 1970 to 2013, are similarly disproportionate when compared to global disaster economic losses. The Centre for Research on the Epidemiology of Disasters (CRED/EM-DAT) reported total economic losses alone in Asia-Pacific region is nearly half of the global losses, with Asian region contributed the most to the loss, and the hydro-meteorological disaster is accounted as well as the largest contributor to global, Asia-Pacific, and South-Eastern Asia region (Figure 3.2).

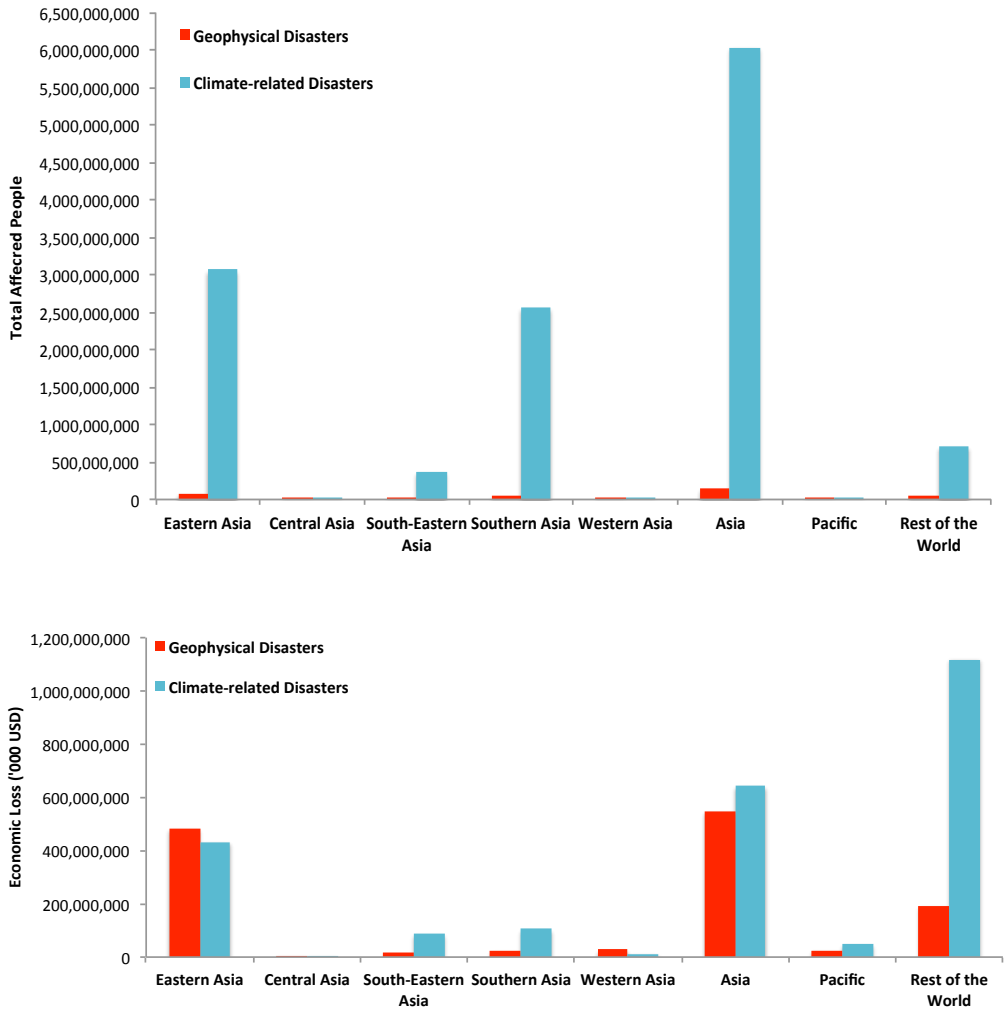


Figure 3.2: Global and Asia-Pacific total disaster affected people and economic loss, 1900-2013
Data Analyzed based on CRED/EM-DAT as of December 31, 2013 (Source: CRED/EM-DAT, 2013)

Both arguments have confirmed that hydro-meteorological disasters are threatening and affected most people, as well as in the economical term, specifically in South-Eastern Asia region.

Indonesia as the second largest country in terms of population in Asia, and the largest country in South-Eastern Asia is highly vulnerable to disasters. Disaster risks in Indonesia are multi-faceted of hazards events and occurring throughout the country. National Disaster Management Agency (*Badan Nasional Penanggulangan Bencana*/BNPB) as the agency being responsible for disaster management identifies the following types of disaster threat: (1) earthquake, (2) tsunami, (3) volcanic eruption, (4) flood, (5) landslide/movement, (6) forest and land fire, (7) drought, (8) extreme waves, (9) erosion, (11) abrasion, (12) epidemics and disease outbreak, (13) forest fire, (14) technological failure, and (15) social conflicts. In the last ten years, Indonesia was affected by various large-scale disasters (Table 3.1).

Table 3.1: Large-scale disasters of last ten years in Indonesia

Time	Type of Disaster	Loss and Damage
December 2004	Earthquake and Tsunami in Nanggroe Aceh Darussalam (Banda Aceh), North Sumatera	165,708 casualties and USD 4.45 billion
May 2006	Earthquake in Central Java and Yogyakarta	5,6678 casualties, 156,662 damaged houses, and USD 3.134 billion
July 2006	Tsunami Pangandaran, West Java	658 casualties and USD 967 million
February 2007	Flood in Jakarta	145,774 houses inundated and USD 967 million
September 2009	Earthquake Padang, West Sumatera	* USD 2.3 billion. Almost 80 percent of all damage and losses are recorded in the infrastructure sectors (including housing), followed by the productive sectors with 11 percent
October 2010	Volcanic eruption of Merapi, Central Java	**Death toll exceeds 300, *** surpass USD 600 million
	Flood in Wasior, West Papua	[IV] USD 2.3 billion of economic loss
	Tsunami in Mentawai Island, Sumatera	[V] USD 1.6 million of economic loss
January 2013	Flood in Jakarta	[VI]1-2 billion USD

*Source: BAPPENAS and BNPB (2010), *UNOCHA (2009), **UNOCHA (2010), [IV]BNPB (2011), ***VOA (2012), [V]BNPB (2011), [VI]IRIDeS (2013)*

Moreover, Indonesia is the world's largest archipelago with more than 17,000 islands and around 240 million populations, making it the fourth most populous country in the world (BNPB, 2011). The geographical position at the intersection of the Pacific, Eurasian and Australian tectonic plates make it extremely prone to volcanoes and earthquakes (BNPB, 2011). Indonesia suffered great casualties due to the tsunami in Mentawai Island, Sumatera, flood in Wasior, West Papua, and the eruption of Merapi Volcano in Central Java in 2010 alone (BNPB, 2011). The Intergovernmental Panel on Climate Change (IPCC) reported that the number of hydro-meteorological disasters has doubled in the last five years, whereas the geophysical hazards have remained the same (IPCC, 2007).

Most of the islands of Indonesia are vulnerable to earthquakes and high waves, due to the position of Indonesia, which is situated between the two shelves. These shelves separate the islands into three groups of major islands: Java, Sumatera, and Kalimantan. Consequently, Indonesia with its huge number of island and vast coastline has very high coastal population – 65% of the population of Java lives in the coastal region. Therefore

those regions are vulnerable to climate change impacts such as sea-level rise (MoE, 2007).

Indonesia is not only ranked fourth in terms of population, but it is also fourth-ranked country in terms of population that lives in low-elevation coastal zones (LECZ) (McGranahan et al., 2007), whereas more than 85 percent of the total population live within 100m above the sea level (Dahuri, 2006). Jakarta, as the capital city of Indonesia inhibits currently 9.5 million people (Ifrizal, 2013). In terms of economic development, Indonesia is categorized as lower-middle income country by the World Bank and part of G20 with the total GDP of USD 846.8 billion (The World Bank, 2012a). However, 18.1 percent of the population lives below USD 1.25 per day and 6 percent out of 63 percent of productive age (age of 15 years and above) is unemployed of the total labor force (The World Bank, 2012b). Currently (in year 2013), Indonesia's economic growth is 6.3 percent (The World Bank, 2012b). Above facts ranked Indonesia at 124th out of 187 countries in Human Development Index (UNDP, 2011) and have placed poverty reduction as the number one out of nine development issues. Economically, Indonesia is dependent of the key sectors of agriculture, coastal zones, and marine ecosystems, water resources, fisheries, and forest services, all of which are highly susceptible to the climate change (The World Bank, 2012c). Thus, the geographical, social, economical, and environmental factors in Indonesia are intertwined and contribute to the high vulnerability to disasters and climate change in the country.

Figure 3.3 shows the natural hazards map of Indonesia, including climate-related hazards. It indicates that almost all major islands, excluding Kalimantan (Borneo), are at medium to high risk of various hazards (UNOCHA, 2011).

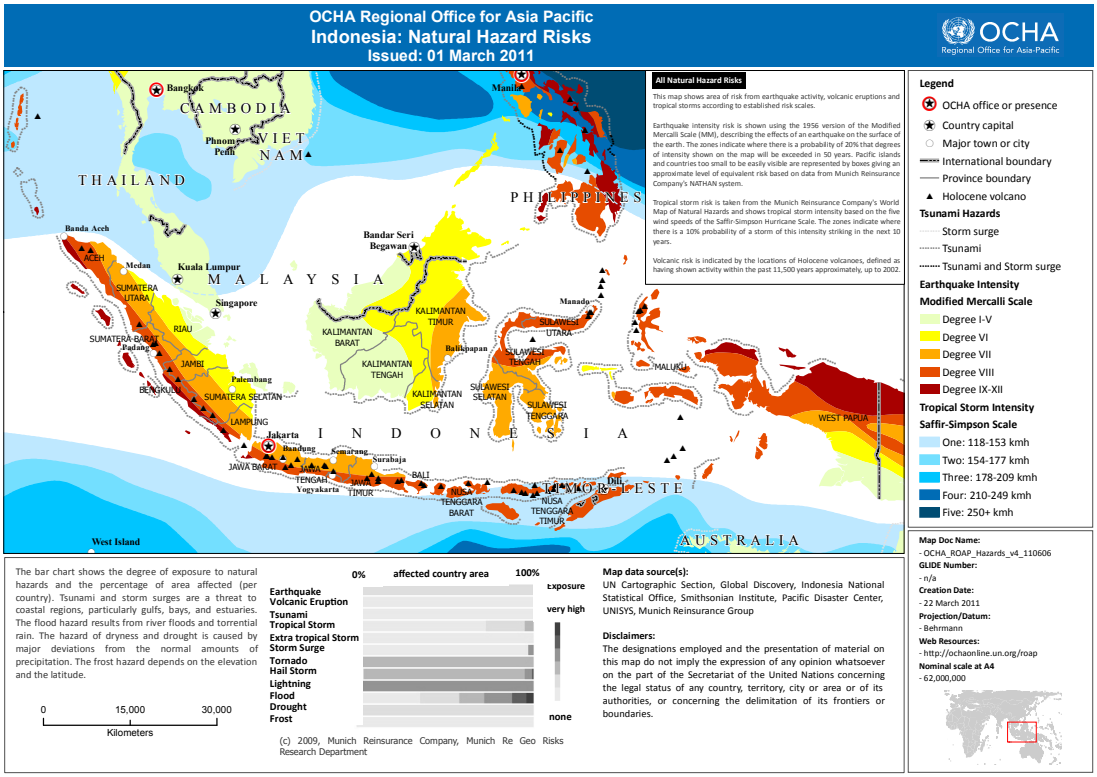


Figure 3.3: Natural hazards map of Indonesia, including climate-related hazards (Source: UNOCHA, 2011)

Therefore, aside from geophysical disasters, such as earthquake, tsunami, and volcanic eruption, Indonesia is threatened by climate-related disasters, such as flood, drought, storm, landslide, and forest fire. According to the International Database of Center for Research on the Epidemiology of Disasters (CRED/EM-DAT, 2013) for the period of 1900 – 2013, earthquakes in 2004 and 2006 are among the most deadly disasters, causing large numbers of people killed. However, floods in 2002, 2007, and 2013 are causing the most economic loss and damages in the country and it is the disaster that affects most people. In addition, BNPB recorded, in terms of number of events and frequency, flood is also the most occurred hazard spanning for a period of almost 200 years, between 1815 and 2013, (BNPB, 2013). Figure 3.4 shows the distribution of the event and casualty of different disaster types in Indonesia.

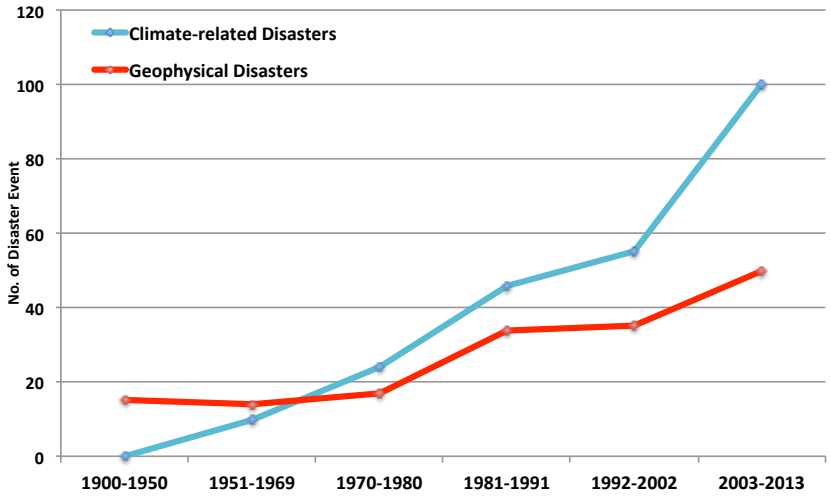


Figure 3.4: Distribution of the event and casualty of different disaster types in Indonesia
Data Analyzed based on CRED/EM-DAT as of December 31, 2013 (Source: CRED/EM-DAT, 2013)

There are 5,590 main rivers flowing throughout Indonesia and 600 of them potentially cause floods. Flood prone areas affected by these main rivers and reach about 1.4 million hectares. BAPPENAS and BNPB (2010) outline in the National Action Plan for Disaster Risk Reduction (NAP-DRR) 2010-2012, the causes of floods in Indonesia. These are as follow:

- Natural events, such as extreme high rainfall, the raise of sea water surface, storms, and so on.
- Human activities result the alteration of spatial layout and nature changes. The floods occurring in Indonesia are generally caused by poor conditions of the micro and macro drainage network, such as:
    - Insufficient dimension and inclination of drainage channels due to waste and sedimentation
    - River overflow that exceeds the river basin due to high rainfall intensity and dredging the river due to sedimentation and clogging caused by waste

- Environmental degradation, such as loss of plants covering the soil in catchment areas

Thus, to underline the above arguments, climate-related hazards, especially hydro-meteorological hazard, such as flood, is exacerbating the condition of Indonesia, posing an enormous risk to the country. More to climate-related disaster risks are illustrated in the following section.

3.2 Climate-related Disaster Risks in Indonesia

Previously mentioned, Indonesia with its 240 million inhabitants is the fourth most populous country and is the world's largest archipelago with more than 17,000 islands. Moreover, Indonesia is the fourth-ranked country in terms of total population that lives in low-elevation coastal zones. Coupled with being in the center of active plate-tectonic zones (see Section 3.1), Indonesia is as well susceptible to climate-change risks. Climate-related disasters overshadow the country, such as hydro-meteorological disasters. These dominate the contribution of 71% disaster events, 16% casualties, 67% of total affected, and 52% total costs (Figure 3.5).

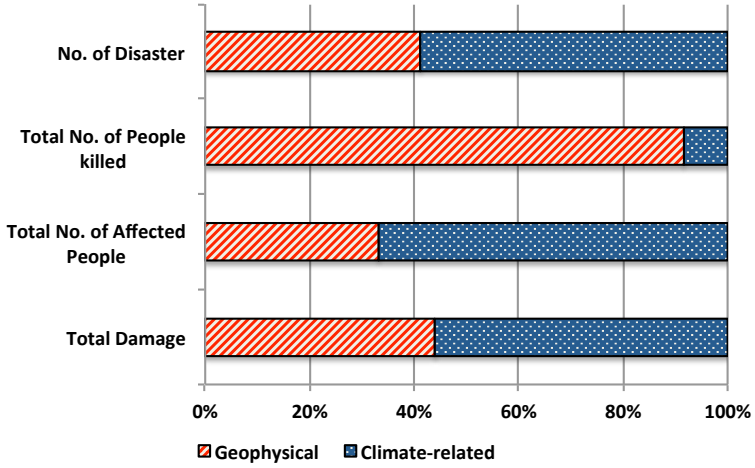


Figure 3.5: Comparison of climate-related- to geophysical disasters impacts in Indonesia (1900-2013) Data Analyzed based on CRED/EM-DAT as of December 31, 2013 (Source: CRED/EM-DAT, 2013)

Recorded data from CRED/EM-DAT database also shows that out of the climate-related disaster, floods are occurring frequently and affected most of people (Figure 3.6). Based on the comparison data in Figure 3.7, although the total damage of flood is smaller than wildfire, which was not regularly occurring; flood accounts for 53% in the total number of affected people and occurring more often by 66% than other climate-related disasters. Thus floods is affected more people and will likely exacerbate the country, reflecting on the trends in Figure 3.6. Figure 3.7 elaborates more the classification of climate-related disasters that are affected Indonesia for the same period (1900 to 2013).

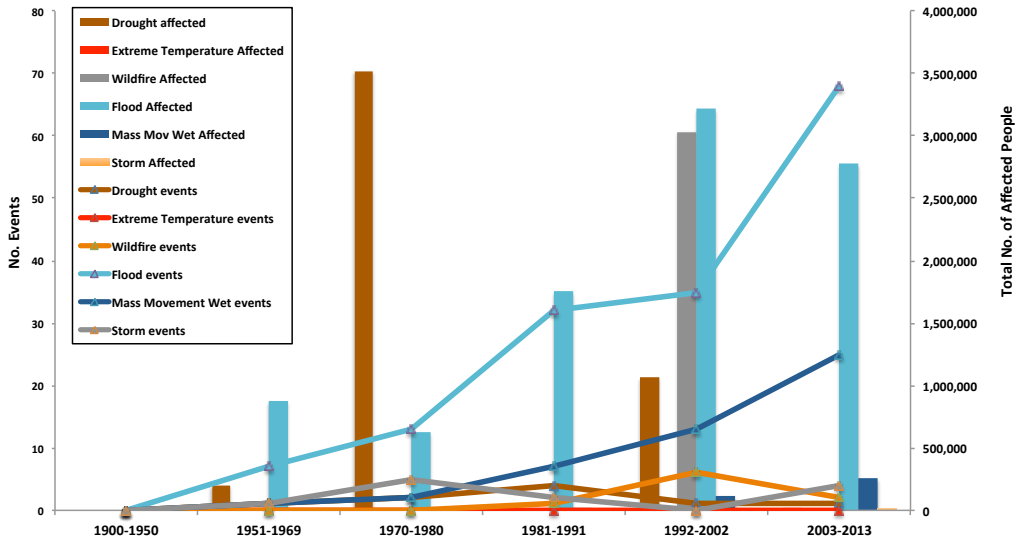


Figure 3.6: Number of events and total number of affected people for climate-related disasters in Indonesia Data Analyzed based on CRED/EM-DAT as of December 31, 2013 (Source: CRED/EM-DAT, 2013)

It is apparent, based on the data analysis from the International data base (CRED/EM-DAT) that flood is dominated the total number of disaster events, total number of affected people among other climate-related disasters (such as drought, extreme temperature, wildfire, mass movement wet, and storm) and competing with wildfire for the total damage of economical loss.

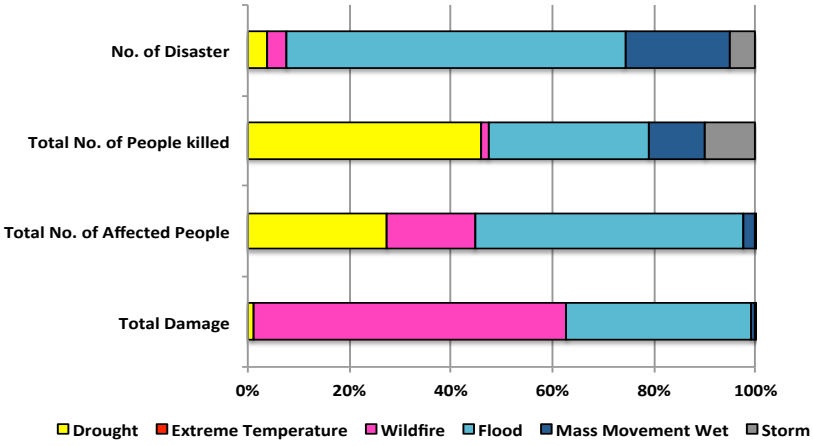


Figure 3.7: Comparison between climate-related disasters impacts in Indonesia (1900-2013) Data Analyzed based on CRED/EM-DAT as of December 31, 2013 (Source: EM-DAT, 2013)

As the consequent, based on the data above (Figure 3.7), therefore, the increase of flood frequency and intensity due to climate change will exacerbate disaster risk in Indonesia (IFRC, 2010). Although geophysical disasters were the deadliest (see Table 3.1), however, climate-related disaster occurred more frequently (see Figure 3.4 and Figure 3.5) and affected more people in Indonesia. Most of climate-related disaster, such as

these flood events is taken place frequently in cities in Indonesia, such as Jakarta, Bandung (West Java), and Semarang (Central Java). Therefore urban flooding is occurring frequently in Indonesian cities. Because of their frequent events, these urban flooding is defined as high frequency and low consequence (HFLC) events. Thus, these circumstances urge Indonesia to undertake actions at a quick pace to reduce the exacerbation and enhance the resilience to this climate-related disaster. To respond this urgent need, a study of climate-related disaster resilience assessment and communication at the local level is proposed, which will be the core of the following chapters. An exemplary case of the urban flooding in Jakarta is illustrated in the following sub-section, to highlight that urban flooding is a major issue for cities in Indonesia.

3.2.1 Characterizing Floods in Urban Areas in Indonesia

Before discussing the urban flooding in Jakarta, following sections describe the causes and categorization of floods that are common occurring in Indonesian cities based on World Meteorological Organization/Global Water Partnership classification (WMO/GWP) (2008). This will underpin the need of resilience and its assessment and communication to climate-related disasters in an urban context.

1. Causes of urban flood

The major causes of flood in urban areas from the human, natural, and governance perspective are described as the ''main drivers'' of the type of such flood (Mulyasari et al., 2011). In terms of human cause, urbanization has led to an increase in economic and social wealth in some places, but also continuing poverty in others (United Nations, 2006 in Zevenbergen, Verbeek, Gernosius, & Van Herk, 2008). An unwanted side effect of this process of rapid urbanization is the increased susceptibility toward flooding as the result of the concentration of people and assets in flood-prone areas – many urbanized areas in Jakarta are located along major water bodies. In addition, due to the rapid development of urbanization, the cities inhabit huge numbers of residents, even exceeding the total number of population and its capacity to withhold the same services as previous years. Rubbish and debris as product of wastes tend to clog the drainage facilities, thus reducing the drainage capacity and leading to increased surface runoff and backup effects and causing the flood (local flood). Many urban drainage facilities are not in good condition due to lack of cleaning and maintenance (WMO/GWP, 2008).

In natural terms, the climate change may cause flood to occur more frequently and severely. This combination is likely to result in substantially larger flood impacts compared with former times, in which the society and environmental change drivers developed more slowly and the societies continuously adapted to environ- mental changes (Zevenbergen et al., 2008). Climate change has the potential to increase flooding risks in cities in three ways: from the sea (higher sea levels and storm surges); from rainfall – for instance by heavier rainfall that is more prolonged than in the past; and from changes that increase river flow – for instance through increased glacial melt (Satterthwaite, Huq, Pelling, Reid, & Lonkao, 2007). In addition, sea level rise increases the risk of coastal floods. Many millions more people are projected to be flooded every year due to sea level rise by the 2080s. Those densely populated low-lying areas where

adaptive capacity is relatively low are especially at risk (IPCC, 2008 in WMO/GWP, 2008). As the aforementioned statements indicate, climate change also works in an indirect way to aggravate the urban flood. An important notion is given by Zevenbergen et al. (2008) that the current protection measures are based on accumulated knowledge of past weather events. Jakarta has thus to create the need to shift from flood protection to a more integrated approach. In the last decade, however, climate change has been recognized as a potential trend breaker, in the way that hydrological variables and existing statistical distributions of flood probabilities are affected (Kabat, Vierssen, Veraart, Vellinga, & Aerts, 2005; EEA, 2005 in Zevenbergen et al., 2008).

In terms of governance, this cause could also be termed as ''inadequate urban planning'' (Bhagat, 2006; Zevenbergen et al., 2008). Although on paper all cities have to a certain extent a development plan, the actual development plan follows no particular pattern except that dictated by expediency, patronage, and privilege. Zevenbergen et al. (2008) recall a research carried out by Sheppard and his team (Angel, Sheppard, & Civco, 2005; Sheppard, 2007 in Zevenbergen et al., 2008). They are one of the first to examine the dynamics and underlying processes of global urban expansion. The results of that study presented important relevant information on built-up areas of the cities and their changes over time and revealed that the spatial distribution of urban population in nearly all 90 cities surveyed is by and large not the result of conscientious planning. Thus, one of the key messages is that cities and all regions must plan early and much more carefully to accommodate and disperse the impact of over concentrations of people and economic activities in order to avoid large-scale catastrophes. The lack of planning, or even uncontrolled urbanization in Jakarta exacerbates the trend of increasing urban flood vulnerability. The contributing factors like ''greenfield'' development in areas previously in nonurban use are leading to encroachment and expansion onto flood-prone areas, such as floodplains and lowlands. In addition, redevelopment of built-up areas (''brownfields'') and ''infill'' of the remaining open spaces in already built-up areas are also leading to an overall density increase and subsequent increase of surface sealing and disruption of natural drainage channels. Table 3.2 summarizes the three aforementioned causes.

Table 3.2: Key causes of urban flood

Key Causes	Characteristics
Human	Rapid Urbanization: ▪ Concentration of people and assets in flood-prone areas ▪ Wastes tend to clog the drainage facilities, reducing the drainage capacity and leading to increased surface runoff
Natural	Sea level rise: ▪ Higher sea levels and storm surges Rainfall intensity: ▪ Prolongation of heavier rainfall than the in the past Increased glacial melt: ▪ Changes that increase river flows
Governance	Inadequate urban planning: ▪ Uneven distribution of urban population

Source: Mulyasari et al. (2011)

In terms of economic losses both direct and indirect, urban flooding has large impacts. The study done by WMO/GWP (2008) showed that flood risks are a function of exposure of the people and the economic structure along with the vulnerability of social

and economic fabric. As such the impact of such floods on the lives and livelihood of people, a function of their vulnerability needs to be understood. WMO/GWP (2008) identifies the following characteristics that have relevance to the increased flood risks in low and middle income countries: concentrated population; large impermeable surfaces and construction of buildings; concentration of solid and liquid wastes due to inappropriate disposal systems; obstructed drainage systems; intensive economic activities; high value of infrastructure and properties; rises of informal settlements; housing with low hygiene standards; and lack of change in regions around cities. These are root causes that are contributing to the risks due to growing suburbs and the mushrooming of peri-urban areas in Jakarta. The extended understanding of the risk is the probability of a loss and it depends on three elements: hazard, vulnerability, and exposure. If any of these three elements increases or decreases, then the risk increases or decreases (Crichton, 1999).

In the context of floods, UNISDR (2009a) mentioned exposure refers only to the question whether people or assets are physically in the path of floodwaters or not and vulnerability may be defined as the characteristics and circumstances of a community, system, or asset. It is susceptible to the damaging effects or impact of a flood. In case of hazardous events, access to such entitlements could enable a person or a group, in terms of their capacity, to anticipate, copes with, resists, and recovers from the impact of a natural hazard (Wisner, Blaikie, Cannon, & Davis, 2004).

In summary, to understand the urban flooding, it is important to first be familiar with the different components that construct the risks of the flood. A component in the creation of risk is the fact that somebody or something is vulnerable to a hazard. Vulnerabilities, like exposure, should not be considered only as given unsafe conditions but as the result of different processes, which finally make people and their belongings more or less susceptible to the impact of flood hazard. Among the root causes of these processes, socioeconomic factors are the driving forces, including access to or exclusion from education, medical facilities, economic opportunities, political participation, and the use of natural resources. Jakarta inhibits these driving forces of stresses, which makes the city susceptible to urban floods. And those entitlements usually depend on the sociocultural background of people in terms of class, ethnic origin, gender, and religion (Wisner et al., 2004; WMO/GWP, 2008).

2. Types of urban floods

The above-mentioned components such as exposure and vulnerability could be labeled thus as the crucial issues that contribute to urban flooding in Jakarta. Basically, WMO/GWP (2008) has divided the types of urban floods into four categories. Regardless to that, flood in urban areas can be attributed to one or a combination of the below-mentioned types. For managing the urban floods and subsequently transfer and convey that information to the public at large (communities) by the local authorities (local government), it is essential to understand the causes and impacts of each one of them. The following presents first, the types of urban flooding according to WMO/GWP classification (2008), second, it argues the type of flood that causes more damages in cities in Indonesia, and third it shows an example of the urban flooding in Jakarta,

particularly on the type of urban flooding that causes more damages and affected most people.

2.a Coastal Flood

High tides and storm surges caused by tropical depressions and cyclones can cause this type of floods in urban areas that are located at estuaries, tidal flats, and low-lying land near the sea in general. Coastline configurations, offshore water depth, and estuary shape influence the intensity of coastal floods. High tides may impede the discharge of rivers and drainage systems, leading to local or riverine floods. Tidal effects in the estuarine reaches keep the river levels high for long periods of time and sustain flooding. Thus, the cities located in estuarine reaches have to bear the combined impacts of riverine as well as coastal floods due to storm surges and tidal effects. Coastal areas are exposed to sea erosion, which is particularly likely with the increase in the sea roughness due to climate change.

2.b Flash Flood

Flash floods occur as a result of the rapid accumulation and release of runoff waters from upstream mountainous areas, which can be caused by very heavy rainfall, cloudbursts, landslides, the sudden break-up of an ice jam, or failure of flood control works. They are characterized by a sharp rise followed by relatively rapid recession causing high flow velocities. The discharges quickly reach a maximum and diminish almost as rapidly. These are particularly common in mountainous areas and desert regions but are a potential threat in any area where the terrain is steep, surface runoff rates is high, streams flow in narrow canyons, and severe thunderstorms prevail. In more densely populated areas, they are more destructive than other types of flooding due to their unpredictable nature and unusually strong currents carrying large concentrations of sediment and debris, giving little or no time for communities living in its path to prepare for it and causing major destruction to infrastructure, humans, and whatever else stands in their way.

2.c Local Flood/Inundation Flood

Saturated and impervious soil is exacerbated by seasonal storms and depressions during the rainy season with very high intensity and long duration rainfall. Built environments like cities generate higher surface runoff that is in excess of local drainage capacity, causing local floods. Urbanization leads to decreased rate of infiltration and increased surface runoff. Many urban drainage facilities are in bad shape due to lack of cleaning and maintenance. Wastes tend to clog the bottlenecks of drainage facilities, leading to increased surface runoff and backup effects, causing local floods. In small and medium towns and cities, the rapid development and the consequent infrastructure such as road building fail to account for the natural drainage systems without providing for cross-drainage works. Depending on the local hydrogeological situation, rising groundwater or subsurface flows can be other causes that lead to local floods. They are generally confined to rather small geographical areas and are normally not of long duration. However, in regions of extended rainy seasons (monsoon climates), local floods may last for weeks, resulting in widespread destruction.

2.d Riverine Flood

River floods occur when the river runoff volume exceeds local flow capacities. River floods are triggered by heavy rainfall or snowmelt in upstream areas, or by tidal influence from the downstream. The river levels rise slowly and the period of rise and fall is particularly long, lasting a few weeks or even months, especially in areas with flat slopes and deltaic areas. Failure or bad operation of drainage or flood control works upstream can also sometimes lead to riverine flooding. Urban areas situated on the low-lying areas in the middle or lower reaches of rivers are particularly exposed to extensive riverine floods. In most major river basins, floodplains are subjected to annual flooding. Often, urban growth expands over some of the floodplains, reducing the area into which floods can naturally overflow. A risk might exist for lower city parts, in case the artificial levees breached, causing devastating urban flooding. Table 3.3 differentiates each of urban flood type.

Table 3.3: Differences of urban flood features

Categorization of Urban Flood	Typical Feature
Coastal Flood	▪ High tides and storm surges caused by tropical depressions and cyclones ▪ Coastline configurations, offshore water depth, and estuary shape influence intensity of coastal floods ▪ High tide impede the discharge of rivers and drainage systems ▪ Tidal effects in the estuarine reaches keep the river levels high for long periods of time and sustain flooding ▪ Coastal areas are exposed to sea erosion, particularly likely with the increase in the sea roughness due to climate change
Flash Flood	▪ Rapid accumulation and release of runoff waters from upstream mountainous areas ▪ Sharp rise followed by relatively rapid recession causing high flow velocities. Discharge quickly, reach a maximum, and diminish rapidly ▪ In mountainous areas and desert regions but a threat in steeply terrain area, high surface runoff rates, streams flow in narrow canyons, and severe thunderstorms prevail ▪ In densely populated areas, more destructive than other types of flooding
Local Flood/Inundation Flood	▪ During rainy season, very high rainfall intensity and long durations, sometimes caused by seasonal storms and depressions and exacerbated by saturated or impervious soil ▪ Built environments generate higher surface runoff that is in excess of local drainage capacity, adding up bad condition of urban drainage facilities; wastes clog the bottlenecks of drainage facilities, leading to increased surface runoff and back up effects ▪ Groundwater rising, depending on the local hydrogeological situation or subsurface flows ▪ Generally confined to rather small geographical areas and are normally not of long duration. In small and medium towns and cities, rapid development and the consequent infrastructure fail to account for the natural drainage systems without providing for cross- drainage works
Riverine Flood	▪ Occur when the river runoff volume exceeds local flow capacities ▪ Triggered by heavy rainfall or snow melt in upstream areas, or tidal influence from the downstream ▪ Failure or bad operation of drainage or flood control works ▪ Upstream. In parts of the city below flood level and protected by artificial levees, risk that it may be breached and cause devastating urban flooding exists ▪ Exposing urban areas situated on the low-lying areas in the middle or lower reaches of rivers, in most major river basins and floodplains ▪ Local floods/ inundation floods

Source: Mulyasari et al. (2011)

Drawing from Table 3.3, among the urban flood types, the riverine and local flood/inundation are occurring frequently in an urban area and it will cause more damages in the economical term. The built environments in large size cities generate higher surface runoff, which is in excess of local drainage capacity. This is mostly causing by the saturated and impervious soil that is exacerbated by the seasonal storms and depressions during the rainy season with very high intensity and long duration of rainfall. Additional burden is the insufficient water- and wastewater network system due to for example, waste clogging. Consequently it leads to the increasing of surface runoff and backup effects, causing local flood that might last hours and days to subside.

Moreover, the nature of an urban area location, its geographical area, also determines the impact of flood. A city located in the low-elevation zone and inhibits within significant water bodies, such as rivers, may be at greater risk to others. As the high intensity and volume of rainfall precipitation occurs, river runoff volume may exceeds the local flow capacity and coupled with insufficient of flood control works in upstream, may causing excessive overflowing of water from the river body and eventually inundated cities with all its facilities and infrastructures to large extent. These types of floods are not affecting the city directly, such as damage in physical features (damage to buildings and transportation infrastructure), but indirectly, socio-economic condition as well. The disruption of social and economic activities, such as in education, health, employment, and service sectors are far more beyond the ordinary economic loss. The following section outlines these flood events in Jakarta, Indonesia.

3.2.2 Case Study: Floods in Jakarta (2002, 2007, 2013)

In late January 2002, excessive monsoonal rains hit Jakarta (Figure 3.8), and the subsequent floods crippled the city for days, with thousands of houses submerged, 300,000 people homeless and 30 people are died (Steinberg, 2007). In February 2007, an even bigger flood affected 60% of the city-region, killed 80 people - either died from drowning or electrocution, 430,000 residents were forced out from their homes, thousands of homes were totally destroyed, and most of the people were accommodated in 700 temporary shelters in different places such as schools, mosques, office buildings, tents and other neighborhoods. In large parts of city, they were disconnected from electricity and telecommunication services (IFRC, 2007) and leaving a total loss 1.2 billion USD (ADPC, 2009).

According to the city's flood crisis center, the floods affected an estimated 80 districts in Jakarta (WHO, 2007). As floodwaters receded after two weeks in February 2007, lack of flood warning, the inadequacy of emergency assistance, and the failure of long-term planning and civil works were the main concerned. The scope of damage shows how vulnerable the communities are living in Jakarta (Mulyasari et al., 2011).

The causes for flooding in Jakarta go beyond the geographical difficulties and are mostly man-made. The main causes are: lack of carrying capacity of flood control infrastructure; reduction of capacity of existing systems, due to uncontrolled garbage dumping; and reduction of rainwater absorption due to urbanization and deforestation. Firstly, the city's flood canal system remains largely incomplete. The Dutch-built

Western Flood Canal is not sufficient and the Eastern region of the metropolis dearly lacks the completion of the Eastern Flood Canal. Secondly, there is a reduction in the width of important waterways.



Figure 3.8: Jakarta Flood in 2002 impacted community daily activities
(Photo courtesy: Getty Images in Deutsche Welle, 2013)

For example, the *Angke* River, which originally was 40 to 60 meters wide, has shrunk to approximately 5 to 10 meters in width as of 2007 data. The government held the riverbank settlers responsible for inappropriate waste dumping because illegal settlers do not have public waste collection services (Steinberg, 2007). Huge amount of household garbage and industrial waste are emptied into Jakarta's rivers each year, and the fact that this is not cleared by the authorities or the adjacent communities, substantially contribute to increase the probability of regular flooding.

Thirdly, the reduction of water absorption is due to uncontrolled urbanization in the city suburbs. Among others, the traditional water catchment area of North-West Jakarta, located near the international airport, has been reduced substantially. The reduction is seen among the prime causes of the massive flooding (Steinberg, 2007). In addition, deforestation and new real estate colonies in the neighboring districts have had additional impacts in those areas where majority of rainfall occurs. At the upstream areas, numerous villas have been built as secondary residences in the past 50 years by the upper classes of Jakarta, while a flourishing tea plantation has progressively settled on the main slopes of volcanoes causing a huge reduction in the forested area (Texier, 2008). Fast and uncontrolled urbanization is thus largely recognized by Texier (2008) as it has been recalled in UN (2008) a major factor that emphasizes flood risk in Jakarta. The impact of the 2007 flood was massive; the loss of life, property, economic capacity, and health problems has forced the capital city of the 4th largest country in the world in paralysis.



Figure 3.9: Jakarta Flood in 2007 inundated large extent of residential area in Eastern part of city (Photo courtesy [left]: Oxfam America, 2013 and [right]: Panoramio, 2007)

In addition, in early January 2013, a larger and longer period of flood was again occurring. The estimated flooded area was 41km^2 with the flood depth ranging from 0.2 to 3.5 m. The event caused massive economic losses (the preliminary statement from the Governor is raised around 1-2 billion USD) (IRIDeS, 2013). Local Disaster Management Agency of Jakarta Province (BPBD Jakarta, 2013 in IRIDeS, 2013) noted the 47 fatalities and had forced up to 20,000 people to be evacuated. The provincial government has declared a state of emergency through 27 January 2013.

The January 2013 floods are a complex problem, although the rainfall intensity is smaller than floods in 2002, yet the Jakarta wealthy commercial and government core, that were not affected in 2007 floods, was inundated. This raises the various issues of increased runoff due to rapid urbanization and reduced drainage due to land subsidence (itself due to groundwater extraction and the weight of new construction). Also contributing to the flood may have been reduced capacity of the drainage system due to trash clogging floodgates, sedimentation reducing the depth of drainage canals, and illegal development of shantytowns in floodplains reducing the storage capacity of the system. Furthermore, breaching of a section of embankment along the west drainage canal flooded downtown areas below the canal. The canal embankment overtopping itself may have been the result of inconsistent embankment height (a locally lower embankment in the breach area) or/and seepage along the embankment/structure interface at a concrete structure (a highway bridge pier or a tower) built on the embankment at the breach site.

In addition to flooding due to the canal breach, IRIDeS (2013) has investigated that downtown flooding was partially a result of operation of the Old *Ciliwung* gate at *Manggarai*, but this is unclear. Newspapers reported that this gate was opened in order to reduce water level in the west drainage canal, while the gate operator reported that the gate was never opened, but rather overtopped until the canal breach occurred downstream, thereby lowering water levels at *Manggarai*. Such contrary information was common during the team's visit, making reconstruction of actual events difficult.

Similar contrary information was encountered regarding the problem of trash, which is a critical problem because clogging of the *Karet* gate by trash may have been a principle

cause of high water level at the canal breach site and at *Manggarai* gate, resulting in canal embankment failure and possibly *Manggarai*/Old *Ciliwung* gate overtopping and the ensuing flooding of Jakarta's commercial/governmental core. When asked why trash is disposed of in canals instead of collected properly by the city, government agencies stated that residents are lazy and need to be educated about the importance of proper trash disposal at designated government collection sites, and that due to the density of and narrow roads in illegal settlements along the waterways, trash collection trucks cannot access many of these communities to collect their trash. However, residents stated that the government does not collect trash in locations convenient to their neighborhoods, and so residents have no option other than to dispose of trash in the drainage system. Residents also suggested the government collect trash by barge or boat in waterside locations that trucks cannot reach.

Such balkanization within and lack of trust among government agencies and between agencies and the public makes gathering facts and development of effective flood countermeasures difficult. However, all agencies, as well as the public, appeared very willing to talk to and share data and experiences with our team, as we are foreign and thus impartial to local infighting and partisan politics. The role of foreign organizations such as ours appears critical for forging cooperation among agencies and developing trust between the government and the public.

Unexpected casualties, such as those which occurred when the underground parking area of the UOB building flooded, can be attributed to lack of a Standard Operating Procedure (SOP) for flood response, and the development of such SOP is a major goal of the current Governor's administration. Despite the lack of SOP, residents in frequently flooded areas (many of whom are illegal inhabitants) are developing their own flood response strategies, such as building multi-story homes and removing all important possessions from the ground floor. Individual survey by IRIDeS (2013) to determine the individual responses to the flood and the effectiveness of the government's flood evacuation warning system was carried out. Initial results indicate that residents are reluctant to evacuate because they are concerned about the security of their possessions, or because there are no specified evacuation sites so they do not know where to go.



Figure 3.10: Jakarta Flood in 2013 paralyze the government (presidential palace was underwater) and city (Photo courtesy [left]: The Jakarta Post, 2013 and [right]: StraitsTimes, 2013)

Also important is the difficulty faced in relocating waterside shantytown residents to proper upland homes. Residents claim they live in waterside shantytowns because they can afford to and because living there is convenient for them (especially if they earn their livelihood by picking trash from the river and would otherwise have to commute to do this). They also claim life in the floodplain is not so bad, because they are only flooded 1 month of the year, so have the remaining 11 months to live normally, especially after adapting to the flooding by building 2-story homes. However, these illegal waterside shantytowns reduce the water storage capacity of the drainage system, and are the source of much of the trash that clogs the system.

Unlike after Jakarta's previous floods, deaths due to leptospirosis and dengue have not been reported this time, even though most of Jakarta's population has no access to sewage or septic systems, meaning that floodwaters inevitably contain much human waste. However, acute respiratory infections, diarrhea, gastritis, typhoid, and skin disease were common after the January 2013 flood due to continuous rain, cold living conditions, and lack of hygiene and sanitation in flooded and refuge areas. When asked how they view the danger of infection from floodwaters, many of the residents interviewed feel that since they were born and raised in unsanitary conditions, their immune systems are very strong and thus they will not fall ill even if they play or work in floodwaters. Analysis of water quality samples is underway to determine whether dilution of this waste with floodwater may have been a reason for the lack of leptospirosis and dengue in last month's flood. In addition to disease, the floods affected residents by interrupting the supply of clean water and electricity, and by temporarily putting affected health care facilities out of operation.

Many industrial parks are located in eastern Jakarta, where flood risk is considered lower than the in rest of the city, but insufficient local drainage has been seen to cause standing water, even while the water level in the eastern drainage canal was relatively low. Due to the recurrent flooding in Jakarta, private industries are implementing their own measures to reduce flood risk. For example, a Japanese industrial park has constructed a 1-m high floodwall around its periphery with sandbags stocked at the entrance gate for the guard to place if necessary, purchased pumps for evacuation of floodwaters and generators for emergency power, constructed storm water retention basins, and elevated local roads to prevent flooding of transport routes. Guards working for the industrial park, regularly check water levels as reported by the National Agency of Meteorology, Climatology, and Geophysics *(Badan Meteorologi, Klimatologi, dan Geofisika/BMKG)*, and run disaster preparedness drills. Individual industries do not face the same social obstacles to effective flood control that Jakarta as a whole faces, but even though industries have enacted their own effective flood countermeasures, they have been adversely affected by flooding of highways and streets throughout the capital, as this has prevented the transport of labor and goods, especially to key locations such as the port and airport.

The summary of 2002, 2007, and 2013 Jakarta Flood is showed in Table 3.4

Table 3.4: Summary of major floods in Jakarta, Indonesia

Indicators	2002 Flood	2007 Flood	2013 Flood
Duration	5 days (29 Jan – 3 Feb)	7 days (2 – 8 Feb)	9 days (15 – 23 Jan)
Rainfall intensity	5288 mm	7065 mm	Continuous heavy rainfall occurred over Jakarta city for more than 8 hours (180-200 mm)
Death toll	32 people	48 people	34 people
Displaced people	40,000 people	316,825 people	4,599 internally displaced persons, 2,196 affected households
Damage on public utilities and facilities	132 electrical post	2140 electrical post, central telephone down, cellular and fix phone disrupted, clean water distribution disrupted	Transportation network disrupted, damages to residential areas
Loss	500 - 600 million USD	1-1.2 billion USD	1-2 billion USD
Inundated area	16,788 ha	45,000 ha	24,000 ha

Source: ADPC (2009), UNOCHA (2013), IRIDeS (2013)

All in all, the lessons that can be drawn from the floods in Jakarta, is that the social, physical, and organizational or institutional factors are contributing to flood disaster. The goal of analyzing these factors is not to alter the system, but to identify and determine the root problems before effective risk reduction actions can be implemented. Although the example of Jakarta urban flooding shows catastrophic impacts, other medium size cities in Indonesia that are still growing, are impacting from the high frequency low consequence flood events that will have catastrophic impacts for these cities and its citizen in the long run.

Therefore a climate-related disaster risk assessment, incorporating these factors needs to be measured and communicated to communities. Basically the assessment should address "who is doing what and to whom". This assessment should measure the strength, the weakness, and the capacity of city and communities cooping above three factors that conceptualize the resilience; or better, resilience to climate-related disaster. Before entering this climate-related disaster resilience assessment, which will be illustrated in the later chapter; Indonesia's approaches in disaster risk reduction is described in the following section. It is important to illustrate and examine the disaster risk reduction governance at the national level as well as the institutional framework for both disaster risk reduction and climate change adaptation as further guidance down to local level in institutionalizing local initiatives.

3.3 Disaster Risk Reduction Efforts of Indonesia

Indonesia as one of the developing countries in Asia and the Pacific region has been doing efforts in the reduction of risks to disasters. Disaster risk reduction (DRR) in Indonesia is a part of international DRR efforts, as the collective responsibility of governmental and community. Moreover, as part of the Indonesian commitment, the platform for the formulation of the National Action Plan for Disaster Risk Reduction (NAP-DRR) refers to international agreement and the Indonesian Laws and Regulations, which will be discussed more in the later section.

The awareness of DRR efforts has started since 1990-1999 decade when the International Decade for Natural Disaster Reduction was declared. At the national level, Law Number 24/2007 and Disaster Management and Government Regulation Number 21/2008 on the Implementation of Disaster Management act as the basis for DRR. In the period of 2006-2009, Indonesia stipulated a NAP-DRR as a follow up to Hyogo Framework for Action (HFA) 2005-2015, particularly on the elaboration of HFA five priority groups, and encouraged a holistic participation from related stakeholders, from government to communities (BAPPENAS and BNPB, 2006). Accordingly, the NAP-DRR 2010-2012 is formulated as the continuation of NAP-DRR 2006-2009. The NAP-DRR 2010-2012 articulates the interests and responsibilities of all related stakeholders in the dissemination and implementation of DRR measures at the national level resulting from a process involving coordination, consultation and participation in line with the global agreement on DRR in the HFA (BAPPENAS and BNPB, 2010). The NAP-DRR is formulated in line with the shift of paradigm in disaster management in Indonesia. Three key issues related to the shifting paradigm in Indonesia are as follow (BAPPENAS and BNPB, 2010):

- Disaster management does not only emphasize on emergency response, but on the overall risk management
- Provisions of protection to the community from disaster hazards by the government is the manifestation of people's human rights and not only the government's obligation
- Disaster management is not only the responsibilities of the government, but the entire community.

Thus, parallel to the shifting paradigm in disaster response in Indonesia, which is no longer on the emergency response aspect, but places more emphasis on overall disaster mitigation management, mainstreaming disaster reduction in the overall development, is now required and calls for community participation.

Before coming to community participation in DRR, below are the sequences of Indonesia's DRR commitment, formulated in NAP-DRR that refers to international platform down to Indonesian Laws and Regulations (BAPPENAS and BNPB, 2010).

3.3.1 Institutional Framework

International Platform

The United Nations started two decades ago through a several resolutions, has been actively encouraging countries around the world to prioritize DRR efforts as inseparable part of sustainable development programs. Some international and regional resolutions play a role as the platform for DRR efforts, namely as follows:

a. United Nations (UN) Resolutions

Disaster risk reduction efforts have been a cross-regional and cross-sectoral issue in the framework of sustainable development. On July 30, 1999, the UN Economic and Social Council (ECOSOC) issued Resolution Number 63/1999 deciding the 1990-decade as the International Decade for Natural Disaster Reduction (IDNDR). The resolution

recommended that the UN focus on actions to implement the international strategies for DRR. Two main targets of international strategies for DRR are as follow:

- Embodiment of community resilience to the impacts of natural disasters, technology and the environment
- Change of the disaster protection pattern to disaster risk management by integrating disaster risk reduction strategies into sustainable development activities

Furthermore, the UN General Assembly issued Resolution Number 56/195 dated December 21, 2001 stipulating the International Day for Disaster Risk Reduction to encourage the adoption of sustainable efforts for DRR as an annual agenda of the countries who are ratifying the resolution. Following this, on 22 December, 2005, Resolution Number 60/195 on the International Strategy for Disaster Reduction (ISDR) was issued. In this resolution, the UN reminds the countries around the world that DRR should be as an important part of sustainable development, and encourages all countries to establish a solid commitment to Hyogo Declaration (followed by HFA) and Yokohama Strategy. The International Strategy for Disaster Reduction (ISDR) is a global approach to disaster risk reduction involving all components of the community to minimize the losses of life, social and economic sectors and environmental damages due to natural disasters. ISDR focuses are on:

- Increasing community awareness of DRR efforts
- Realizing government's commitment to DRR implementation policies and efforts
- Promoting multi-stakeholders cooperation in DRR
- Improving the science application for DRR

b. Yokohama Strategy

Yokohama Strategy for a Safer World; Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action adopted in 1994 provides guidelines for reducing risk and disaster impacts. The review on Yokohama Strategy implementation progress emphasize on the importance of proactive approach to support disaster risk reduction in providing information, motivation and involving community in all aspects of disaster risk reduction at local level. Other emphasize was on insufficient resources aspect specifically allocated from development budget to achieve the risk reduction goals, both at the national and regional levels, and through international cooperation and financial mechanisms.

c. Hyogo Framework for Action (HFA)

A world conference on Disaster Risk Reduction held in Kobe, Hyogo, Japan on June 18-22, 2005, carried out the 2005-2015 Framework for Action to build nations and communities resilience against disasters. The conference adopted the following five Priorities of Actions:

1) Ensure that disaster risk reduction is a priority at the national and local levels with a strong institutional basis for its implementation
2) Identify, assess and monitor disaster risks and improve early warning
3) Use knowledge, innovation and education to develop a culture of safety and resilience at all levels
4) Reduce fundamental risk factors
5) Strengthen disaster preparedness for effective response at all levels

Djalante, Thomalla, Sinapoy, and Carnegie (2012) have researched about the progress and challenges of Indonesia in implementing the HFA. In their research, it states that the Global Assessment Report (GAR) published in 2011 has rated Indonesia's progress in implementing HFA with a score of 2.8, while the world average is 3.0 (UNISDR, 2011). As outline by UNISDR (2007) in the report of "Word into Action: The Guideline for Implementing the HFA", each country is required to self-asses its progress towards the Priorities of Action based on the requirements outlined for each indicator. This self-assessment process is conducted through discussions with and inputs from various DRR national and local stakeholders. In Indonesia, the review process is coordinated at the national level by the National Disaster Management Agency (BNPB) and it coordinates the involvement of other government agencies, non-government organizations, and private organizations in the assessment (BNPB, 2011). To date, in 2008, there are 645 DRR organizations (governments, non-governments, and donor agencies) listed by United Nations Office of Coordination of Humanitarian Affairs (UNOCHA) Indonesia database (UNTWG-DRR, 2008). Out of these, 155 organizations are working in HFA implementation in Indonesia (DRR Convergence Group, 2011).

d. Beijing Framework for Action

The first Asian conference on disaster risk reduction was held in Beijing, China on September 27-29, 2005. The conference was attended by 385 participants from 42 countries in Asia and South Pacific, 13 UN Agencies and international organizations, with intention to implement the outcome of HFA. As an outcome, the conference reached an agreement called Beijing Action for DRR in Asia. Regional institutions working on DRR are encouraged to perform the following duties in accordance with their respective mandates, priorities and resources:

- Improve regional programs, including programs for technical cooperation, capacity building, development of methodology and standards for monitoring and safeguard against hazards and vulnerabilities, information exchange and effective mobilization of resources intended to support national and regional efforts in achieving the objectives of the framework for action
- Implement and publish regional and sub-regional baseline surveys on disaster risk reduction status in accordance with the identified needs and their mandates
- Conduct coordination and publish periodic studies on intra-regional progress, obstacles and required support, and assist countries, if requested, in preparing periodic national summaries of programs and progress
- Establish or strengthen the existing specific regional cooperation centers in conducting research, training, education and capacity building programs in the field of disaster risk reduction; and
- Support the development of regional mechanism and capacity building for early warning systems for disasters, including tsunamis

For the purpose of evaluating HFA implementation at regional level in Asia, two-yearly meetings are held, attended by ministerial-level officials. The Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) meetings held in following places: AMCDRR I in Beijing, China; AMCDRR II in New Delhi, India; AMCDRR III in Kuala Lumpur, Malaysia; AMCDRR IV in Incheon, South Korea; and AMCDRR V in Yogyakarta, Indonesia.

The implication of these DRR institutional frameworks at the international level for Indonesia is providing the country the guidance and directions for the formulation of NAP-DRR. DRR in Indonesia is part of the international DRR as a shared responsibility and commitment. Therefore, the basic foundation to formulate the NAP-DRR refers to international treaties and Indonesian laws and regulations, which are illustrated below.

National Platform

The 1945 Indonesia Constitution states that every person shall be entitled for self-protection, and property, and shall be entitled to security and protection against threat of fear for doing something. DRR plan must be based on the fulfillment of basic human rights as mandated in the constitution (BAPPENAS and BNPB, 2010).

a. Law Number 25 Year 2004 on the National Development Planning System

NAP-DRR is the elaboration of Disaster Management Plan with a five-year time frame and three years for NAP-DRR. Within the framework of National Long-term Development Plan *(RPJPN)* and the National Medium-term Development Plan *(RPJMN),* the Disaster Management Plan and NAP-DRR are positioned as the elaboration of the National Development Plan as described in Figure 3.11, Law Number 25/2004 on National Development Planning System is the legal framework for the planning system in Indonesia. The National Spatial Plan *(RTRWN)* stipulated under Government Regulation Number 26/2008 also serves as reference to the formulation of NAP-DRR, particularly for disaster prone areas.

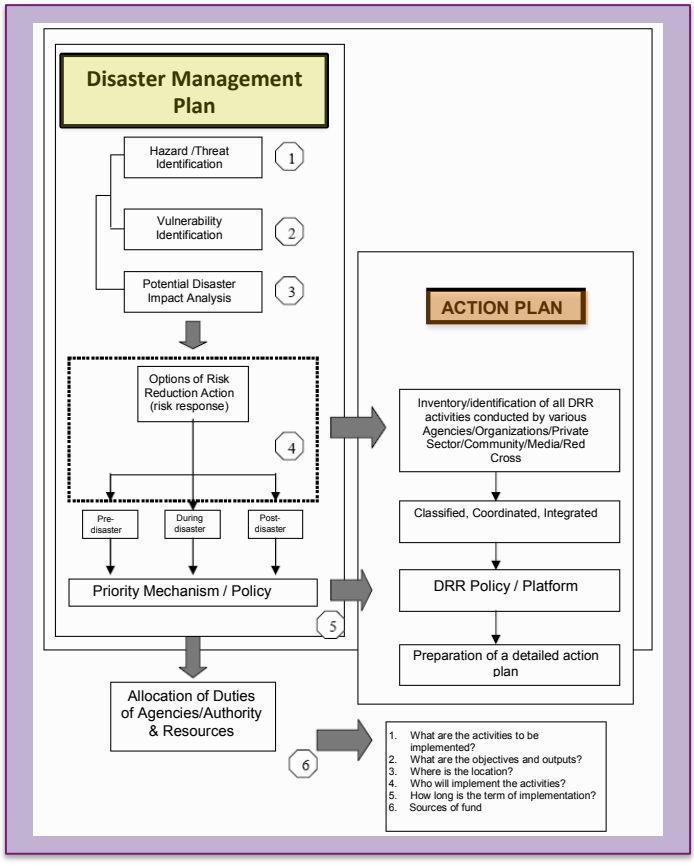


Figure 3.11: The formulation of Disaster Management Plan and NAP-DRR of Indonesia (modified) (Source: BAPPENAS and BNPB, 2010)

National Development Plan consists of integrated development planning, devised by ministries/agencies, and regional development planning based on authorities, as a result from RPJP (*Rencana Pembangunan Jangka Panjang*/ Long-term Development Plan), RPJM (*Rencana Pembangunan Jangka Menengah*/Mid-term Development Plan), and RKT (*Rencana Kerja Tahunan*/Annual Work Plan). (The plans are prepared through a series of development planning meetings (*Musrenbang*) attended by elements of state administrators, involving the community. The synchronization and coordination of this planning process are described in diagram in Figure 3.12, Disaster Management Plan and NAP-DRR must follow the principles set forth in this national development planning system. In relation to RPJPN, RPJMN, and RTRWN documents, the position of RPB and NAP-DRR can be described as a form of the operational implementation of the RPJMN.

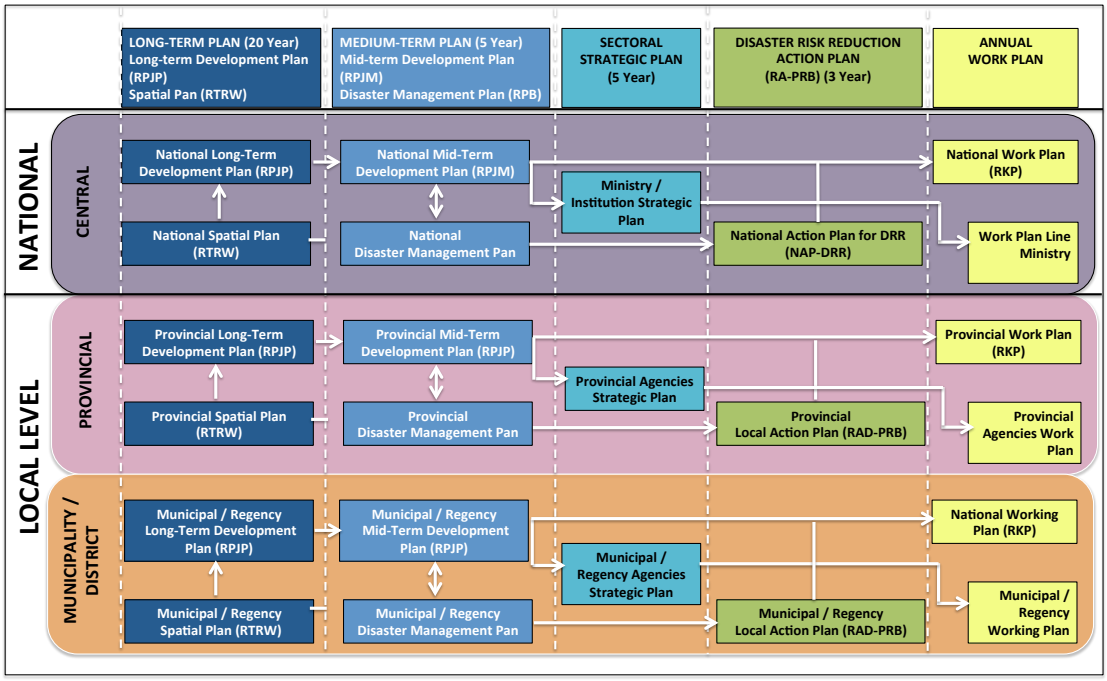


Figure 3.12: Disaster Management Planning Coordination Framework (modified)
(Source: BAPPENAS and BNPB, 2010)

b. Law Number 24 Year 2007 on Disaster Management

Disaster management is part of the national development in a series of activities implemented prior to, during and following the occurrence of disaster. In principle, Law Number 24/2007 regarding Disaster Management is intended for the phases of disaster, including pre-disaster, response, and post-disaster. The content of the law includes basic principal of disaster management, such as:

- The implementation of disaster management under responsibility and authority of central and regional governments which shall be carried out in a planned, integrated, coordinated and holistic manner
- The implementation of disaster management during the emergency response phase shall be fully implemented by BNPB and Local Disaster Management Agency (BPBD)

- Disaster management shall be implemented concerning community's rights, including rights to receive assistance for basic needs, social protection, education and skills in disaster management, and participation in decision-making processes
- Disaster management activities shall be conducted by providing considerable opportunity for private sectors and international organization
- Supervision of all disaster management activities shall be conducted by the central government, regional governments and the community in each phase of disaster in order to prevent any irregularities in the use of disaster management funds
- The Government shall be responsible for disaster risk reduction and integrating disaster risk reduction and the development programs implemented.

Formerly, three Government Regulations, derivative of Law Number 24/ 2007 on Disaster Management, have been issued, namely as follows:

1) Government Regulation Number 21/2008 on the Implementing Disaster Management;
2) Government Regulation Number 22/2008 on the Disaster Aid Financing and Management; and
3) Government Regulation Number 23/ 2008 on the Role and Participation of International Organization and International Non- Government Organization in Disaster Management.

Law Number 24/2007 and the three foregoing Government Regulations have been some of the measures undertaken to provide a legal framework for the preparation of DRM, NAP-DRR and RAP-DRR. As stated on articles 33 to 35 of Law Number 24/2007, the implementation of disaster management shall comprise three phases; namely pre-disaster, emergency response and post-disaster. During the pre-disaster phase, a distinction is made in the implementation of disaster management under non-disaster conditions and under potential conditions. Furthermore, in Government Regulation Number 21/2008 on the Implementation of Disaster Management, it is mandated that in order to carry out DRR efforts, an action plan for DRR shall be prepared consisting of a national action plan for DRR and regional action plan for disaster risk reduction. NAP-DRR shall be prepared in a comprehensive and integrated manner in a forum involving elements from the government, non-government, and business entities under the coordination of BNPB. NAP-DRR shall be stipulated by the Head of BNPB in coordination with agencies/institutions responsible for national development planning, for a period of three years and may be subject to review as necessary.

Figure 3.13 illustrates the position of NAP-DRR towards Law No. 24/2007 and National Platform. Thus, Indonesia is strong in the movement and progress of governance and institutions for DRR. The driving factor is the adoption of Law No.24/2007 on Disaster Management that is followed by the enactment of serials laws and regulations, the establishment of key organizations, and the involvement of multi stakeholders of DRR.

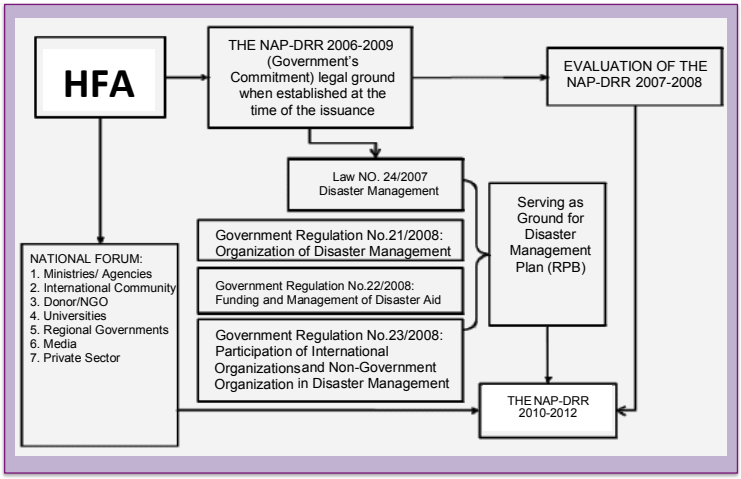


Figure 3.13: The position of NAP-DRR towards Law No.24/2007 and National Platform (modified) (Source: BAPPENAS and BNPB, 2010)

Previously, Figure 3.12 has shown the mainstreaming of DRR within the development planning framework of Indonesia, based on the Law No.25/2004 (GoI, 2004; BAPPENAS and BNPB, 2010). It illustrated how the Disaster Management Plan is integrated in the National Plan; and disaster and climate change issue is one of nine development priorities within the Mid-term Development Plan 2010-2014. Furthermore the National Disaster Management Agency (BNPB) at the national level and Local Disaster Management Agency (BPBD) at the local level implement a three-year DRR Action Plan and an Annual Plan. This legal institutional framework for DRR is centered on the formation of the National Disaster Management Agency and its sub-national/local counterparts (BPBDs) (BNPB, 2011). Figure 3.14 illustrates the organizational structure of the National Disaster Management Agency. Under the leadership of the President of Republic of Indonesia, a steering committee of experts and professionals in DRR, and 13 government ministries and organizations/agencies support BNBP. With this recognition, the disaster management agencies are set up at the national level as well as across 33 provinces and 497 local governments (cities and regencies) (BNPB, 2011).

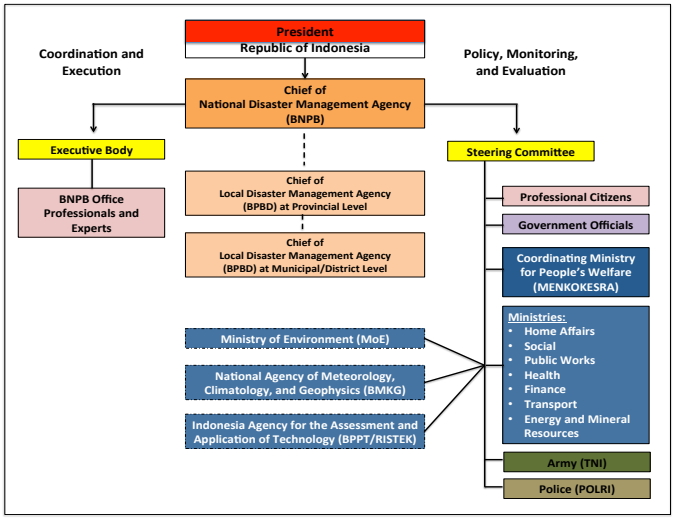


Figure 3.14: The organizational structure of National Disaster Management Agency (modified) (Source: Chang-Seng 2010; BAPPENAS and BNPB, 2010)

In term of collaboration, the National Disaster Management Agency (BNPB) is not only cooperating with several ministries, but academe, humanitarian organization, and private sector as well. Following table (Table 3.5) describes those institutions and their contributions in terms of collaboration with BNPB.

Table 3.5: Cooperation of BNPB with ministries and other institutions

Scope of Cooperation		Duration	MoU
Ministry			
Directorate General of Higher Education – Ministry of National Education *(Direktorat Jenderal Pendidikan Tinggi – Kementrian Pendidikan Nasional/KEMENDIKNAS)*	▪ Facilitation of research, education, and trainings in enhancing disaster management capacity ▪ Knowledge and disaster technology capacity development at national and local level ▪ Collaborative forum and national consultation	3 years	30 April 2010
Ministry of Defence *(Kementerian Pertahanan RI)*	▪ Education and training facility development of Indonesia Disaster Relief Training Ground *(Ina DRTG)* in Indonesia Peace and Security Centre	As long as it is needed	19 December 2011
Ministry of Defence and Military Headquarter of Republic Indonesia *(Kementerian Pertahanan RI dan Markas Besar TNI)*	▪ Implementation of operational and administrative disaster management	5 years	6 January 2011
Directorate General of Highways – Ministry of Public Works *(Direktorat Jenderal Bina Marga – Kemterian Pekerjaan Umum)*	▪ Available funding for emergency roads and bridges reconstruction activities caused by cold *"lahar"* disaster of Merapi Volcano eruption	Unlimited	22 December 2011
Directorate General of Human Settlement – Ministry of Public Works *(Direktorat Jenderal Cipta Karya Kementerian Pekerjaan Umum)*	▪ Available funding for emergency settlements and infrastructures reconstruction activities caused by cold *"lahar"* disaster of Merapi Volcano eruption	Unlimited	22 December 2011
Directorate General of Water Resources – Ministry of Public Works *(Direktorat Jenderal Sumber Daya Air - Kementerian Pekerjaan Umum)*	▪ Available funding for emergency water resources facilities reconstruction activities caused by cold *"lahar"* disaster of Merapi Volcano eruption	Unlimited	22 December 2011
Ministry of Agriculture *(Kementrian Pertanian)*	▪ Support in logistics, funding, human resources, facilities-infrastructure, and information ▪ Aid distribution procedure to disaster affected people ▪ Reporting and Evaluation	4 years	22 February 2012
Ministry Coordination of People's Welfare *(Kementrian Koordinator Bidang Kesejahteraan Rakyat/MENKOKESRA)*	▪ Support in policy	Unlimited	nd
National Agency			
Monetary and Development Control Agency *(Badan Pengawas Keuangan dan Pembangunan)*	▪ Assisting in the implementation of good governance ▪ Assisting in the implementation of Intern Governmental Control System according to Government Regulation No.60/2008 ▪ Assisting in the implementation of managerial issue	3 years	3 August 2010
National Agency of Auditing *(Badan Pemeriksa Keuangan/BPK)*	▪ Development and Information System Management of BNBP data access, which consisted of: ▪ Computer application system ▪ Communication network infrastructure ▪ Data access procedure	Unlimited	18 January 2011
Indonesia Agency for the Assessment and Application of Technology *(Badan Pengkajian dan Penerapan Teknologi/BPPT/RISTEK)*	▪ Formulation and implementation of policy in the aspect of disaster risk reduction technology ▪ Assessment and application in the aspect of disaster risk reduction ▪ Capacity development of stakeholders through disaster management education and trainings	5 years	2 February 2012
National Agency of Geospatial Information *(Badan Informasi Geospasial/BAKOSURTANAL)*	▪ Utilization and development of geospatial information, including survey and mapping for disaster management support ▪ Focused-development of geospatial information, including survey and mapping for disaster management support	5 years	2 February 2012

National of Search and Rescue Agency *(Badan Search and Rescue Nasional /BASARNAS)*	▪ Cooperation and coordination effectively in the implementation of disaster management during emergencies in line with own functions and responsibilities ▪ Cooperation in the implementation of disaster management system	5 years	2 February 2012
National Agency of Meteorology, Climatology, and Geophysics *(Badan Meteorologi, Klimatologi, dan Geofisika/BMKG)*	▪ Information service for: Earthquake, Tsunami Early Warning, Extreme Weather Early Warning, and Extreme Climate and Wave ▪ Development of Earthquake and Tsunami Early Warning dissemination of communication and information facility	5 years	2 February 2012
Academe			
Universitas Kristen Satya Wacana Salatiga *(Christian University of Satya Wacana Salatiga, Central Java)*	▪ Facilitation of research, education, and trainings in enhancing disaster management capacity ▪ Knowledge and disaster technology capacity development at national and local level. ▪ Collaborative forum and national consultation	5 years	30 April 2010
Universitas Jember *(Jember University, East Java)*		5 years	4 May 2010
Universitas Gadjah Mada *(Gadjah Mada University/UGM, Yogyakarta)*	▪ Enhancement of synergy ability in the implementation of duty and function of BNPB and UGM' mission ▪ Implementation coordination in monitoring, evaluation, and reporting	5 years	16 December 2011
Institut Teknologi Bandung *(ITB, West Java)*	▪ Cooperation in disaster management survey/empirical research, investigation and assessment ▪ Disaster knowledge and information sharing	5 years	2 February 2012
Institut Pertanian Bogor *(IPB, West Java)*	▪ Development of community empowerment in disaster ▪ Capacity development in disaster management ▪ Enhancing the role of science in disaster management technology	5 years	22 June 2012
Universitas Andalas *(UNAND, Padang-West Sumatera)*	▪ Cooperation in disaster management survey/empirical research, investigation and assessment ▪ Disaster knowledge and information sharing	5 years	16 July 2012
Humanitarian Organization			
Indonesia Red Cross *(Palang Merah Indonesia/PMI)*	▪ Disaster management implementation in line with main task and function of PMI	5 years	23 March 2009
Other Governmental Institution			
Jakarta Rescue	▪ Facilitation of research, education, and trainings in enhancing disaster management capacity, including dog tracker (K9-cadaver) ▪ Capacity development of knowledge and technology at national and local level	3 years	22 June 2012
National Scouts Quarter *(Kwartir Nasional Gerakan Pramuka)*	▪ Implementation of disaster management, including education and operational activities	5 years	9 December 2011
Private Sector			
Indonesian State Bank *(Bank Negara Indonesia/BNI)*	▪ National Budget fund distribution and/or aid fund to working units and/or to aid recipient ▪ Availability saving service and fund management through integrated cash management (payment, collection, liquidity) ▪ Facility saving and loan service for disaster management	5 years	22 June 2012

Note: MoU (Memorandum Of Understanding)
Source: BNPB (2013)

c. Law Number 26 Year 2007 on Spatial Planning

A disaster mitigation-based spatial planning is required as an effort to improve the safety and comfort of life and livelihood. Spatial planning must be carried out in a comprehensive, holistic, coordinated, integrated, effective and efficient manner with due observance of the economic, social, cultural, security, safety, and environment conservation aspects. The objective of spatial planning as set forth in Law Number

26/2007 regarding Spatial Planning is to harmonize the natural and artificial environment in order to realize integration in the use of natural and artificial resources, so as to provide protection for spatial functions and prevent negative impacts on the environment. The strategy for the implementation of spatial planning as part of disaster risk reduction efforts is as follows:

- Consistent implementation of zoning regulations complementary to the spatial planning detailed plan
- Emphasis on the control of spatial use conducted in a systemic manner by stipulating zoning and licensing regulations, providing incentives and disincentives, as well as imposing sanctions
- Rigorous and consistent law enforcement with the aim of realizing orderly spatial planning

d. Law Number 27 Year 2007 on the Management of Coastal Areas and Small Islands

Law Number 27/ 2007 mandates that in respond to disaster hazards in coastal areas and small islands, disaster mitigation efforts shall be in the form of efforts to reduce disaster risks, both structural and physical, through natural and/ or artificial physical development, as well as non-structural or non-physical development. Articles 56 to 59 clearly provide that DRR efforts must be integrated in the plans for the management and utilization of coastal areas and small islands carried out by involving the responsibilities of the Central Government, regional governments and/or the community. Observing the social, economic and cultural aspects of the community as well as the environment preservation, the implementation of disaster mitigation shall be carried out. Table 3.6 presents the summary of the above laws that are related to disaster management to highlight the differences from each other.

Table 3.6: Summary of Laws related to disaster management in Indonesia

Year	Law	Differences to other Law
2004	Law No. 25 on National Development Planning System	▪ Legal framework for the planning system in Indonesia ▪ As a basis for the development of National Action Plan for Disaster Risk Reduction
2007	Law No. 24 on Disaster Management	▪ Part of national development ▪ Reference for all disaster activities in pre-during-and post-disaster ▪ Mandated local government in taking responsibility in disasters (establishment of local disaster management agencies) ▪ Participation of community in disaster activities (CBDRM) ▪ A legal framework for the preparation of DRM, NAP-DRR and RAP-DRR ▪ Birth of Governmental Regulation: o No.21/2008: Organization of Disaster Management o No.22/2008: Funding and Management of Disaster Aid o No.23/2008: Participation of International Organization and NGO in Disaster Management
	Law No. 26 on Spatial Planning	▪ Requirement of disaster mitigation-based spatial planning (zoning regulations, building codes)
	Law No. 27 on the Management of Coastal Areas and Small	▪ Risk reduction and mitigation (structural/physical and non-structural/non-physical) to respond disasters in coastal areas) ▪ DRR must be integrated in the plans and management and utilization of coastal areas and small islands, involving central, local government, and communities

Following, to summarize the DRR efforts in Indonesia, Table 3.7 lists the key activities/milestones of DRR in the country.

Table 3.7: Chronology of DRR milestones in Indonesia

Year	DRR milestones
1945	▪ Office for War Victim Supports (BPKKP)
1966	▪ National Board for Disaster Management (BP2BAP)
1967	▪ National Coordination Team for Disaster Management (TKP2BA)
1979	▪ National Provincial Coordinating Board for Natural Disaster Management (BAKORNAS and SATKORLAK PBA
2001	▪ National Coordinating Board for Disaster Management and Refugees (BAKORNAS PBP)
2004	▪ Tsunami Relief, Rehabilitation, and Reconstruction started for Aceh and Nias ▪ (BRR Aceh and Nias)
2005	▪ National Coordinating Board for Disaster Management (BAKORNAS-PB) ▪ Tsunami relief, rehabilitation, and reconstruction started ▪ World Conference on Disaster Risk Reduction (WCDR) ▪ Hyogo Framework for Action (HFA)
2006	▪ National Action Plan for DRR (2006-2009)
2007	▪ First Global Platform for DRR ▪ Enforcement of Laws: o Law No. 24/2007 on Disaster Management o Law No. 26/2007 on Spatial Planning o Law No. 27/2007 on Small Islands and Coastal Management
2008	▪ Establishment of National, Sub-National, and Local Disaster Management Agency (BNPB and BPBD)
2009	▪ Second Global Platform for DRR ▪ Indonesian National Platform for DRR (PLANAS PRB)
2010	▪ Mid-Term Development Plan (RPJM) 2010-2014 ▪ National Action Plan for DRR (NAP-DRR) 2009-2012 ▪ National Disaster Management Plan (NDMP) and Guidelines (RENAS PB) 2010-2014
2011	▪ Third Global Platform for DRR ▪ Global Champion of DRR is awarded by the UN General Secretary
2012	▪ Fifth Asian Ministerial Conference on Disaster Risk Reduction (5th AMCDRR) in Yogyakarta on "Strengthening Local Capacity for Disaster Risk Reduction", with sub-themes: o Integrating Local Level Disaster Risk Reduction and Climate Change Adaptation into National Development Planning o Local Risk Assessment and Financing o Strengthening Local Risk Governance and Partnership
2013	▪ Thematic Consultation on Post-2015 HFA in Jakarta

Source: UNISDR (2011b), (BAPPENAS and BNPB, 2010)

3.3.2 Approach on Local DRR Implementation

It is apparent that there is a shifting of disaster paradigm on the two scales in Indonesia (See Table 3.7 on the chronology of DRR milestones). The first one is on the shifting from the response-centered to preparedness and risk reduction focused. The enacted Law on Disaster Management in 2007 after the 2004 Aceh Tsunami is the key to the establishment of National and Local Disaster Management Agency. Second shift is that, coupled with decentralization process and the adoption of HFA, they have pushed Indonesia to focus on the DRR implementation at the local level. It drives by the recognition that the disaster impacts are immediately felt and affected by the communities, households, and individuals. Thus, the implementation of HFA, of which it strategic goal is building the resilience and reducing disaster risks and losses, is imperative to be carried out locally. It is inline with the Priority of Action HFA 1: Ensure that DRR is a national and a local priority with a strong institutional basis for implementation (See Chapter 2).

The Global Assessment Report (GAR) that was published in 2011, reviewed the latest development and progress and challenges experienced by countries in implementing the HFA (UNISDR, 2011). Previously mentioned, the procedure for implementing and measuring the HFA is outlined in the report "Word into Action: the Guidance for Implementing the HFA" (UNISDR, 2007) but how to carry and activate the HFA locally, is described in the document of "Guide for Implementing the Hyogo Framework for Action by Local Stakeholders (KU and UNISDR, 2010). Each country is required to self-assess its progress towards the Priorities for Action based on the requirements outlined for each indicator. The self-assessment process is conducted through discussion with inputs from various DRR national and sub-national DRR stakeholders. In Indonesia, the review process is coordinated at the national level by the National Disaster Management Agency (BNPB) and BNBP coordinates the involvement of other government agencies, private organizations and NGOs in the assessment (BNBP, 2011; Djalante et al., 2012).

Djalante et al. (2012) have studied the HFA implementation, progress, and challenges in Indonesia. Especially on the Priority of Action HFA 1 and its four indicators: Ensure that DRR is a national and a local priority with a strong institutional basis for implementation (See Chapter 2), Indonesia achieved a score 3 out of 5 (from scale 1 lowest to 5 highest). Indonesia has some level of commitment and capacity for achieving DRR, but the progress is not substantial (Djalante et al., 2012). As has been previously mentioned. The Law No. 24/2007 on Disaster Management has brought fundamental shifts in the way disaster management is framed and viewed in Indonesia (GoI, 2007). Three key paradigms are adopted that the disaster management is viewed as comprehensive process of mitigating, managing, and responding to disasters; which requires participation of all stakeholders and communities, and specifically the government at the local level, has the authority and responsibility for disaster management (GoI, 2007).

Further to mention, how DRR approach in Indonesia focuses on local implementation, based on the study conducted by Djalante et al. (2012) that the success of forming institutions for DRR at the national level has not yet been widely duplicated at the local level. All 33 provinces in Indonesia have established BPBDs (Local Disaster Management Agencies), however, only 144 out of 497 local governments have momentarily developed their BPBD (BNPB, 2011). Thus, the 30 percent of BPBDs' establishment are still far from the BNPB's target. Based on the study conducted also by Djalante et al. (2012), the conventional disaster management paradigm still linger some local governments that still perceived the disaster management as emergency response and management, when they put the disaster management mandate to the already established agencies, such as Fire Department of *Kesbanglinmas* (Office of civil security), instead of creating new office and tasks that spans from risk identification to disaster recovery for holistic disaster management. Other example that delaying the establishment of local disaster management agencies is that disaster issues are competing with other priority, such as poverty alleviation and corruption eradication. Moreover, the study also mentioned that although some local governments have established local disaster management agencies, they are lack of qualified personnel, technical, and financial capacity (Djalante et al., 2012). Particularly on financial capacity, the local disaster management agencies are relying heavily on national government and

international NGOs support, leaving these local agencies with insufficient budget for implementing local DRR activities.

Despite the above evidences, local disaster management agencies and DRR activities are highly visible in some highly disaster susceptible areas, such as in Aceh, Padang, and Yogyakarta-Central Java. The disaster events of 2004 Aceh Tsunami, 2006 Yogyakarta Earthquake, 2009 Padang Earthquake, and 2010 *Merapi* volcanic eruption in Central Java have brought international projects and financial support in the aftermath of high-impact disasters to local institutions such as to local government, NGOs, and/or universities. For example, the Yogyakarta Earthquake and *Merapi* eruption events had bring all relevant stakeholders to cooperate and coordinate the risk management issues in collaborative manner *(Merapi Forum)* (UNISDR, 2009b).

In summary, the arguments and examples above illustrated on how DRR approach in Indonesia focuses on local implementation. By the enactment of Disaster Management Law, decentralization process, and implementing HFA locally; despite the average score value for Priority of Action HFA 1, Indonesia is in the right path to downscale the DRR from national to local level.

Coming to the point of the relation to the increasing frequent urban climate-related disaster events in Indonesia, which have been extensively discussed earlier, due to the changing climate factor; it is apt to discuss as well Indonesia's institutional framework of climate change adaptation and link it with the disaster risk reduction framework. This is needed to elaborate and enable in identifying synergies and gap between disaster risk reduction and climate change adaptation for institutionalizing local initiatives in strengthening the climate-related disaster resilience at the local level.

3.4 Linkage of Disaster Risk Reduction and Climate Change Adaption Institutional Framework in Indonesia

The institutional framework of disaster risk reduction (DRR) has been extensively discussed earlier. However, the increasing trends of climate-related disasters in Indonesia that some are caused by the changing climate cannot be neglected. Therefore, aside from national disaster risk reduction institutional framework and arrangements, Indonesia is in the position to address climate change as well. These efforts are tackled and framed in the National Action Plan Addressing Climate Change (MoE, 2007). Thus, it is essential to discuss as well the national institutional framework of climate change adaptation (CCA) and find the linkage to DRR framework. This will give entry points in institutionalizing local initiatives to reducing and enhancing climate-related disaster resilience at the local level.

3.4.1 Climate Change Adaptation

The disaster risk reduction (DRR) was initiated since Indonesia's Independence in 1945 whereas 'Office for War Victims Families' (BPKKP) was created (BNPB, 2011). Following, there have been serial of DRR milestones, shifting the paradigm of emergency response to preparedness and mitigation, since the 2004 Indian Ocean Tsunami,

particularly the 2004 Aceh Earthquake (See Table 3.7). Indonesia received the highest recognition of DRR effort when the President of Republic Indonesia, Dr. Susilo Bambang Yudhoyono, is awarded as the Global Champion for DRR by the UN General Secretary (UNISDR, 2011). Indonesia is considered to have successfully led the reconstruction processes in Aceh (2004) and Yogyakarta (2006) Earthquake, set up the necessary regulations and institutional frameworks for DRR, and has engaged international agencies for partnerships in assisting the DRR. A major finding that can be highlighted from Table 3.7 is the change of country's disaster management paradigm from response to mitigation, preparedness, and risk reduction. The newly established Disaster Management Law endorsed the change and risk reduction was manifested at the local level (establishment of Local Disaster Management Agency). But, due to the increased climate-related disasters event, aside from National Action Plan for DRR, Indonesia felt also the need of developing a national plan to address the changing climate and its related disasters

Therefore, as a response to a changing climate and recognizing country's vulnerabilities to climate change, Indonesia has developed National Action Plan Addressing Climate Change (NAP-CC) for the period of 2007 to 2050 (MoE, 2007). The NAP-ACC clearly defines that the socio-economic transformation to improve the quality of life of the Indonesian people in the post-independence period (post 1945) took place in the context of dynamic domestic and foreign political economy, which was not always in accordance with the national interest. The focus of development that centers on economic growth, political stability, and equity takes place on a base of natural resource exploitation without consideration of its sustainability. Therefore, the triple track strategy mentioned above should be expanded with the fourth track, namely pro-environment, which based on the sustainable development. The improvement of production infrastructure and the extension of production sectors particularly in the last generations have also created social ecological pressures to the livelihood support systems throughout the archipelago (MoE, 2007). Thus, to integrate these strategies with sustainable development principles, the community should received necessary information (risk communication) and be actively involved, as stipulated often as community participation in DRR international and national platforms. Table 3.8 illustrates the summary of participation of mitigation and adaptation actions in NAP-CC.

Indonesia plays an active role in various international negotiations on climate change. Indonesia has hosted the 13th Conference of the Parties to the UNFCCC in Bali, which created the Bali Action Plan (BAPPENAS, 2010). With vast coastline, high susceptibility to natural disasters, and highly vulnerable agriculture production systems, Indonesia is one of the countries that are most vulnerable to the negative impacts of climate change.

Table 3.8: Summary of participation of Mitigation and Adaptation Actions NAP-CC (2007-2050)

Mitigation		
Sector	**Major Activities**	**Responsible Institutions**
Land Use and Land Use and Cover Forest (LULUCF)	Forestry	Department of Forestry Ministry of Environment Local Government
Marine	Increase carbon absorption	Department of Forestry Ministry of Environment Local Government

Energy	Power plant, transportation, industry, domestic (household) and commercial, and others (Such as energy saving campaign)	Ministry of Industry Department of Energy and Mineral Resources Ministry of Finance State Ministry of Environment Department of Public Works Local Government
Adaptation		
	Activities	**Responsible Institutions**
	Water Resource	State Ministry of Environment Department of Public Works Department of Forestry National Coordination Body for Survey and Mapping Local Government
	Agriculture	Department of Marine Affairs and Fisheries State Ministry of Environment Department of Public Works Local Government
	Marine, Coastal and Fisheries	Department of Marine Affairs and Fisheries State Ministry of Environment Department of Public Works Local Government
	Infrastructure	State Ministry of Environment Department of Public Works Local Government
	Health	Department of Health State Ministry of Environment Local Government
	Forest and Biodiversity	State Ministry of Environment Department of Forestry National Coordination Body for Survey and Mapping Local Government
	Cross Sector	Ministry of Interior, State Ministry of Environment Public Works, Geophysical and Meteorological Agency Department of National Education National Institute of Aeronautics and Space National Coordination Body for Survey and Mapping

Source :MoE (2007)

Therefore, Indonesia needs to be at the forefront of collective international efforts to manage the risks of global climate change. Indonesia also recognizes that tackling climate change is an integral part of the development challenge facing the nation. Climate change planning cannot and should not be performed separately from national economic development planning, thus planning for both mitigation and adaptation must be integrated into all aspects of national, regional, and local development planning. Therefore, it is expected that the Indonesia Climate Change Sectoral Roadmap (ICCSR) serves as a detailed policy guidance and mainstreaming tool for the sectoral and cross-sectoral development programs in order to take up considerations of climate change into all aspects of development planning.

The ICCSR is meant to provide inputs for the five year Medium-term Development Plan (RPJM) 2010-2014, and also for the subsequent RPJMN until 2030, laying particular emphasis on the challenges emerging in the forestry, energy, industry, agriculture, transportation, coastal area, water, waste and health sectors. It is the National Planning Agency's (BAPPENAS) policy to address these challenges and opportunities through effective development planning and coordination of the work of all line ministries,

departments and agencies of the Government of Indonesia (GoI). It is a dynamic document and it will be improved based on the needs and challenges to cope with climate change in the future. Changes and adjustments to this document would be carried out through participative consultation among stakeholders. Table 3.9 describes the adaptation and mitigation sectors currently being undertaken by the GoI.

Table 3.9: Adaptation and Mitigation Sectors undertaken in ICCSR (2010-2029)

Sector	Issues
Adaptation in the Water Sector	▪ The need to maintain the balance between water availability and water demand (water balance) ▪ Insufficiency of water infrastructure and the need for provision of alternative water sources in certain areas ▪ Limited availability of data, technology and research as a basis for water resource management ▪ The necessity to reduce vulnerability and risk from water shortage, flood and drought ▪ The need to find synergetic solutions for cross-sector issues with agriculture, forestry, health, energy, and industry sectors ▪ The need to integrate water resources management and flood control ▪ The need to conserve water based on innovation, community participation and local wisdom
Adaptation in the Marine and Fisheries Sector	▪ Existing regulation and policy have not specified the need for climate change adaptation ▪ Inundation of settlements, business areas, fishponds, and ports because of Sea Level Rise and damage caused by storms have not been considered by policy makers at national and local government ▪ Shifting of fishing grounds, depletion of fishing stocks, and the changing pattern of winds will bring severe damages ▪ Degrading and sinking of outer small islands (Indonesia's territory border)
Adaptation in the Agriculture Sector	▪ Agriculture sector is the main producer of food, supplier of agro-industry, and bioenergy ▪ Sea level rise would decrease agriculture land in the coastal zone ▪ Increase of atmospheric temperature would decrease crop productivity, damage agriculture land resources and infrastructure ▪ Limited land resources because of degrading land quality and declining production potential ▪ Change in rainfall pattern, causing a shift in planting period, season and planting pattern, land degradation, and decrease in water availability
Adaptation in the Health Sector	▪ Diseases or deaths caused by disasters related to extreme climate events and diseases that might be outbreak in the refugee sites ▪ The increase of respiratory diseases as a result of increasing air pollution, which are associated with the rise of surface air temperature ▪ The increase of agents of water-borne diseases or contagious diseases, which normally take place during droughts or floods ▪ Malnutrition during famine due to harvesting failure ▪ Changing pattern of diseases brought by vectors such as mosquito due to land use conversion and climate change. Moreover, temperature rise of 2-3 degree Celsius is projected to increase the number vector-borne diseases by 3-5% and also to increase the distribution of the vectors ▪ Precipitation level also contributes to the type and intensity of vectors' habitat

Source: BAPPENAS (2010)

Thus, the above issues in different sectors in Table 3.9 were pinpointed in post risk analysis by the team of ICCSR (BAPPENAS, 2010), which have to be addressed in order to successfully adapt to climate change. This includes managing frequent climate-related disasters, such a flood and drought in the water sector. Therefore, it accentuates the

need of downscaling the national policies down to local actions and implementation, thus highlighting the need of local risk (resilience) assessment.

Aside from NAP-CC and ICCSR, in terms of governance issue, GoI attempts to mobilize and involve relevant stakeholders. The National Council on Climate Change (*Dewan Nasional Perubahan Iklim*/DNPI, established in July 2008 through Presidential Decree No 46/2008, was designed to serve as the ultimate body for policy coordination among key national government agencies on matters related to climate change (Figure 3.15). It also acts as the focal point for United Nations Framework Convention on Climate Change (UNFCCC) in Indonesia and Designated National Authority for Clean Development Mechanism projects. Led by the President of the Republic of Indonesia as Chair, DNPI has the Coordinating Minister of Economy and the Coordinating Minister of Social Welfare as vice chairs. The Council members are 17 Ministers (State Secretary, Cabinet Secretary, Environment, Finance, Home Affairs, Foreign Affairs, Energy and Mineral Resources, Forestry, Agriculture, Industry, Public Works, Development Planning/BAPPENAS, Fishery and Marine, Trade, Research and Technology, Transportation, Health) and Head of Meteorology, Climatology and Geophysics Agency/BMKG (DNPI, 2013). Figure 3.15 illustrates the members and working groups of the National Council on Climate Change.



Figure 3.15: National Council on Climate Change (DNPI) (Source: DNPI, 2013)

Moreover, the substance of DRR, including Climate Change in Indonesia is related to each other. In the planning framework, NAP-DRR is related to other relevant action frames at regional level, such as spatial planning, environment, climate change, and poverty reduction. The four aspects have formulated the National Action Plans and thus are linking to each other as illustrated in Table 3.10

Table 3.10: The relationship of NAP-DRR, Spatial Planning, NAP-CC and Poverty Reduction

Policy Instruments	Spatial Planning	Climate Change	DRR and Disaster Management (DM)	Poverty Reduction Strategies	Integration Scheme
Regulation /Planning/ Institution	The 2007 RTRWN, Island RTRW, Provincial RTRW, RTRW of Strategic Areas, National Spatial Planning, Coordinating Board (BKTRN), Ministry of Public Works	NAP-CC is in process, but it requires support of legal frameworks, Ministry of Environment, Ministry of Forestry, Ministry of Marine, Ministry of Agriculture, BAPPENAS	Regulations on DM: Government Regulation No. 21, 22, 23/2008, DM Plan and NAP-DRR of BNPB/BPBD, BAPPENAS, BPPT, LIPI	PRSSP under the coordination of the Coordinating Minister for People's Welfare, Public Works, Ministry of Cooperative	RPJP and RPJM, Annual Working Program, BAPPENAS and BNPB will lead the coordination of multi stakeholders
Direct Intervention	Special attention to vulnerable areas, protection regions	LULU fs, Forest Protection / Conservation / Water Management	Mapping of prone areas/ DRR Assessment for disaster prone areas, establishment of EWS in disaster prone areas	Social system / Community Forestry System, PNPM	Coordination among programs, projects, Integration of climate change and DRR in PNPM
Capacity Building	Improvement of community participation in R & D, spatial planning, Improvement of the role of community control in R & D	R & D, Improvement in education, community awareness and participation in climate change	R & D, Improvement in education, community participation in EWS as well as DRR	Community-Based Society Organizations (CBSOs) capacity building	Integration of community empowerment with CBSOs

Further on, Table 3.11 lists the time series of CCA activities and key achievements in Indonesia.

Table 3.11: Chronology of CCA milestones in Indonesia

Year	CCA milestones
1990	▪ Formation of the National Committee on Climate Change (*Komite Nasional Perubahan Iklim/KNPI)*
1992	▪ Indonesia signed the Climate Convention
1994	▪ Indonesia ratified the UNFCCC in Rio de Janeiro
1997	▪ Established the Kyoto Protocol Adaptation Fund
1999	▪ Submission of Indonesia's First National Communication to the UNFCCC, included: o National emissions inventory of greenhouse gasses (GHG), described sectoral measures to reduced GHG emissions and provide other important information related to climate change
2004	▪ Indonesia ratified the Kyoto Protocol
2007	▪ UNFCCC COP 13: Bali, Indonesia ▪ The Bali Road Map/Action Plan ▪ National Action Plan for Climate Change (NAP-CC) (*Rencana Aksi Nasional Perubahan Iklim/RAN-PI)* o NAP-CC aims to create development systems that are resilient to climate change and climate variability, and to implement more sustainable development that decreases the rate of environmental destruction o Outlines Indonesia's strategies on mitigation and adaptation o The plan specifically states that the country current capacity to cope with climate change will strongly affect its capacity in the future, and that is therefore important to incorporate Indonesia's current NAP-DRR (See Table 3.10) within the NAP-CC ▪ First Sub-National Task Force on CCA
2008	▪ UNFCCC Nairobi Work Program ▪ Formation of the National Council on Climate Change *(Dewan Nasional Perubahan*

Year	CCA milestones
	Iklim/DNPI) o The formation of DNPI is to address the complexity and the need of for better integration and coordination to address climate change o The council is managed by the President with the Minister of the Environment (MoE) acting as the daily leader. DNPI oversees six working groups: adaptation, mitigation, technology transfer, funding, Post Kyoto 2012, forestry, and land use, and others as needed ▪ National Development Plan of Indonesia Response to Climate Change
2009	▪ UNFCCC COP 15: Copenhagen Accord ▪ Formation of the Indonesian Climate Change Trust Fund (ICCTF) o The ICCTF was created to build the national policy for framework for climate change mitigation and adaptation and to support its implementation o The formation of the ICCTF addresses three major targets: conducting low-carbon economic development, promoting national resilience to climate change, and achieving effective CCA ▪ National Planning Agency (BAPPENAS) outlined report: o National Development Planning: Indonesia's Responses to Climate Change (ICCSR), on: The possible impact of climate change on Indonesia and sectoral targets for climate change sectoral roadmap, which identifies nine development priorities that will be strongly linked with climate change mitigation and adaptation activities (energy, forestry, transportation, industry, waste treatment, agriculture, marine and fisheries, water resources, and health)
2010	▪ Submission of Indonesia's Second National Communication to the UNFCCC, reported: o Indonesia's progress in adapting and mitigating to climate change and provided a detailed plan for GHG emissions reduction of 26 percent by 2020
2011	▪ UNFCCC COP 17: Durban, South Africa. Implications for Indonesia: Statement of ASEAN Leaders <u>Emphasizing:</u> o Southeast Asian region is vulnerable to climate change due to its geological and geographical factors which will seriously affect most of aspects of livelihood and limit our development options for the future, including our efforts towards poverty eradication, sustainable development, and the achievement of the Millennium Development Goals; o The need to provide necessary assistance and support to countries that are particularly vulnerable to the adverse effects of climate change, as identified in the Convention o The urgent need to enhance awareness among all stakeholders to address the climate change issues <u>Recognizing:</u> o The need for the development of communities resilient to climate change and supporting various regional and international initiatives on climate change
2012	▪ UNCC Learn planning workshop in Indonesia on "Developing a National Strategy to Strengthen Human Resource Capacities and Skills to Advance Green, Low Emission and Climate Resilient Development"
2013	▪ Consultation on National Strategy for Climate Change in Jakarta

Source: GoI (1999), MoE (2007), State Secretary of Republic Indonesia (2008), Muhammad (2009), UNDP Indonesia (2009), Indrawati (2009), ASEAN (2011), UNCC Learn (2012)

3.4.2 Synergy between DRR and CCA

When one talked on how to find synergy between DRR and CCA, quasi, integrating DRR and CCA frameworks in Indonesia, one must reflect to the overarching problems that are globally shadowing on why there is a need of DRR and CCC integration. Firstly, as have been previously mentioned in Chapter 2 and Section 3.1 in this chapter, natural disasters are becoming more frequent, deadly, and costly (UNISDR, 2011a). According to the CRED/EM-DAT database, within the period of 1900 to date (2013), there has been five-fold increase in the number of natural disasters reported, taking its peak within the 2000 to 2010 period (CRED/EM-DAT, 2011). While there is a gradual reduction in the number of death, the number of people reported affected increased rapidly in the last

40-50 years, averaged more than 300 million by 2010 (CRED/EM-DAT, 2011). The costs of natural disasters have increased significantly since the 1980s and the average costs peak at just below USD 100 billion by 2010 (CRED/EM-DAT, 2011). Secondly, the frequency and magnitude of climate-related hazards (climatological and hydro-meteorological hazards) is increasing (IPCCC, 2007; CRED/EM-DAT, 2011), with flood as the most frequent disaster and affected most people (CRED/EM-DAT, 2013). And thirdly, based on each understanding and the nature of policy framework, DRR was defined as *"systematic efforts to reduce disaster risks through analyzing and managing the casual factors of disasters, including the reduction of vulnerability, and improved preparedness for adverse events"* (UNISDR, 2009a). Therefore HFA 2005-2015: Building the Resilience of Nations and Communities to Disasters was adopted in 2005 act as the international framework for DRR (UNISDR, 2007). While CCA, according to IPCC (2007) is as "*an adjustment in natural of human systems in response to actual or expected climatic stimuli of their effects, which moderates harm or exploits beneficial opportunities".* Thus, the anticipated increase in the frequency, intensity, and severity of climate-related disasters therefore call urgently for better integration of DRR and CCA to reduce vulnerability and increase resilience to natural disasters. Therefore it is critical to identify synergies and linkages between these two fields.

Data shows for Indonesia, as the largest country in Southeast Asia region, that in the last 100 years, the most total number of disaster events, people killed and affected, as well as total cost are dominating by geophysical and climate-related disasters (See Figure 3.5). Thus, while geophysical disasters are causing more fatalities, climate-related disasters occur more frequently and affected more people. Moreover, Indonesia's vulnerability to natural hazards and climate change and in addition its highly exposure to danger and extremely sensitivity to shocks and low adaptive capacity are the main drivers for DRR and CCA integration (Djalante, 2013). The next following question is how to integrate DRR and CCA and identify the synergy between those two fields. According to IPCC (2007), linking DRR and CCA is important because climate change is likely to frequency and severity of hydro-meteorological (climate-related) hazards. The simultaneous application of DRR and CCA also results in more efficient use of financial, human, and natural resources and therefore increases the effectiveness and sustainability of both approaches (Djalante, 2013). Therefore, there is a significant overlap between the theory, policy, and practice of DRR and CCA. The synergy between these two fields is firstly, the management of climate-related hazards, where DRR needs to take into account changing hazards, and adaptation needs to build resilience (Mitchell and van Aalst, 2008). Secondly, Both DRR and CCA emphasize on vulnerability reduction and sustainable and flexible long-term strategies to build resilience to adverse impacts. And thirdly, both DRR and CCA promote approaches that are pro-active, holistic and long-term either before or after occurring hazards (Thomalla et al., 2006; Schipper, 2009).

In Indonesia, to identify the synergy between DRR and CCA is first to analyze the comparison of the evolution process of DRR and CCA policy, frameworks, and how they operationalized and institutionalized (Table 3.12). Based from Table 3.7 and Table 3.11 on DRR's and CCA's chronological milestones, it can be derived that there are certain guidelines, policies, strategies and activities, which may link DRR to CCA. In terms of

policy and frameworks, for example, the results of the consultation on national strategy for climate change recently in Jakarta have to be included in thematic consultation of post 2015 HFA, such as how this strategy can be mainstreamed and downscaled at the local level in building a resilient community to the increasing climate-related disaster events. Another entry point for the synergy is that in the 5th Asian ministerial Conference on DRR, it is the goal that DRR and CCA as one component, have to be integrated in the development planning at the local level; hence it injects in the routine programs and plans of relevant sectors.

While Indonesia participated in the third Global Platform for DRR and awarded as the Global Champion for DRR, Indonesia also acknowledged in 17th sessions of UNFCCC Conference of Parties in Durban that there is urgent need to enhance community awareness to climate change and its related disasters. One significant synergy that is widely acknowledged is the adoption of Bali Plan. It has highlighted the importance of DRR as part of enhanced action on CCA. Moreover, the newly established disaster management can take up the momentum of the outcomes of Nairobi Working Program of the assessment and impacts and adaptation measures of climate change, at the national and most important at the local level. And lastly, the adopted Cancun Agreements' vision on the protection of climate impacts, including its related disasters in building sustainable futures can be infused in Mid-term Development Planning (2010-2014), National Action Plan for DRR (2009-2012), and in the National Guidelines for DRR (2010-2014) as well as in National Disaster Management Plan, since all are occurring in the same year. Thus, in terms of policy and frameworks, Indonesia is provided with sufficient entry points to synergized DRR and CCA.

Table 3.12: Comparison of the evolution process of DRR and CCA policy and frameworks

Year	DRR	CCA
2013	▪ Thematic Consultation on Post-2015 HFA in Jakarta	▪ Consultation on National Strategy for Climate Change in Jakarta
2012	▪ Fifth Asian Ministerial Conference on Disaster Risk Reduction (5th AMCDRR) in Yogyakarta on "Strengthening Local Capacity for Disaster Risk Reduction", with sub-themes: o Integrating Local Level Disaster Risk Reduction and Climate Change Adaptation into National Development Planning o Local Risk Assessment and Financing o Strengthening Local Risk Governance and Partnership	▪ UNCC Learn planning workshop in Indonesia on "Developing a National Strategy to Strengthen Human Resource Capacities and Skills to Advance Green, Low Emission and Climate Resilient Development"
2011	▪ Third Global Platform for DRR ▪ Global Champion of DRR is awarded by the UN General Secretary	▪ UNFCCC COP 17: Durban Decisions o Indonesia as the largest country among the ASEAN nations, emphasizing the urgent need to enhance awareness among all stakeholders to address the climate change issues and recognizing the need for the development of communities resilient to climate change and supporting various regional and international initiatives on climate change ▪ SREX Report: o Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

Year	DRR	CCA
2010	▪ Mid-Term Development Plan (RPJM) 2010-2014 ▪ National Action Plan for DRR (NAP-DRR) 2009-2012 ▪ National Disaster Management Plan (NDMP) and Guidelines (RENAS PB) 2010-2014	▪ UNFCCC COP 16: Cancun Agreements o Capturing plans to reduce greenhouse gas emissions, protect from climate impacts and, build on sustainable futures ▪ Indonesia's Second National Communication to the UNFCCC
2009	▪ Second Global Platform for DRR ▪ Indonesian National Platform for DRR (PLANAS PRB)	▪ UNFCCC COP 15: Copenhagen Accord o Guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stock o Capacity building o Systematic climatic observations ▪ Formation of the Indonesian Climate Change Trust Fund (ICCTF) ▪ ICSSR Report
2008	▪ National, Sub-National, and Local Disaster Management Agency (BNPB and BPBD)	▪ UNFCCC Nairobi Work Program o Improve understanding and assessment of impacts, vulnerability and adaptation to climate change o Make informed decisions on practical adaptation actions and measures to respond to climate change on a sound scientific, technical and socio-economic basis, taking into account current and future climate change and variability ▪ Formation of the National Council on Climate Change *(Dewan Nasional Perubahan Iklim/DNPI)* National Development Planning Indonesia Response to Climate Change
2007	▪ First Global Platform for DRR ▪ Enforcement of Laws: ▪ Law No. 24/2007 on Disaster Management ▪ Law No. 26/2007 on Spatial Planning ▪ Law No. 27/2007 on Small Islands and Coastal Management	▪ UNFCCC COP 13: Bali, Indonesia o The Bali Road Map/Action Plan: Highlights the significance of disaster risk reduction, as part of enhanced action on climate change adaptation ▪ National Action Plan for Climate Change (NAP-CC) (*Rencana Aksi Nasional Perubahan Iklim/RAN-PI)*
2006	▪ National Action Plan for DRR (2006-2009)	
2005	▪ World Conference on Disaster Risk Reduction (WCDR) ▪ Hyogo Framework for Action (HFA) ▪ National Coordinating Board for Disaster Management (BAKORNAS-PB) ▪ Tsunami relief, rehabilitation, and reconstruction started	
2004	▪ Tsunami Relief, Rehabilitation, and Reconstruction started for Aceh and Nias ▪ (BRR Aceh and Nias)	▪ Indonesia ratified the Kyoto Protocol
2001	▪ National Coordinating Board for Disaster Management and Refugees (BAKORNAS PBP)	
1999		▪ Submission of Indonesia's First National Communication to the UNFCCC
1997		▪ Established the Kyoto Protocol Adaptation Fund
1994		▪ Indonesia ratified the UNFCCC in Rio de Janeiro
1992		▪ Indonesia signed the Climate Convention
1990		▪ Formation of the National Committee on Climate Change (*Komite Nasional Perubahan Iklim/KNPI)*

Year	DRR	CCA
1979	▪ National Provincial Coordinating Board for Natural Disaster Management (BAKORNAS and SATKORLAK PBA	
1967	▪ National Coordination Team for Disaster Management (TKP2BA)	
1966	▪ National Board for Disaster Management (BP2BAP)	
1945	▪ Office for War Victim Supports (BPKKP)	

The integration of DRR and CCA is one of the three main objectives to strengthen the national and local resilience to climate change, threats, shocks, and disasters (GoI and UN, 2011). In terms of governance, the opportunity or the entry point of DRR and CCA synergy is in the agencies or key institutions that play role in both DRR and CCA issues. In Indonesia, at the national and local scale, UN organizations and donor agencies activities are greatly influenced the development of DRR and CCA. Database from the United Nations' Office of Coordination of Humanitarian Activities (UNOCHA) lists more than 100 organizations working on DRR, spanning from UN organizations, donor agencies, international and national NGOs, international organizations, and humanitarian organizations such as International and Indonesian Red Cross and Red Crescent Societies (OCHA Indonesia, 2011). Aside from actively involved in the development of the disaster management bill turned into Law No.24/2007 of Disaster Management, establishing and supporting various national and local disaster management activities; United Nations Development Program also supported the development of CCA. It supported the GoI in preparing the National Communication to UNFCCC (UNDP Indonesia, 2007a,b; 2008a,b). Another synergy is showcased by the UNDP's project on "Safer Communities through DRR" (SC-DRR) to improve institutional capacity for planning for natural hazards, including climate-related hazards. It gave impact to the integration trough training and capacity development programs for DRR and CCA nationally as well locally (UNDP Indonesia, 2012).

In addition, international funding agency such as the World Bank plays important role on supporting DRR and CCA in Indonesia. The World Bank, with other donor agencies has implemented Global Facility for Disaster Reduction and Recovery (GFDRR). It supports the formulation of the National Action Plan for DRR 2010-2012 as well as the capacity building of national and local disaster management agencies. It is also specifically focusing on the integration of DRR and CCA in technical assistance and pilot initiatives for disaster and climate proofing building codes and standards (GFDRR, 2011).

Moreover, coordination platforms such as the Convergence Group for DRR and Consortium for Disaster Education (CDE), and National Platform for DRR have started to consider CCA within their DRR programs (Djalante and Thomalla, 2012). Several community-based society organizations (CBSOs) and NGOs have been actively involved in DRR and the establishment of National Platform for DRR in 2009 as well as strengthened and acknowledgement the importance of their roles in DRR as well in CCA (Planas PRB, 2009). It is worth to mention as well that humanitarian organization such as Indonesian Red Cross *(Palang Merah Indonesia/PMI)* expanding its activities to

include risk reduction. Based on the study conducted by Djalante and Thomalla (2012), PMI is conducting two leading programs of community-based first aid and integrated CBDRR to climate change in West and East Jakarta to improve community adaptive capacity to climate change and disasters through vulnerability and capacity assessments. Lastly, organization of disaster management society *(Masyarakat Penanggulangan Bencana Indonesia/MPBI)*, are conducting trainings for local governments in developing their disaster management plans as well as organizing online forums and annual meetings for practitioners in knowledge sharing and networking, and the development of more effective frameworks for CBDRR and CCA (Djalante and Thomalla, 2012).

Table 3.13 shows the summary of key institutions for DRR and CAA at various levels and the opportunity of the entry point for DRR and CCA synergy.

Tabl3 3.13: Key institutions for DRR and CCA in Indonesia at various levels

Level	DRR	CCA	Integration of DRR and CCA
Global	▪ UNISDR ▪ GFDRR ▪ Global Platform for DRR	▪ UNFCCC ▪ IPCC	▪ Bali Action Plan on DRR and CCA ▪ Nairobi Work Program ▪ Cancun Agreements (both for DRR as well as CCA) ▪ SREX Report ▪ International organizations and International NGOs initiating integrated DRR and CCA projects
Regional	▪ Asia DRR ▪ ADRC ▪ ASEAN DRR	▪ Asian Adaptation Platform	▪ 4th Asian Ministerial Conference on DRR through CCA ▪ 5th Asian Ministerial Conference on DRR through Integrating Local Level Disaster Risk Reduction and CCA into National Development Planning ▪ Incheon REMAP ▪ International organizations and International NGOs initiating integrated DRR and CCA projects
National	▪ BAPPENAS ▪ BNPB ▪ National Platform for DRR (PLANAS DRR) ▪ Convergence Group of DRR ▪ Consortium for Disaster Education (CDE) ▪ DM Society Organization	▪ BAPPENAS ▪ DNPI ▪ Ministry of Environment	▪ Funding agencies ▪ UN organizations ▪ International organizations and International NGOs initiating integrated DRR and CCA projects
Local	▪ BAPPEDA ▪ BPBD ▪ NGOs ▪ CBSOs	▪ BAPPEDA ▪ Environmental Department ▪ NGOs ▪ CBSOs	▪ International organizations and International NGOs initiating integrated DRR and CCA projects ▪ Community-Based Risk Management (include Climate Change issues)

3.4.3 Gap between DRR and CCA

Scholars such as Adger (2003) and Brooks et al. (2005) suggested that the synergies between DRR and CCA are probable at the local level. Local government and communities are the ones who felt the impacts of disasters and climate change and require to response with or without support from outside (Bulkeley and Betsill 2003).

Despite the acknowledgement of DRR and CCA activities in Indonesia, however, the duplication and progress of DRR and CCA at the national level has not been transferred to the local scale. The institutional structure at the national level at the moment is not allowing the gap between the two fields (DRR and CCA) narrowing. Nationally, DRR is managed by the National Disaster Management Agency, while the National Council on Climate Change and the Ministry of Environment coordinates CCA. There has been recognition of the integration of DRR and CCA by these agencies; however, no formal collaboration is identified momentarily. National Disaster Management Agency is not a formal member of the National Council on Climate Change Adaptation Group and the National Council on Climate Change is not part of National Platform for DRR (DNPI, 2010).

Thus, cooperation between National Disaster Management Agency, National Council on Climate Change, and Ministry of Environment needs to be strengthened. To add to the institutional issue, the National Disaster Management Agency has the mandate for coordination to its sub-national agencies (Local Disaster Management Agencies), while the National Council on Climate Change has currently no clear arrangement for coordinating responses to climate change between national and sub-national (local) government levels.

In overall, policy and frameworks, as well as agencies, institutions, and institutionalization of DRR and CCA offer opportunities in entry points of synergies as well as gap. But, it is important that Indonesia is advancing these opportunities to accelerate the process of DRR and CCA integration. The success story of the contribution and efforts of UN organizations, international and national NGOs, and international agencies in DRR and CCA at the country level should allowing the space for downscaling to the local level in an attempt to build the nation's resilience to climate-related disasters comprehensively.

3.5. Disaster Risk Reduction at Local Context

At the local context, Community-Based Society Organizations (CBSOs) play significant role in DRR in Indonesia. Previously in Chapter 2, the CBSOs are described as CBDRR (Community-Based Disaster Risk Reduction) and scholars such as Shaw (2012), Victoria (2009), Izumi (2012), and Izumi and Shaw (2012) have raised the important role of CBSOs in DRR. The CBSOs and its role in DRR in Indonesia are obtaining more recognition since the 2004 Aceh Earthquake and Tsunami. Since year 2004, the *MPBI* (*Masyarakat Penanggulangan Bencana Indonesia*/Indonesian Association for Disaster Management) introduced the concept of Community-Based Disaster Risk Management (CBDRM) and is providing platform for relevant stakeholders from government to NGOs to discuss and share the process, framework and tools in implementing CBDRM, and networking regularly (MPBI, 2013).

A top-down approach in viewing disaster management tends to overlook local resources that may have the potential to build a disaster prevention or recovery program. After evaluating several possibilities, experts in the field concluded that a new risk management program must have more opportunities to involve local people. In creating

bigger roles for the people, the new approach shall be community-based and will focus on ways to encourage and invite more active participation from the members of the community to propose ideas in the planning, implementation, and evaluation of the program (ADPC, UNESCAP, and DIPECHO, 2008).

Community-Based Disaster Risk Management consists of steps of actions encompassing prevention of risks, emergency preparedness, emergency procedures, and recovery after a disaster. The term "community-based," means that the community jointly deals with disaster management. Although the role of the community varies, it is agreed that under this approach, communities are the main actors that develop and implement important policies in relation to disaster management. This argument bears implication on the role of CBDRM practitioners as the "outsider," although they may come from and live in the community. Their contribution in assisting community members in dealing with disaster management is defined by limited spatial dimension and time availability (ADPC, UNESCAP, and DIPECHO, 2008).

CBDRM is an acknowledgment of the community's capacity to determine the type and approach of disaster management that is most suitable to them. This has been discussed in Chapter 2. It recognizes the basic rights of individuals and communities to self-determination. Following this line of thinking, to the extent required by laws and regulations, the communities have the right and the capacity to determine what and how disaster can be managed in their respective areas.

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3.5.1 CBDRM Framework in Indonesia

In the second CBDRM Symposium held in April 12–13, 2006, a general guidance on the standard principles of and a comprehensive framework on CBDRM were laid out. In general, CBDRM is characterized by the following elements[1]: (1) the community as the center of attention, actor and benefit user; (2) based on risk reduction; (3) correlation to development process; (4) multi-sector & multidiscipline approach; and, (5) evolving framework. The characteristics of CBDRM are especially reflected in the statement, "systematic disaster management with and by the community." To deal with disaster in the broadest sense is what disaster management means while the word "systematic" implies that CBDRM is an organized and planned process that complies with relatively standardized procedures. With and by communities, meanwhile, pertains to the spirit of CBDRM that lies at the word "community." In essence, practitioners must place the communities at the heart of the overall process of CBDRM.

CBDRM in Indonesia has evolved since the Disaster Management Law No. 24/2007 is enacted (see Chapter 3). CBDRM involves multi-sectoral and multi-level participation. Since the 2004 Aceh Tsunami, various community-level organizations have volunteered to help in the government's emergency relief and early recovery efforts. Their participation not only complemented the government's efforts, but they can also be considered as agents of development who can help in continuing efforts to raise public awareness (ADPC, UNESCAP, and DIPECHO, 2013). Figure 5.1 shows the framework of CBDRM, compiled by ADPC, UNESCAP, and DIPECHO (2008) from 1st, 2nd, and 3rd CBDRM symposium in Indonesia. The CBDRM framework illustrates how CBDRM can be implemented at the provincial until the ward level, as the lowest administrative unit.

At the provincial level, the Local Disaster Management Agency (BPBD) is the second in command after the National Disaster Management Agency (BNBP), followed by the BPBD at the city level (municipality) and the subsequent levels such as at sub-district and ward. The interventions of CBDRM are possibly best at wards and neighborhoods.

[1] Based on the minutes of the 2nd Symposium on CBDRM held in April 12–13, 2006 and Community-Based Disaster Management Framework by Puji Pujiono, et al., 2006 in ADPC, UNESCAP, and DIPECHO, 2008

Relevant community organizations such as women groups, youth groups, and other groups are providing community services, which serve as a platform in implementing and integrating CBDRM in communities. Exactly these groups will be the focus of the study and act as risk communicators in enhancing the community resilience to climate-related disasters. This will be illustrated extensively in the following chapter. The dotted red line in Figure 3.16 is the focus of this study.

3.5.2 Challenges and Experiences of the Role of Institution in CBDRM

Numerous institutions and government department are already attempting to integrate CBDRM in their policies. Although their implementation policies have yet to comply with CBDRM framework in Indonesia, these initiatives are worth to note. For example, *Pusat Studi Manajemen Bencana* (Center of Disaster Management Study/PSMB)-UPN, Flores Institute for Resources Development (FIRD), and OXFAM have empirical experiences in developing the capacity of district governments, communities, and civil society groups to achieve the resilience in *East Nusa Tenggara (NTT), Central Java and Yogyakarta*. The multi-level stakeholders' partnership is meant to address the vulnerabilities due to the increasing intensity and frequency of natural disasters throughout the ongoing decentralization. Moreover, the MPBI's experiences in supporting the local action plans in several areas, such as *Serang, West Java, Yogyakarta, Ende and Alor-NTT*, and Semarang faced some challenges in integrating CBDRM into planning and budgeting.

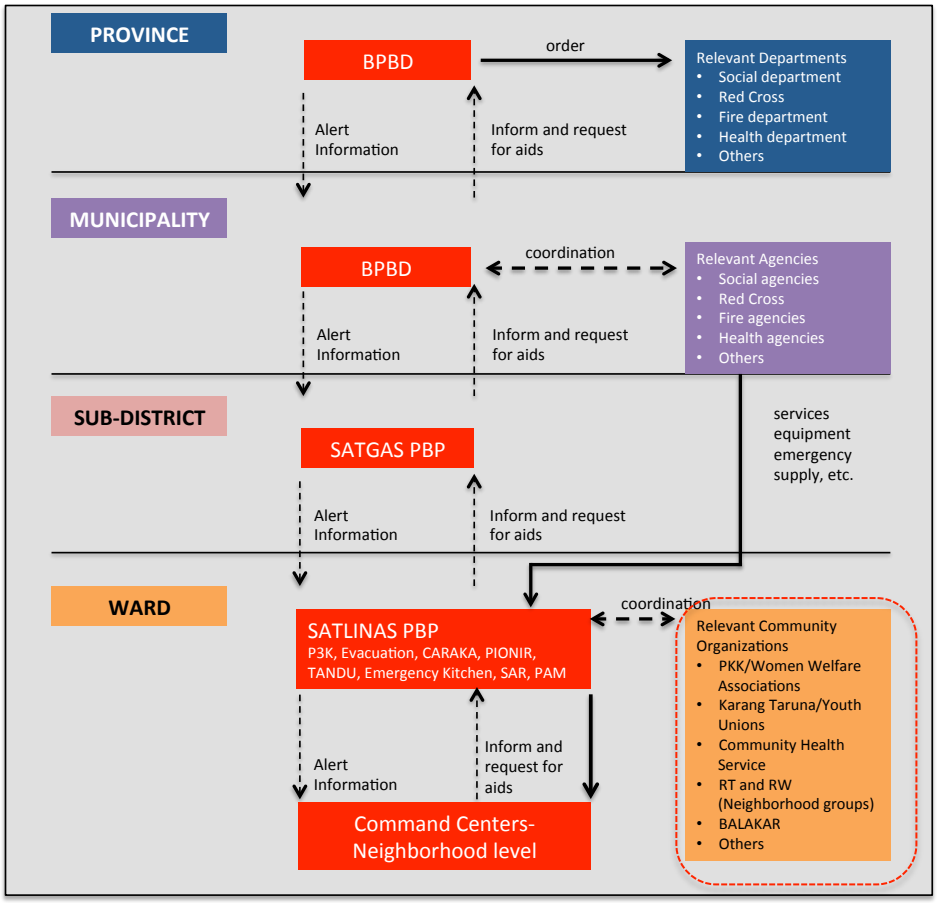


Figure 3.16: The framework of CBDRM in Indonesia at the local level (modified) (Source: ADPC, UNESCAP, DIPECHO, 2008)

Those challenges are as follow: (1) lack of information on "community-based disaster management" within the government, (2) the bureaucracy is seen as the government's business alone and does not involve the community, (3) ongoing processes in paradigm shift, as stated in DM Law require adjustment in the attitude of decision-makers, strategies and policies, (4) lack of community understanding on the gap and on policies containing CBDRM.

However, there are also strong indications that the CBDRM process is taken place in the community through government departments. The report of ADPC, UNESCAP, and DIPECHO (2008), stated that some departments are working with the community and integrating CBDRM components in their programs. These departments are as follow: Home Affairs Department, Social Department, and the Energy and Mineral Resources Department. In addition to above departments, there are also several areas that have already integrated CBDRM into their policies. Even though they do not explicitly labeled it as CBDRM, their planned activities are community-based disaster risk reduction activities. Furthermore, many areas are already in the process of formulating local action plans and local regulations *(PERDA)* that include CBDRM programs. Their efforts and experience in CBDRM are described in Table 3.14.

Table 3.14: The experiences of governmental institution in CBDRM

Government Institution	Experience
Home Affairs Department	HANSIP (*Pertahanan Sipil*/Civil Protection) at ward level provides community security and discipline services. This activity is often referred to as CBDRM of Home Affairs Department. It is expected that in the future, the budgeting, planning, and policy making will be integrated in CBDRM.
Social Department	TAGANA (*Taruna Siaga Bencana*/Youth Disaster Preparedness Unit) emphasizes youth involvement in community disaster risk component organization in nationwide network.
Energy and Mineral Resources Department	*Wajib Latih* (Compulsory Exercise) is a compulsory exercise/simulation for Merapi preparedness in Jogjakarta, Central Java. This program is conducted in conjunction with *Forum Merapi*, a stakeholder network in the Mount Merapi area.
Local Government of Jakarta PEMDA DKI Jakarta	DKI Jakarta local government develops flood management strengthening at ward level in the hope that the ward will be able to manage flood and save lives.
Local Government of Padang PEMDA Padang	Padang Local Government is accommodative and involving community participation in their DM (Disaster Management) policy, for example SOP (Standard Operation Procedure) and DM Local Regulation.
Local Government of Yogyakarta PEMDA Yogyakarta	In Yogjakarta, the municipal's Local Action Plan included community activity. However, it is not specifically called community-based disaster management.

Source: ADPC, UNESCAP, and DIPECHO (2008)

To summarize, some local governments and institutions or organizations in Indonesia have integrated to a certain extent the CBDRM in their programs. By the enacted DM Law, it is a prerequisite to incorporate risk reduction issues in community activities (CBDRR) that may increase community resilience. Risk reduction can be achieved by transferring risk information through local risk communication approaches. Therefore, local actors such as CBSOs are essential in enhancing community resilience.

Drawing from above arguments, local actors such as CBSOs have the potentials as disaster risk reduction drivers and local risk communicators in increasing community resilience. This will be discussed more in the following chapter (Chapter 5).

3.6 Implications of National Context DRR Approach to Local DRR Implementation

The key message for this chapter is that the increasing climate-related disasters and risks in Indonesia urge the integration of disaster risk reduction (DRR) and climate change adaptation (CCA). Both national's institutional frameworks of DRR and CCA were discussed and the identification of synergy between these two fields provides opportunities of the integration process at local context; institutionalizing local risk reduction initiatives. Therefore, the importance of examining further the governance and implementation of climate-related disaster risk reduction at the local level is imperative for Indonesia in enhancing community resilience. As the consequence, local government and other stakeholders, such as community organizations have an essential role in DRR since they are usually the first responders following disasters; they are likely to have better knowledge of their localities. Therefore the existence networks and the participation of local stakeholders determines the resilience of local communities (King, 2008), which needs to be assessed and communicated.

The following chapters will exemplify the role of local and city stakeholders in the assessment and communication of climate-related disaster risks. The role of governance is crucial in reducing the vulnerability and risks and increasing the resilience. Developing a disaster resilient communities is not only about anticipating, responding, and managing the risks, but also integrating multiple stakeholders at multiple scales to mitigate and respond to disasters (Kapucu et al., 2013). The issue of scales is essential in building the resilience since the existence of different organizations at different scales allows for the corresponding of organizational and environmental scales (Folke et al., 2005). Since Indonesia is set with serial of laws related to disaster management and institutions, it is the high time for the country to narrowing the gap between theory and implementation of DRR and CCA at the local level.

3.7 Key Findings of Chapter 3

Some key findings of this chapter can be extracted and linked to current study. These are as follow:

Box 3.1: Key findings of Chapter 3 and the link to current study

Highlights
▪ Trends of climate-related disaster events in Indonesia, such as urban floods, are increasing with high number of affected people and total damage ▪ High Frequency and Low Consequence flood events in medium cities of Indonesia, in the long run, pose serious threats as urban flooding with catastrophic impact ▪ Enactment of new set of institutional framework of disaster risk reduction and climate change adaptation in Indonesia ▪ The importance of institutionalizing local initiatives for DRR as the implication of institutional arrangement at the national level, stipulated in DM Law No.24/2007. ▪ The issue of scales is essential in the enhancement of resilience, since the existence of different organizations in Indonesia at different scales allows for the corresponding of organizational and environmental scales of DRR.

▪ At the local scale, the concept of putting communities for DRR at the forefront highlights the Community-Based Disaster Management, driven by CBSOs, such as women's groups, youth unions, etc.
Link to current study
▪ Implications of institutional arrangement/framework at national context on disaster management for the implementation at the local level ▪ Local actors, such as CBSOs are taking more role on local implementation of risk reduction actions ▪ Synergy of disaster risk reduction and climate change adaptation on institutional framework is in place for localizing risk reduction actions in communities towards climate-related disaster

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Chapter 4
Resilience Assessment of Climate-related Disasters in Bandung

"I alone cannot change the world, but I can cast a stone across the waters to create many ripples."
~Mother Theresa

Chapter 4
Resilience Assessment of Climate-related Disasters in Bandung

This chapter provides the approach of the assessment of climate-related disaster resilience at the local level. A case study of Bandung City is selected to present the exemplary process of identifying the strength, capacity and weakness and pointing out the necessary sectors that need to be enhanced as the overarching goal of the larger disaster risk reduction. The local and micro-level resilience assessment is required to plan and implement contextualized risk reduction actions; hence at the later stage, resilience activities that will strengthen the city will be taken through risk communication approaches.

4.1 Introduction to Disaster Risk Reduction in Bandung City

Bandung, the capital city of West Java Province, despite its position in the seismic source zones system of the region, has never experienced damaging earthquake in its past. However, the city has an augmented risk toward earthquake disaster, due to the following factors: (1) major faults system of West Java (*Sunda Strait Fault* in the west, *Indian Ocean Subduction Fault* in the south, *Baribis Fault* and *Cimandiri Fault* in the middle, *Bumiayu Fault* in the east, and some other smaller faults), (2) soil condition due its location in the prehistoric lakebed of Bandung Basin, (3) population density and growth, (4) strategic context of the city, and (5) lack of preparedness (ADPC, 2000a; 2000b). To improve the city awareness toward earthquake risk, an initiative in disaster mitigation program has been implemented in Bandung City as a demonstration project under the Asian Urban Disaster Mitigation Program coordinated by the Asian Disaster Preparedness Center (ADPC) during 1997 to 2000. The project is called the Indonesian Urban Disaster Mitigation Project (IUDMP), which is basically aimed at establishing sustainable public and private sector mechanism for disaster mitigation in Indonesian cities, taking Bandung as its pilot study area. The Institute for Research from Institute of Technology Bandung (ITB) carried out the project management. The project implementation has involved many participants from various organizations under the local government as well as the national level institutions. The Earthquake Engineering Research Group (EERG) and the Center carried it out collaboratively for Urban and Regional Planning Study (CURDS) within the Institute for Research of Institute of Technology Bandung (LP-ITB), and with the participation of various relevant agencies and individuals' advocates to disaster mitigation in the region.

Simultaneously, Bandung was also part of the RADIUS (Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters) initiative. It was launched by the UN IDNDR (International Decade for Natural Disaster) secretariat to promote worldwide activities for the reduction of urban seismic risk in developing countries (UNISDR, n.d). Bandung was selected as one among three chosen cities from Asia out of 27 pre-selected cities for RADIUS case studies. According to UNISDR document (UNISDR, n.d), in Bandung there is a single coordinating office for emergency response, which becomes active during disasters, receiving reports and transmitting them to other agencies for emergency response. Disaster risk reduction and management is marginal in Bandung Development Plan and due to the assumption that the city has no record of damaging earthquakes; the general awareness of communities and decision makers of seismic risks is very low.

Although previous DRR efforts in Bandung are seismic-based, the RADIUS initiative at that time mentioned the annual flooding as the most frequent disaster in the city (UNISDR, n.d). These current frequent flooding and inundations affect people and cause economic damages to Bandung and its citizen. This was observed as the current phenomenon that occurs in medium size cities in Indonesia, which have the potential as the growing cities; not only in Bandung but in other cities as well, such as Semarang (Marfai and King, 2008).

Because of these impacts, these provide the study to dwell more on the flood issues. The rationale was also accelerated by the previous key findings that trends of climate-related disasters are increased in Indonesian urban areas. In regard to these, previous chapter has described the climate-related disasters and DRR approaches in Indonesia, as well as the illustration of the concept of resilience in Chapter 2. The next question is how do we downscale the resilience assessment at the local level? How do we measure the level of resilience of a city to climate-related disaster? How do we localize the risk reduction and resilience initiatives? These key questions are important related to the status of resilience level and capacity of a city, and to what sector is the city at risk? Eventually, how does the city convey the results of resilience assessment and risk information to public; hence appropriate risk reduction actions can be implemented? What kinds of risk communication approaches are to be identified in the city of Bandung?

Therefore, this chapter aims to introduce the tool on how to assess the climate-related disaster resilience at the local level. The tool named CDRI (Climate Disaster Resilience Index) methodology. Its origin was developed in 2007 by various researchers in International Environment and Disaster Management (IEDM) Laboratory, Graduate School of Global Environmental Study of Kyoto University, Japan. Recently in 2011, the CDRI was refined and with the improved CDRI (Joerin and Shaw, 2011), IEDM has assessed 33 cities in Asian region, 12 Indian cities, 10 zones of Chennai City, and 9 districts in Delhi for its climate disaster resilience. The CDRI aims to measure the current capacity of different characteristics of an urban community, including the provision of basic urban services (Joerin, 2012). CDRI tool is also developed for the local level to better incorporate the micro level diversity (Prashar, 2012). Moreover, CDRI is an integral component of the Climate Disaster Resilience Initiative, a planning tool that aims at sustainable development through increasing disaster resilience of cities (Joerin and Shaw, 2011; Shaw and Sharma, 2011). This methodology and its application in Bandung City will be discussed in following sections.

4.2 The Context of Bandung City

Below sections illustrates the overall context of Bandung City from the point of view its geographical location, climate and its administrative structure. The later part describes various development sectors of Bandung, which may at risk by climate-related disasters.

4.2.1 Location and Demography

Bandung City is the capital of West Java province in Indonesia, and the country's third largest city, and second largest metropolitan area with a total population of 2,393,633

people and an area size of 167.67 km^2 (Bandung Statistical Agency, 2011). After the Indonesian independence in 1945, the city experienced rapid development and urbanization, which has transformed Bandung from an idyllic town into a densely populated urban area with an average population density of 14,275.9 people/km^2. Bandung City is located at 768m above sea level and thus, due to its elevation the climate is cooler than in most Indonesian cities. It is classified as humid with an average yearly temperature of 23.1 °C (BMKG Kota Bandung, 2010 in Bappeda Kota Bandung, 2010). The average annual rainfall ranges from 1,000 millimeters in the central and southeast regions to 3,500 millimeters in the north of the city. The wet season is from November to April. The city lies in a river basin and is surrounded by up to 2,400 m volcanic mountains.

The 400 km^2 flat of central Bandung plain is situated in the middle of 2,340.88 km^2 wide of the Bandung Basin. The basin comprises Bandung, the *Cimahi* city, part of Bandung Regency, part of West Bandung Regency, and part of *Sumedang* Regency. The basin's main river is the *Citarum*; one of its branches, the *Cikapundung*, divides Bandung from north to south before it merges with *Citarum* again in *Dayeuhkolot*. The Bandung Basin is an important source of water for drinking water, irrigation and fisheries, and its 6,147 million m^3 of groundwater is a major reservoir for the city. Based on Bandung City Region Regulation No.6/2008, the city administration is divided into 30 sub-districts *(Kecamatan)* and 151 wards *(Kelurahan).* A mayor *(Walikota)* leads the city administration. Since 2008, the city residents directly voted for a mayor, while previously mayors were nominated and selected by the city council members or known as the Regional People's Representative Council *(DPRD).* Thus, Bandung City in terms of administrative unit is divided into 30 sub-districts *(kecamatan)* and 151 wards *(kelurahan)*, headed by the sub-district and ward leaders. Figure 4.1 shows the location of Bandung and its 30 sub-districts. The details of the sub-districts are shown in Table 4.1 and the list of the wards of each sub-district is in Appendix 1.

Bandung has increasingly experienced regular floods, especially local inundations since early 2000. The local government took up necessary countermeasures for flood risk reduction, yet the measures are more structural mitigation and do not directly address the communities' specific needs. What the community needs is a system of communication that enhances their coping capacity for a more resilient community. Bandung's existing level of community resilience has to be measured and communicated widely, and this can be done through resilience assessment and risk communication at the community level. Urban flood risk information at the local scale is one of the central issues. This information is necessary in order to assess the impacts of urban floods on city systems, and to develop suitable adaptation as well as mitigation strategies at the local level. (Mulyasari et al. 2011; Mulyasari and Shaw, 2013). In Bandung, 26 out of 30 sub-districts are usually inundated during high precipitation, with 68 locations identified by the Bandung Construction and Water Service (*Dinas Bina Marga dan Pengairan Kota Bandung in Bappeda Kota Bandung* 2010).

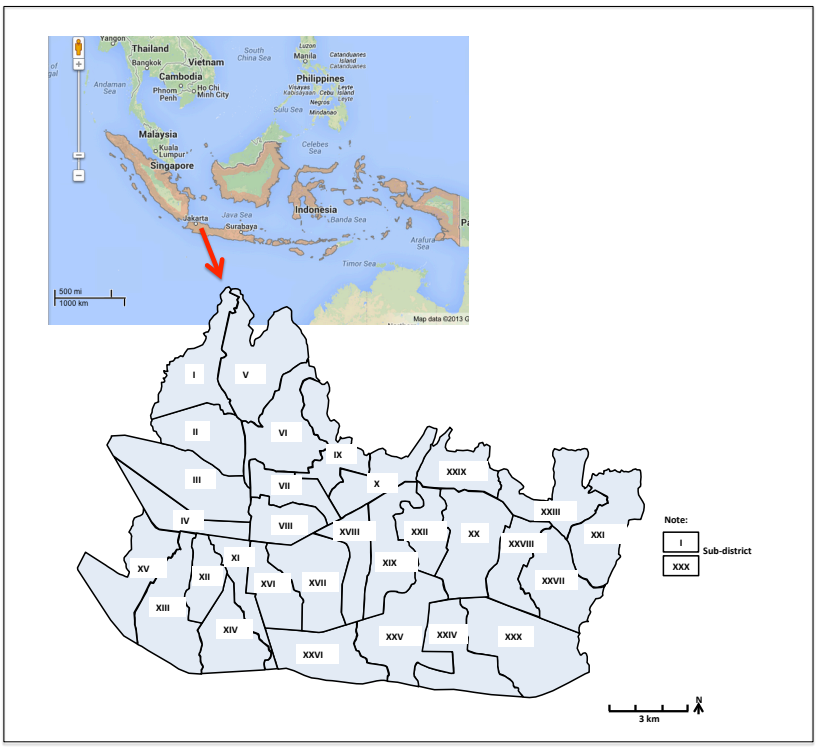


Figure 4.1: The location of Bandung City and its 30 sub-districts
(Source inset Map: Google Maps, 2013, Source Bandung Map: Bappeda Kota Bandung, 2010, modified)

Table 4.1: Details of 30 sub-districts in Bandung

No.	Sub-district	No. of wards	Area (km²)	Total Population	Population Density
I.	Sukasari	4	6,27	79.211	12.633
II	Sukajadi	5	4,30	104.805	24.373
III.	Cicendo	6	6,86	96.491	14.066
IV.	Andir	6	3,71	94.361	25.434
V.	Cidadap	3	6,11	56.325	9.218
VI.	Coblong	6	7,35	127.588	17.359
VII.	Bandung Wetan	3	3,39	29.807	8.793
VIII.	Sumur Bandung	4	3,40	34.446	10.131
IX.	Cibeunying Kaler	4	4,50	68.087	15.290
X.	Cibeunying Kidul	6	5,25	104.575	19.919
XI.	Astanaanyar	6	2,89	66.658	24.065
XII.	Bojongloa Kaler	5	3,03	117.218	38.686
XIII.	Babakan Ciparay	6	7,45	143.203	19.222
XIV.	Bojongloa Kidul	6	6,26	83.600	13.355
XV.	Bandung Kulon	8	6,46	138.644	21.462
XVI.	Regol	7	4,30	79.316	18.446
XVII.	Lengkong	7	5,90	69.307	11.747
XVIII.	Batununggal	8	5,03	116.935	23.248
XIX.	Kiaracondong	6	6,12	127.616	20.852
XX.	Arcamanik	4	5,87	65.607	11.177
XXI.	Cibiru	4	6,32	67.412	10.666
XXII.	Antapani	4	3,79	72.006	18.999
XXIII.	Ujung Berung	5	6,40	72.414	11.315
XXIV.	Rancasari	4	7,33	72.046	9.878
XXV.	Buahbatu	4	7,93	92.140	11.619
XXVI.	Bandung Kidul	4	6,06	57.398	9.472
XXVII.	Panyileukan	4	5,10	37.691	7.390
XXVIII.	Cinambo	4	3,68	23.762	6.457
XXIX.	Mandalajati	4	6,67	60.825	9.119
XXX.	Gedebage	4	9,58	34.299	3.580
	Total Sub-districts: 30	**Total wards: 151**			

Source: Bandung Statistical Agency, 2011

Bandung with its 30 sub- districts and 151 wards is located in various topographies such as mountains, rivers, and plains. Bandung is described as a promising city with opportunities in business and has extensive administrative, commercial, and industrial activities as well as being the center for higher education (Bandung City Government,

2011). These have contributed largely to its urbanization and results to a rapid growth in the city's population. Currently, the drainage system, which was initially built in 1810 (during Dutch colonialism), cannot accommodate a larger population and has led to the vulnerability of Bandung to disastrous events such as flooding. These underline the need for a resilience assessment at the local level and disaster risk communication framework. It raises the following questions, such as: Who are at risk? What are the threats? How to assess the resilience? How to communicate the risk? Who are the stakeholders involved? What is the link between the senders and the receivers? By which media do senders and receivers interact? Therefore, based on the facts above, Bandung City is selected as the research study to answer above key questions on developing a resilient community through risk communication. Figure 4.2 shows the spatial planning map of Bandung for the period of 2011-2030.

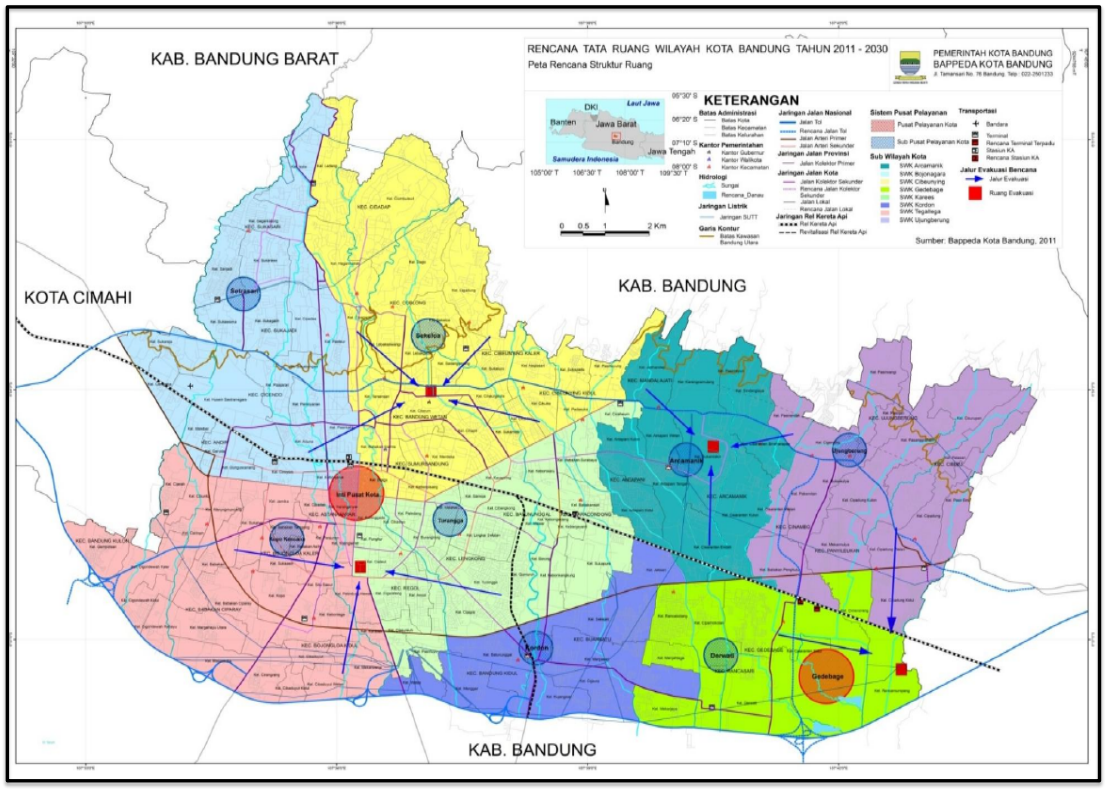


Figure 4.2: Map of Spatial Planning Bandung City (2011-2030) (Source: Bappeda Kota Bandung, 2011)

4.2.2 Development Sectors of Bandung City

According to Mid-Term Development Planning of Bandung City (2009-2030), Local Regulation No. 9 Year 2009 (Bappeda Kota Bandung, 2010), Bandung City has six missions. These are: (1) Developing healthy, intelligent, professional, and competitive human resources, (2) Developing city's economy competitive in the job creation and supporting public services and increasing the role of private sector in the economic development of the city, (3) Improving the social welfare and develop a culture city of orderly, safe, creative, in performing its services, (4) Bandung city planning towards an integrated environmentally sound metropolitan, (5) Improving the performance of the city government that is effective, efficient, accountable and transparent in order to

improve the capacity of metropolitan services, and (6) Improving financial management capacity and financing urban development of accountable and transparent in supporting clean and respectable of government system. Therefore, Bandung City has seven priority programs of development. These programs are as follow: (1) Education, (2) Health, (3) Welfare, (4) Environment, (5) Culture and Art, (6) Sport, and (7) Religion.

However, the combination of densely populated areas in Bandung and increasing risks of climate-related hazards makes the city particularly vulnerable to disasters. Therefore, the study, shown in this thesis, aims to assess the resilience of Bandung and its currently existing 30 sub-districts to climate-related disaster (e.g. floods, storms, droughts/water scarcity) and how these will be communicated; hence proper risk reduction action can be properly taken.

Following are the sectors of Bandung that will likely be affected by climate-related disasters.

1. Physical

Lifeline service

In terms of basic lifeline services, such as the provision of electricity and water, are provided sufficiently for communities in Bandung. The majority of the usage of these services is households, aside from industry and business sectors (Table 4.2).

Table 4.2: Electricity and water customer conditions of Bandung

Electricity				
Kinds of Tariff	**Total customer**	**Power Connection (KVA)**	**Sold Energy (MW/h)**	**Revenue (Billion Rp.)**
Social	7,177	55.292	80.946	51.417
Household	482,975	549.952	1.041.818	650.249
Business	31,002	353.935	581.083	459.305
Public service	1,932	45.153	69.538	51.471
Industry	2,675	405.467	1.315.691	824.496
Undefined	20,899	36.159	38.014	34.745
Water				
Customer Category		**Drinking water distribution**		
		Total sold (m^3)		**Value (in thousand Rp.)**
Household		24.125.577		89.523.237
Social service/Hospital		120.955		252.474
Religious/General facilities		1.178.698		1.409.600
Store, Company, Hotel		5.284.584		30.467.837
Government Office		2.666.634		12.047.436
Industry and Tourism site		131.574		897.967

Note: Rp. 11,335 ≈ 1 USD (exchange rate on November 4th, 2013)

Source: Bappeda Kota Bandung, 2011

For example, the source and clean water provision of Bandung are from the following sources (Bappeda Kota Bandung, 2010):

<u>*Surface water:*</u> Total discharge of 2,600lt/sec derived from *Cisangkuy* River (South Bandung) with discharge 1,800lt/sec, *Cikapundung* (North Bandung) with discharge

860 lt/sec and a few other small rivers. Of surface water is the largest source of raw water with a contribution of 80.3% of the total.
Groundwater: Using several wells drilled in the largely built area during the first phase of the Bandung Water Supply (BAWS) Project 1982 with 14.7% from the total number.
Wellspring: Springs that are used by Water State Company of Bandung (PDAM) located in the mountainous northern region, including in the area of Bandung regency administration with 5.0% of the total amount. Point of clean water sources in the city are from *Cisangkuy River, River Cikapundung, Cikapundung I* (IPA Expert), *Cikapundung II* (Swimming Dago Pakar), *Cikapundung III* (Siliwangi road), *Cibereum River*, *Cirateun River, Cipanjalu River*, wells drill, and water spring.

Solid waste management
In terms of solid waste management, the total amount of waste producing in the city, roughly are from residential waste (65.56%), market (18.77%), regional commercial (5.99%) industrial, office/school (2.81%), and roads, parks etc. (5.52%). Thus, the amount of waste the city is producing mounted up to 7500m^3/day, based on an estimation of 2 liters/person/day with a population of 2.34 million people. The amount of waste generation in the Temporary Disposal Site (TDS) for different districts are 157,505 m^3/day in West Bandung, 616,876 in South Bandung Area, 12,773 m^3/day in the East Bandung, and 146,777 m^3/day in North Bandung Region. The waste service coverage is divided in four regions, namely West Bandung (7 sub-districts), East Bandung (10 sub-districts), North Bandung (7 sub-districts) and South Bandung (6 sub-districts), thus there are 151 TDS available for 151 wards.

The service is based on the number of new "un-served" population that reached 1,350,000 people and based on the service coverage that has reached 60%. Moreover, the garbage is collected by garbage truck with average of 108 street 91-units/day, and for the transport capacity in TDS ranged from 6-30 m^3/day in each polling station. As for the capacity of 3R (Reduce, Reuse, Recycle) from the shredded organic waste is approximately 106 m^3/day. The waste transportation capacity by Cleaning Service Agency is about 4,158 m^3/day or about 200 trips/day. Vehicles (garbage trucks) are transported the collected waste a landfill area for further treatment. Figure 4.3 shows the vehicle that is used as common waste management in a sub-district in Bandung.



Figure 4.3: Solid waste (garbage) management in one of sub-districts in Bandung

Housing and land use

In terms of housing and land use, Bandung experiences increased population growth like other big cities in Indonesia. Currently, Bandung is burdened by high rate of urbanization and inter-local migration. This implies for the provision of sufficient services of facilities and infrastructure (Bappeda Kota Bandung, 2009). The report of Mid-term Investment Program of Bandung (2010-2014) mentioned that government could not accommodate the new inhabitants due to limited land use and therefore slums pockets are growing rapidly. Slums areas are built illegally by the newcomers and not according to adequate standards. Thus, housing and land use issues in Bandung are as follow: housing backlog, decreasing of housing environment quality, inability in providing adequate and healthy housing, and high building density.



Figure 4.4: High density of housing in Bandung: aerial picture of Bandung (left), high-end residency in a northern sub-district (middle), and slums pocket in Bandung (right)

The government of Bandung City responded to above issues by developing affordable flats, constructed in various dense populated sub-districts (Figure 4.5).



Figure 4.5: Affordable flats in Bandung: Sukasari Sub-district, 400 units (left), Cibeunying Kaler Sub-district, 150 units, (middle), and Lengkong Sub-district, 16 units (right) (Source: Bappeda Kota Bandung, 2010)

2. Social

Population

As an important activity center, around Bandung, hinterland areas such as *Bandung* and *West Bandung Regency*, west part of the district as well as *Sumedang* Regency and *Cimahi* City are growing rapidly and inhabited by large numbers of people. *Bandung* and

West Bandung Regency and *Cimahi City* in 2006 reached a population of 5 million citizens. With a role as an orientation center, the movement of people between the center and the hinterland is mixed, therefore the actual number people who move in Bandung is likely to exceed the number of people registered. Average population growth between the year 2002-2007 in Bandung is 1.43%. Under these conditions, it is predicted that by 2013, the population of the city of Bandung reached almost 2.6 million people. This population growth can be a heavy burden when simultaneously surrounding area also continued to experience population growth. The Government of Bandung City suggests if the cost of living and move in Bandung is increasingly competitive and expensive, the population growth could be decreased and reaches 2.4 million people. However, this number still considers that Bandung City is important, particularly for people who reside outside the city but doing activities in the city and commute everyday. Therefore, the condition of this shadowed load large population becomes a crucial issue for Bandung and is showed in grey color in Figure 4.6. The development and population growth trends of Bandung (2009-2013) and the demographic profile are shown in Figure 4.6 and Figure 4.7.

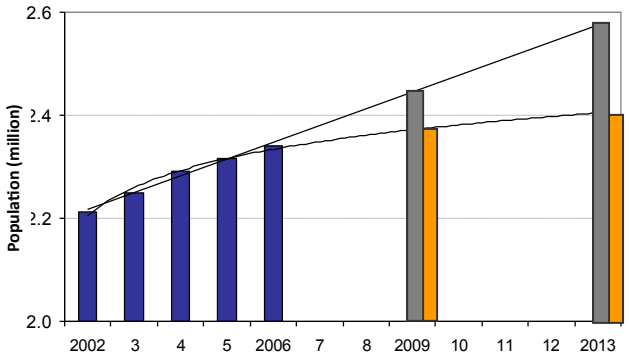


Figure 4.6: Population growth of Bandung (2009-2013) (Source: Bappeda Kota Bandung, 2009)

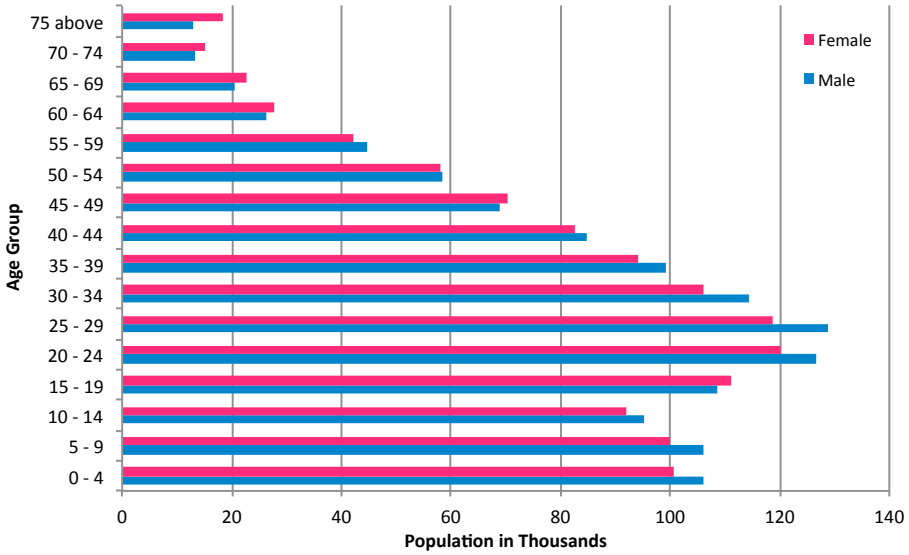


Figure 4.7: Demographic profile of Bandung (Source: Bandung Statistical Agency, 2011)

Education and Health

In terms of education and health, Bandung is developing rapidly. To date, in total there are 104 State and Private Universities (Bandung Statistical Agency, 2011), therefore it is not surprising that more young people are the new migrants in city. Furthermore, there are in total 2,298 health service providers (Bandung Statistical Agency, 2011). The highest amount of health service provider is the *Posyandu* (*Pos layanan kesehatan terpadu* /Integrated health service), spread in wards and neighborhoods of Bandung. The women organization, *Tim Penggerak PKK (TP PKK),* known as Women Welfare Associations (WWAs) is the pioneer, manager, and coordinator of this integrated health service in neighborhoods. Thus, better education and health service attract people to live in Bandung, makes the city overpopulated and susceptible to disasters. This has to be quickly responded by the government in restoring the balance of city.



Figure 4.8: Integrated health service of Women Welfare Associations (WWAs) of a neighborhood in Bandung (left) and the WWAs is measuring the weight of an infant as regular community health check-up (right)(Source: Rancasari Sub-district official site, 2013)

3. Economic

Bandung has an important role in the economy of West Java Province. For example, in year 2004-2007 the economic contribution of the city of Bandung in West Java Province reaches an average of 10%. Within the scope of Greater Bandung, the contribution of its economic activity is about 23% of to the economy of West Java. Bandung economic growth is also quite high, or above the average economic growth of West Java and even of country. In 2006, the economic growth rate reached 7.83% and in 2007, it reached 8.24%. The high growth rate indicates that Bandung is one of the important sources of economic growth in West Java and Indonesia (Bappeda Kota Bandung, 2009). In addition, the contribution of the economic activity of Bandung is higher (10.03%) than other cities in West Java. This indicates that Bandung is essential for the economic activity in West Java and nation-wide. As the growth of the pedestal in the center of trade and manufacturing activities increased, Bandung also becomes one of the destinations of labor migration influx. Another role of Bandung City is as one of the most important education center in Indonesia, and infused with the current economic life; its economic growth is very high.

Moreover, Bandung Economic Growth Rate from 2005 to 2007 has increased. This may indicate increased in the economic activity. The inflation rate in the city of Bandung is

relatively higher than other district/cities in West Java. In terms of an increase in the investment, however, it has not been followed by the significant employment rate. There is an increase in the number of unemployed from 175,337 to 175,664 people in 2006, but in 2007 it dropped to 174,067 people and is expected to decline again be 173,074 inhabitants. The fluctuation in the number of unemployed is caused by various factors, in particular to the end of 2008, there was a decline in fuel prices that changed two times, but at the same time the global financial crisis in the United States and the European Union had an impact on the economic performance in Indonesia generally and Bandung locally. In line with the fluctuating number of unemployment, this condition had an impact on the number of poor households. Poor households increased from 70,419 in 2005 to 84,287 and in 2006 are decreased to 83,500, and in 2007 it decreased again to 82,606 people. The orientation of the economic activity of Bandung in next few years tends to experience positive economic growth significantly (Bappeda Kota Bandung, 2009). Factory outlets, retails shopping of fashions, contribute highly to this growth. Domestic as well as international tourists that visit Bandung often, with the newly daily flight routes from/to neighboring countries (Singapore, Malaysia, Thailand) have brought high GDP rate to the city.



Figure 4.9: Varieties of factory outlets in Bandung contribute to city's economic growth

However, despite good economic prospects, Bandung's economy faces severe challenges, such as the impact of economic activities to the surrounding environment. Several types of economic activities threaten environmental quality and the quality of citizen's life through various types of pollutions. Thereupon risk assessment needs to be conducted to identify potentials and gaps of city; hence proper mitigation measures and risk reduction can be implemented.

4. Institutional

Institutionally, in terms of disaster management, Bandung does not have a local disaster management agency (BPBD). However, at the provincial level, West Java Province has established BPBD of West Java in 2008, one year after the 2007 Disaster Management Law was enacted, and includes Bandung under its coordination. However, the existence of *Lembang Fault* (earthquake prone), *Tangkuban Perahu Volcano* (volcanic eruption threat), and frequent floods and inundations, have urged the city government to set up its local disaster management agency.

The city is thus prone to earthquake and volcanic eruption, aside from flood and inundation. This has to be included in the city' agenda and priority, to be considered for the rapid establishment for the effectiveness in crisis management and better disaster preparedness of Bandung City.



Figure 4.10: Local Disaster Management Agency (BPBD) of West-Java Province. Visit to BPBD office (left and middle) and radio communication equipment of BPBD (right)

5. Natural

Bandung City and its Regency are categorized as one of flood prone areas in West Java Province by the Water Resource Center of West Java (BBWS Citarum 2009 in Natasaputra, 2010) (Figure 4.11). The numbers in the figure illustrate flood-impacted basins of the *Upper Citarum River*. Bandung City and its surrounding region is occupying Block-8. The city is located in a large river basin, which makes the city susceptible to floods when the rainy season coupled with intense rainfall precipitation occurs.

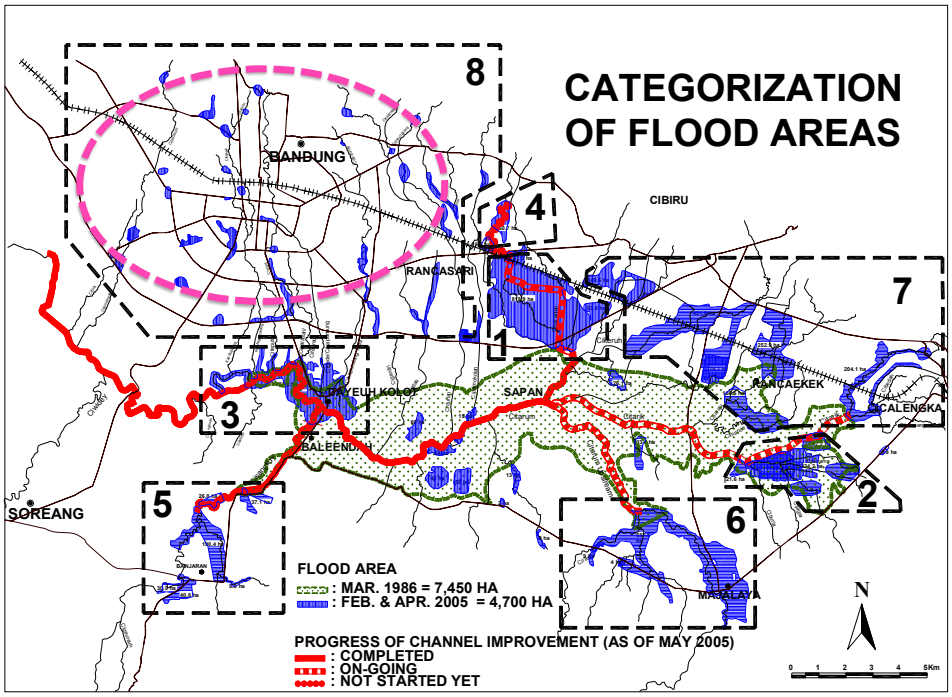


Figure 4.11: Bandung City and Regency (Block No. 8) categorized as one of flood prone areas in West-Java Province (Source: BBWS Citarum 2009 in Natasaputra, 2010)

Citarum River Basin is one of the strategic Basins in West Java. *Citarum River* flows from the mountainous area in Bandung, through the three cascade dams: *Saguling, Cirata, and Jatiluhur*, before finally flows to Java Sea. Surface water from Upper *Citarum River Basin* is a plateau area surrounded by mountain range, which forms a basin that flows into *Saguling Dam*.

This geographical condition causes the rainfall runoff on the mountain range tend to flow into the basin area, resulting in high discharge surface flow during wet season. The high discharge unfortunately is not accommodated with adequate channel capacity, which in this case is the *Citarum River* of *Upstream Citarum River Basin*. Consequently, during the rainy season, flood disaster often occurs around the *Citarum River*, which flows through Bandung Regency. Heavy flood disaster in particular occurred in *Dayeuh Kolot Subdistrict, which* brought great damages, due to the area is located adjacent to the Bandung City, the capital city where many important activities occur. As the main catchment area of *Saguling Dam*, this basin also holds an important role for water supply in the downstream area. Lack of water supply from *Upper Citarum River Basin* during dry season might disturb water supply for irrigation area in *Karawang and Indramayu* as the satellite cities nearby Bandung. Figure 4.12 presents the trends of rainfall and discharge in *Upper Citarum River Basin*. During the last two decades, the average of monthly rainfall during the wet season is increased, which shows that the change of climate is intervened.

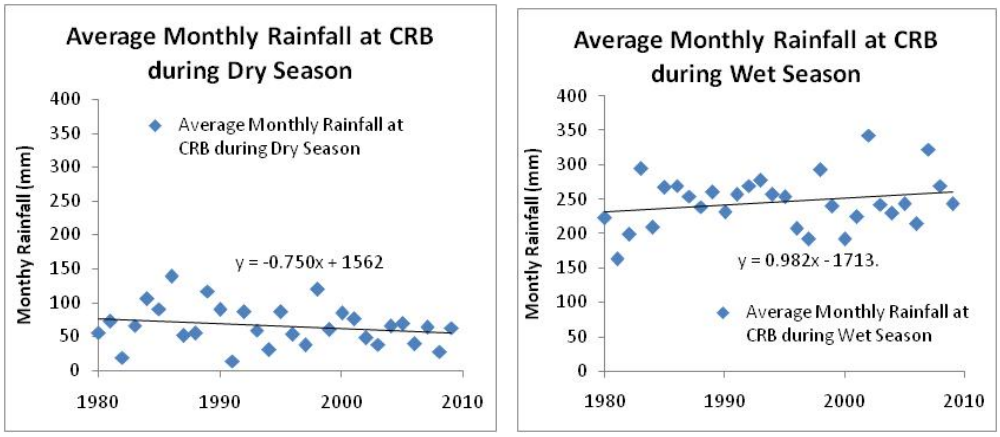


Figure 4.12: Trends of rainfall and discharge in Upper Citarum River Basin, West Java-Indonesia during dry and wet season (Source: Kusuma et al., nd)

The study by Kusuma et al. (nd), revealed that Climate Change Mitigation, which in Indonesia is mainly associated with flood in wet season and drought in dry season has to deals with common problems, for example: 1) lack of hydrological data; 2) high discrepancy in hydrology/drainage computation result using the common computation method; 3) unreliable design of drainage facilities, etc., and his study emphasizes the importance of solving these issues for Climate Change Mitigation in the future, especially in *Citarum River Basin*, where Bandung City is located.

In year 2010, *Dinas Bina Marga dan Pengairan* (Bandung Public and Water Works Agency in Bappeda Kota Bandung, 200) noted 68 frequent inundation spots that lasted up to six hours. The report mentioned that aside from large amount of heavy rainfall for consecutive days, Bandung has serious drainage problems. Inundation occurred on some road networks in Bandung during the rainy season (68 points inundation/flood event). The lack of drainage infrastructure and unavailability of micro drainage to withhold its capacity, contribute to this problem. This is mainly due to the narrowing of the drainage channels due to the development of the city.

The drainage in the southeast, especially in *Gedebage* lower region, located near the river is not integrated with the drainage system in other regions. Thus, defective and ineffective drainage conditions, caused by overburden buildings, changes in the land use, and overpopulated made the channels capacities insufficient. To summarize, the inundations and flooding are caused by silting of rivers and narrowing of the waste stream resulting the settlements were flooded and disrupted the activities of people. Additionally, improper waste treatment and people behavior, and sedimentation, are putting stress and narrowing the outlet channels; leading to the flooding of roads and neighborhoods in city.

Drawing from the above conditions of Bandung, and in responding to frequent flood events, it is necessary that the city firstly, has to be assessed its resilience to climate-related disaster and secondly, how the city communicate the risks and results of resilience assessment to communities. The following sections illustrate on how to assess the disaster resilience of a city to climate related disasters and the results of this assessment at the city and micro-city level.

4.3 Methodology of Resilience Assessment

The tool on how to assess the resilience to climate-related disaster is called CDRI (Climate Disaster Resilience Index) and developed by the International Environment and Disaster Management Laboratory of Kyoto University. CDRI is constructed from five dimensions: physical, social, economic, institutional, and natural (Joerin et al., 2012). Each dimension consists of five parameters (Table 4.3) and each parameter illustrates 25 variables. In brief, CDRI analyzes disaster resilience on 125 (5x5x5) quantifiable variables. The CDRI that is applied in Bandung, is tailored to certain questions to the local characteristics of this study (i.e. changing administrative context) (Table 4.4). Each parameter is evaluated on five level of scoring of 1 (poor) to 5 (best). Following evaluating the parameter, each variable under a specific parameter is required to be ranked or weighted on a scale of 1 (not important) to 5 (very important). The data, later on was analyzed by utilizing Weighted Mean Index (WMI) for the resilience score of parameters and similarly, Aggregated Weighted Mean Index (AWMI) was utilized for the resilience score of dimensions. Thus, the calculated value of AWMI of one dimension defines the CDRI of that particular dimension. The CDRI scores vary from 1 (very poor) to 5 (best) and are presented best in the form of a spider diagram to identify the strength and weakness of each score and also to show the varying conditions of different dimensions, parameters, and variables of a selected type of an urban area (Joerin and Shaw, 2011).

Additionally, statistical analysis on relationship between dimensions, parameters, and variables has the potential to develop connections between different aspects, aside from mapping out the results of indexing. The higher CDRI values means that higher preparedness is inhibited to cope with climate-related disasters. Thereupon, context-based analyzes allow drawing the right solutions for the effective development of sound solutions and practices in those sectors where the condition is lowest.

Table 4.3: Dimension and parameters of Climate Disaster Resilience Index (CDRI)

Dimension	Physical	Social	Economic	Institutional	Natural
Parameter	Electricity	Population	Income	Mainstreaming DRR and CCA	Intensity/Severity of Natural Hazards
	Water	Health	Employment	Crisis Management	Frequency of Natural Hazards
	Sanitation and Solid Waste Disposal	Education and Awareness	Household Assets	Knowledge Dissemination and Management	Ecosystem Services
	Accessibility of Roads	Social Capital	Finance and Savings	Institutional Collaboration	Land Use in Natural Terms
	Housing and Land Use	Community Preparedness	Budget and Subsidy	Good Governance	Environmental Policies

Source: Joerin and Shaw (2011)

After the data are gathered and CDRI results are revealed, proper interpretations are crucial in determining the next step. What would be proper actions in those sectors where needed the most. As mentioned by Joerin and Shaw (2011), the key aims of CDRI are to reduce the risks and to make urban area more prepared and capable of withstanding climate-related disaster. It implies that qualitative interpretation of the weaker and stronger sectors of a city is sufficient to stimulate the process in terms of planning. Following sections illustrate the data collection and results of resilience assessment, advancing CDRI tool in Bandung City.

Data collection of CDRI in Bandung

The data for the resilience assessment were collected through the 14-page condensed questionnaire forms. The resilience assessment was conducted at two stages, not only at the city, but at micro-city as well, in terms of sub-district level. The focus at the micro-city level concentrates on local-level decision-making rather than on the powers available at the city level. For instance, the involvement of sub-district officials at the micro-city level becomes more crucial than at city level in analyzing the institutional condition of specific area within a city. Another example was raised by Joerin and Shaw (2011) that in the institutional dimension, namely the development of housing or transport plans/policies, is a matter dealt at the city level rather than at the micro-city level; therefore, they are replaced by the capability of the sub-district level administrative body to produce development plans that address disaster risk reduction. Thus, the CDRI questionnaire at the sub-district level is more tailored to the specific administrative conditions, where the policy framework is already given. Accordingly, the city level questionnaire assesses the conditions from the higher administrative level of power. Thus the variation of micro level assessment is needed to address the different local contexts in varying types of Bandung.

Table 4.4: Dimensions, parameters, and variables of CDRI

Dimensions	Parameters And Variables
Physical	**Electricity** (access, availability, supply capacity, alternative capacity) **Water** (access, availability, supply capacity, alternative capacity) **Sanitation and solid waste disposal** (access to sanitation, collection of waste: treated, recycled, collection of solid waste after a disaster) **Accessibility of roads** (% of land transportation network, paved roads, accessibility during flooding, status of interruption after intense rainfall, roadside covered drain) **Housing and land-use** (building code, buildings with non-permanent structure, buildings above water logging, ownership, population living in proximity to polluted industries)
Social	**Population** (population growth, population under 14 and above 64, population informal settlers, population density at day and night) **Health** (population suffer from waterborne/vector-borne diseases, pop. suffer from waterborne diseases after a disaster, access to primary health facilities, capacity of health facilities during a disaster) **Education and awareness** (literacy rate, population's awareness about disasters, availability of public awareness programs/disaster drills, access to internet, functionality of schools after disaster) **Social Capital** (population participating in community activities/clubs, acceptance level of community leader (in ward), ability of communities to build consensus and to participate in city's decision-making process (level of democracy), level of ethnic segregation **Community preparedness during a disaster** (preparedness (logistics, materials, and management), provision of shelter for affected people, support from NGOs/CBOs, population evacuating voluntarily, population participating in relief works)
Economic	**Income** (population below poverty line, number of income sources per household, income derived in informal sector, % of households have reduced income due to a disaster) **Employment** (formal sector: % of labor unemployed, % of youth unemployed, % of women employed, % of employees come from outside the city; % of child labor in zone) **Household assets** (households have: television, mobile phone, motorized vehicle, non-motorized vehicle, basic furniture) **Finance and savings** (availability of credit facility to prevent disaster, accessibility to credits, accessibility to credits for urban poor, saving practice of households, household's properties insured) **Budget and subsidy** (funding of DRM, budget for DRR sufficient, availability of subsidies/incentives for residents to rebuild houses, alternative livelihood, health care after a disaster)
Institutional	**Mainstreaming of DRR and CCA** (mainstreaming of CCA and DRR in: city's/sub-district's development plans, ability (manpower) and capacity (technical) to produce development plans, extent of community participation in development plan preparation process, implementation of disaster management plan) **Effectiveness of city's/sub-district's crisis management framework** (existence and effectiveness of an emergency team during a disaster: leadership, availability of evacuation centers, efficiency of trained emergency workers during a disaster, existence of alternative decision-making personnel) **Knowledge dissemination and Management** (effectiveness to learn from previous disasters, availability of disaster training programs for emergency workers, existence of disaster awareness programs for communities, capacity (books, leaflets, etc.) to disseminate disaster awareness programs (disaster education), extent of community satisfaction from disaster awareness programs) **Institutional collaboration with other organizations and stakeholders, during a disaster** (city's/sub-district dependency to external institutions/support, collaboration and interconnectedness with neighboring cities/sub-districts, city's/sub-district's cooperation (support) with central corporation department for emergency management, cooperation city's/sub-district's officials for emergency management, city's/sub-districts institutional collaboration with NGOs and private organizations) **Good governance** (effectiveness of early warning systems, existence of disaster drills, promptness of city/sub-district body to disseminate emergency information during a disaster to communities and transparency of city/sub-district body to disseminate accurate emergency, capability of city/sub-district body to lead recovery process)
Natural	**Intensity/severity of natural hazards** (floods, cyclones, heat waves, droughts (water scarcity), tornados) **Frequency of natural hazards** (floods, cyclones, heat waves, droughts (water scarcity), tornados) **Ecosystem services** (quality of city's: biodiversity, soils, air, water bodies, urban salinity) **Land-use in natural terms** (area vulnerable to climate-related hazards, urban morphology, settlements on hazardous ground, amount of Urban Green Space (UGS), loss of UGS) **Environmental policies** (use of city/sub-district level hazard maps in development activities, extent of environmental conservation regulations reflected in development plans, extent of implementation of environmental conservation policies, implementation of efficient waste management system (RRR), implementation of mitigation policies to reduce air pollution)

Source: Joerin et al. (2012), modified

The respondent of CDRI assessment is the key organization in filling up this questionnaire depends on the context. The questionnaire survey was targeted the city officers at the city and sub-district level. However, generally different departments within local government, mainly the planning agency, are required to provide answers either through secondary data for quantitative questions of through a well-thought perception (best answer) to provide responses for qualitative questions and also for those quantitative questions, for which no data is available.

At the end of the assessment, the results are in the form of resilience values for the aforementioned dimensions and the spider diagrams at the city level to show the varying conditions of different dimension and parameters of Bandung (KU, Bandung City Government, and ITB, 2012). At the sub-district level, the results of the assessment are as well in the form of resilience values for the five dimensions and the spider diagrams in the 30 sub-districts. Moreover, the maps showing the value of strength of the resilience of the five dimensions are visualized for the 30 sub-districts. In addition, previously mentioned, a statistical analysis is applied to identify the strength of relationship between the variables and parameters in the same dimension and across different dimension as well, which will be discussed in the later section. Following sections are describing the results of the resilience assessment for Bandung City and its 30 sub-districts in further details.

4.4 Climate-related Disaster Resilience Index at the City Level

The CDRI assessment was conducted in Bandung City, with Bandung Planning and Development Agency *(Bappeda Kota Bandung)* as the key (respondent) and leading sector. After the CDRI questionnaire was filled, the data is analyzed, utilizing the aforementioned statistical method (WMI and AWMI). The results of the resilience value of the five dimensions are listed in Table 4.5, following by the spider diagrams in visualizing the variety of strength of each parameter for the five dimensions (Figure 4.13).

Table 4.5: The results of CDRI value of Bandung

Dimension Overall (3.01)	**Physical 3.31**	**Social 2.90**	**Economic 2.86**	**Institutional 2.89**	**Natural 3.08**
Value	Electricity **4.13**	Population **2.40**	Income **2.60**	Mainstreaming DRR and CCA **3.33**	Intensity/Severity of Natural Hazards **3.80**
	Water **3.40**	Health **2.40**	Employment 3**.07**	Crisis Management **2.73**	Frequency of Natural Hazards **3.13**
	Sanitation and Solid Waste Disposal **3.00**	Education and Awareness **3.07**	Household Assets **3.07**	Knowledge Dissemination and Management **2.80**	Ecosystem Services **2.33**
	Accessibility of Roads **3.33**	Social Capital **4.13**	Finance and Savings **2.87**	Institutional Collaboration **2.73**	Land Use in Natural Terms **3.07**
	Housing and Land Use **3.27**	Community Preparedness **3.00**	Budget and Subsidy **2.07**	Good Governance **2.40**	Environmental Policies **2.40**

Drawing from the assessment results from Table 4.5 and Figure 4.13, following interpretations for each dimension are as follow:

Physical

The average score among the five dimensions is highest (Table 4.5) in the physical dimension compared to the other dimensions. The results of the parameters of physical dimension also show little variations between each of them. However, among the five parameters, sanitation and solid waste management resilience value is the lowest among all. This low rating is due to improper solid waste management of Bandung City. There are several points that can be noted of improper waste management. Firstly, growing population and high urbanization rate cause insufficient of landfills, therefore lack of treatment area issue. Secondly, incoordination of solid waste management between city and lower administrative levels, therefore waste are not timely taken and properly treated. Thirdly, the 3-R (Reuse, Reduce, Recycle) are not yet widely promoted. *Leuwigajah* (the name of one of landfills in Bandung) landslide event that resulted in the deaths of 156 people around the landfill on June 21, 2005, marked a poor historical record for the city of Bandung. Heavy rainfall, which precipitated for three consecutive days, caused 2.7 million cubic meters of solid waste slide and covered nearby settlements (Figure 4.13).

However, the other parameters, especially the basic lifelines, such as electricity and water are rated very high. The performance of State Electricity and Water Company is marked by no or rarely disruption and has to be sustained, although clean water service is sometimes disrupted without a major effect to communities.

Social

Overall score for social resilience is rated between moderate and good (Table 4.5), although the parameter of social capital is rated the highest. Valuable social cohesion of community in Bandung is rated by its citizen in participating in community activities/clubs, the acceptance level of community leader (in neighborhoods), ability of communities to build consensus and to participate in city's decision-making process (level of democracy), and level of ethnic segregation is at its best. Bandung is well known for offering wide opportunities in business activities (Factory Outlets, Hotels, Culinary, Sightseeing Spots, etc.) and attracted people from other cities/region to migrate and live in Bandung. The migrants are not hesitated in actively participate in community activities and have blended with origin Bandung's community. The acceptance level of community in Bandung to migrants is high and is not compromising the social livelihoods of Bandung (Figure 4.13).

The impacts of urbanization (population growth, urban poverty, housing and land-use), are felt by the low ratings of population and health parameter. Thus, aside from the positive urbanization has flourished economic activities in city, however it also creates negative impacts to sanitation and solid waste (see Physical dimension) and health, reflected by the low ratings. Despite all these, the level of community preparedness during a disaster in Bandung is moderate, which might need some improvement, particularly to flood/inundation risk. For this, the role of community leaders and

communication at neighborhoods play essential role to enhance community awareness and preparedness (Figure 4.13).

Economic

The score of the economic dimension of Bandung is the lowest among the five dimensions. Figure 4.11 shows the small shape of the resilience of the economic dimension. All the parameters are rated low and show thus significant impact if a disaster occurs. Although employment, household assets, and finance and savings do not show low values (see the social dimension description on why people in Bandung do not have significant issues in the economic access and wide opportunities in generating income), however, particularly on the budget and subsidy related to disaster management of city's government is low. This shows by unspecific budget and subsidy allocation of disaster management in the city's financial annual budget, which has to be endorsed soon, for better city's preparedness to disasters (Figure 4.13).

Institutional

The CDRI scores in the institutional dimension show a variation of strength among the five parameters. Mainstreaming of DRR and CCA in the city's planning have taken into consideration, by the endorsement of NAP-DRR and NAP-CC at the local level. However, this has not yet manifested in the sectoral/agencies working programs. Thus policy vs. implementation is low, that needs to be improved until the lowest level of administrative unit. This is inline with the low rating of good governance, in terms of effectiveness of early warning systems, existence of disaster drills, promptness of city/sub-district body to disseminate emergency information during a disaster to communities and transparency of city/sub-district body to disseminate accurate emergency, and capability of city/sub-district body to lead recovery process. All of these need to be soon reviewed and evaluated, reminding that Bandung is highly prone to flood (Figure 4.13).

Natural

The natural dimension shows a mixture of results between the parameters' values. This shows how varies the risk is distributed among areas (sub-districts) in Bandung. It is known that floods/inundations occur frequently in Bandung, however, the severity and impacts are varied among the areas in Bandung. Thus Bandung is vulnerable to high frequent and low consequence disasters (such as local inundations). The low rating of the vulnerability of ecosystem services contributes to the frequency of occurring floods. This implies that not all the occurring floods are caused by natural phenomenon (solely due to high amount precipitation for consecutive days), but insufficient drainage system, high rate of urbanization, improper solid waste management (see description of physical resilience) contribute to flood events. This implies that Bandung face a serious problems, if it will not undertaken soon. Thus, efficient and comprehensive risk communication needs to be endorsed to create and sustain community resilience (Figure 4.13).

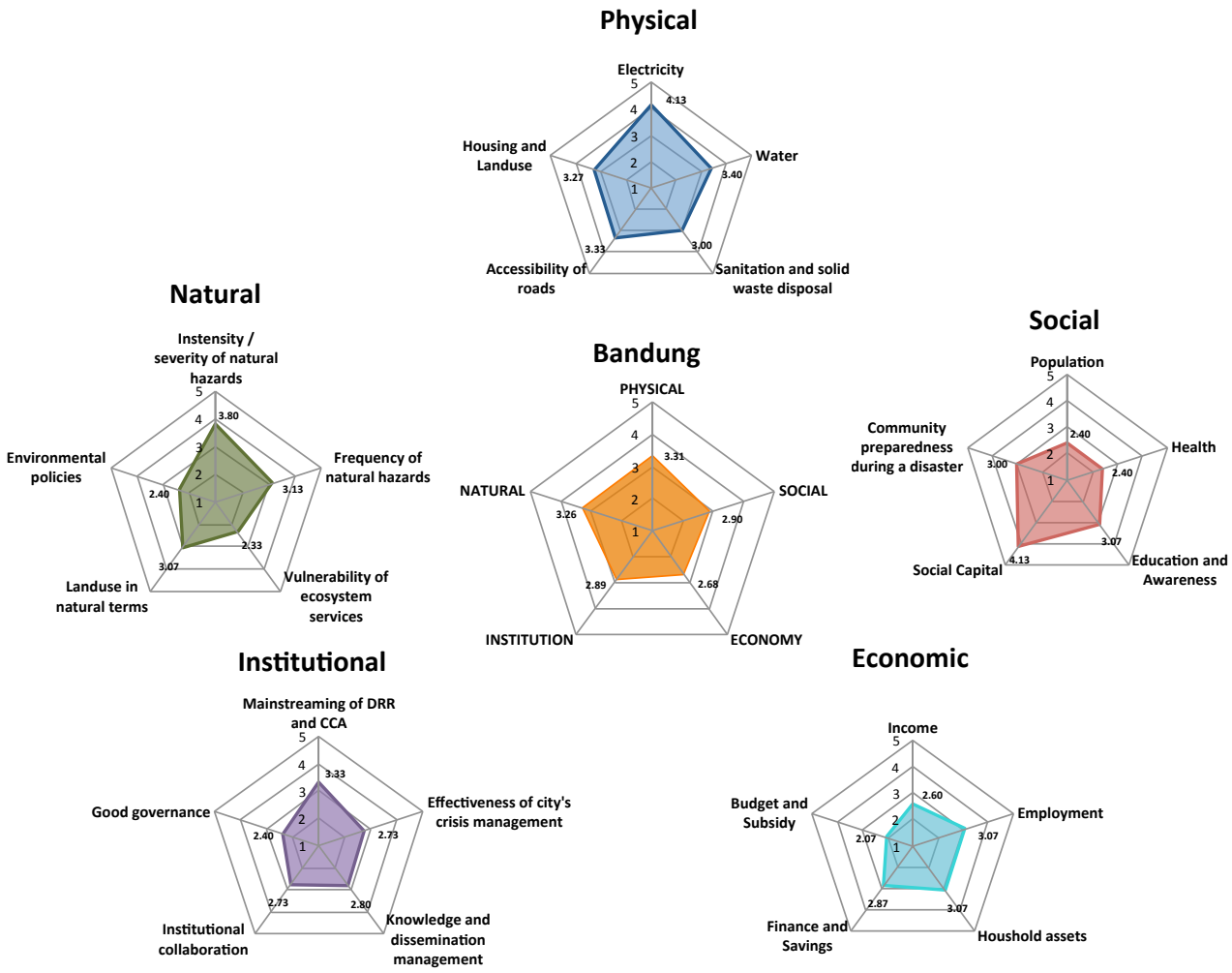


Figure 4.13: CDRI scores of all dimensions of Bandung City

The following section illustrates in details the CDRI assessment and its results at the sub-district level. This is needed to identify specific risks, local capacities and potentials, and most important, to seek a proper local risk communication mechanisms, which might contribute in enhancing community resilience.

4.5 Climate-related Disaster Resilience at Sub-City Level

The resilience to climate-related disasters applied in an urban area at micro-city level (at sub-district/*kecamatan* level), tries to disclose on one hand the capacity of a sub-district's urban infrastructure and services against disasters, and on the other, how communities and institutions of 30 sub-districts are expected to deal with such an event. The fundamental questions would be how resilient is a particular sub-district at present and how is the city and sub-districts are going to absorb, maintain, and recover (bounce back) from climate-related hazards, leading to a disaster.

In this study all the 30 administrative sub-districts of Bandung participated in the short introductory workshop, hosted by Kyoto University and co- hosted by Bandung City Development and Planning Agency *(Bappeda Kota Bandung)* for a trial filling-out of the

CDRI questionnaire, before they fill up the aforementioned 14-page extensive questionnaire to measure their resilience to climate-related disasters. The particular respondents were representative officers from sub-districts (Figure 4.14).



Figure 4.14: CDRI workshop with the officers of sub-districts at Bandung Development and Planning Agency (Bappeda Kota Bandung)

Figure 4.15 shows the division of different areas in Bandung City. This division is based on the geographical location of sub-districts (mountain and valley, river, and plain areas) and different functions of areas (center/business district, residential areas and industry in outer fringes) in the city. The details of the sub-districts are list up again in Table 4.6 and the list of all wards of the sub-district is in Appendix 1. Most of the sub-districts are located in plain areas, where the major rivers and its tributary channels are flowing through these sub-districts. The flood affects the majority of these sub-districts during the rainy season with high precipitation level. This was not due to the poor quality of the drainage system only, but these sub-districts suffer from the overflowing water from the adjacent river.

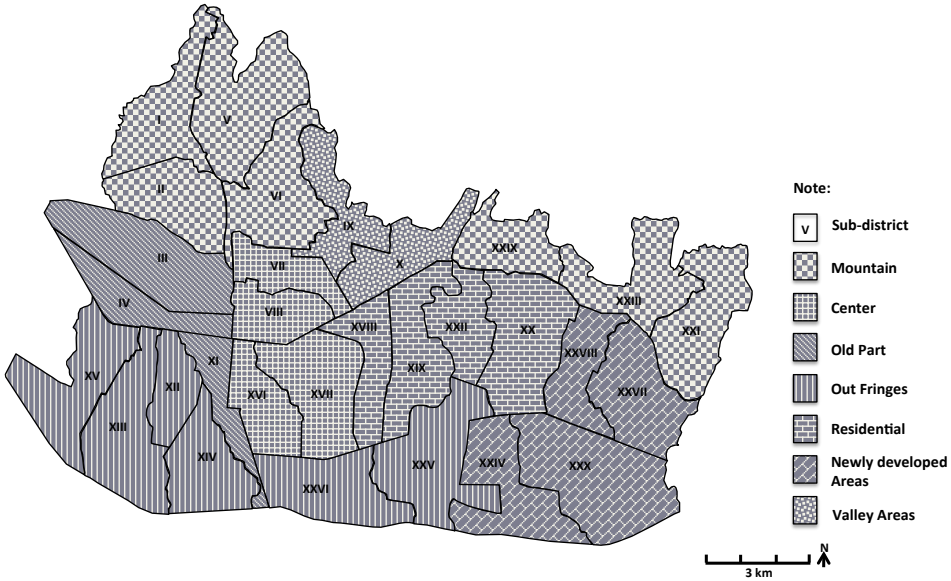


Figure 4.15: Map of Bandung City and its 30 sub-districts in different type of areas

Below figure (Figure 4.16) is illustrating visually the different types of areas in Bandung City, as put in Figure 4.15 above.



(Mountain)



(Center)



(Old Part)



(Out Fringes)



(Residential)



(Newly developed area)



(Valley area)

Figure 4.16: Snapshots of different types of areas in Bandung

Table 4.6 lists the respective 30 sub-districts and its details.

Table 4.6: Sub-districts and its population

No.	Sub-district	Geographical Location	No. of wards	Area (km^2)	Total Population	Population Density
I.	Sukasari	Mountain	4	6,27	79.211	12.633
II	Sukajadi	Mountain	5	4,30	104.805	24.373
III.	Cicendo	River, Plain	6	6,86	96.491	14.066
IV.	Andir	River, Plain	6	3,71	94.361	25.434
V.	Cidadap	Mountain	3	6,11	56.325	9.218
VI.	Coblong	Mountain	6	7,35	127.588	17.359
VII.	Bandung Wetan	River, Plain	3	3,39	29.807	8.793
VIII.	Sumur Bandung	River, Plain	4	3,40	34.446	10.131
IX.	Cibeunying Kaler	Plain	4	4,50	68.087	15.290
X.	Cibeunying Kidul	Plain	6	5,25	104.575	19.919
XI.	Astanaanyar	River, Plain	6	2,89	66.658	24.065
XII.	Bojongloa Kaler	Plain	5	3,03	117.218	38.686
XIII.	Babakan Ciparay	Plain	6	7,45	143.203	19.222
XIV.	Bojongloa Kidul	River, Plain	6	6,26	83.600	13.355
XV.	Bandung Kulon	River, Plain	8	6,46	138.644	21.462
XVI.	Regol	River, Plain	7	4,30	79.316	18.446
XVII.	Lengkong	River, Plain	7	5,90	69.307	11.747
XVIII.	Batununggal	River, Plain	8	5,03	116.935	23.248
XIX.	Kiaracondong	River, Plain	6	6,12	127.616	20.852
XX.	Arcamanik	River, Plain	4	5,87	65.607	11.177
XXI.	Cibiru	Mountain	4	6,32	67.412	10.666
XXII.	Antapani	River, Plain	4	3,79	72.006	18.999
XXIII.	Ujung Berung	Mountain	5	6,40	72.414	11.315
XXIV.	Rancasari	River, Plain	4	7,33	72.046	9.878
XXV.	Buahbatu	River, Plain	4	7,93	92.140	11.619
XXVI.	Bandung Kidul	River, Plain	4	6,06	57.398	9.472
XXVII.	Panyileukan	River, Plain	4	5,10	37.691	7.390
XXVIII.	Cinambo	River, Plain	4	3,68	23.762	6.457
XXIX.	Mandalajati	River, Plain	4	6,67	60.825	9.119
XXX.	Gedebage	River, Plain	4	9,58	34.299	3.580
	Total Sub-districts: 30		**Total wards: 151**			

Source: (Bandung Statistical Agency, 2011)

The following sections show the results of the average values of 30 sub-districts in the form of five resilience maps, providing a visual idea about the current condition of the resilience of these 30 sub-districts. The summary of individual resilience assessment results of each sub-district is listed in Appendix 2.

Physical Resilience of Sub-districts

In overall the physical resilience levels distribute homogenously among the sub-districts. The lowest physical resilience is found in sub-district XXI *(Cibiru)*, which has the resilience value of lower than 3 (2.9). The highest resilience value is recorded in sub-district VIII *(Sumur Bandung),* which has the resilience value of 4.25 (see Table 4.7). Figure 4.17 shows the average of the physical resilience of the 30 sub-districts. The parameters that underline the difference between the lowest and highest physical resilience values are the sanitation and solid waste disposal as well as housing and land-use (Figure 4.17). This average resilience value of lower administrative units (sub-districts), provides more detailed information on the specific strength and weakness of this sector, which the one-point value of the city could not provide/absorb (Figure 4.13). It understands better how these lower administrative units of the city performed. Therefore, it shows only the trends of these 30 sub-districts. A deeper analysis (micro level assessment), how each of these sub-districts perform, refer to Figure 4.25, Table 4.7, and Appendix 2.

The analysis of these average resilience values is applicable to all other sectors (social, economic, institutional, and natural resilience of the sub-districts) in the following pages.

The amount of collected solid waste produced per day is only limited up to 50%, meaning not all the solid waste could be collected by the city, evaluated by the particular sub-district representative. For the housing and land-use issue, the amount of buildings that are constructed following the building code is less than 10%. There is a gap in term of solid waste service provision and the accessibility of roads in term of paved road. The lowest resilience can be found typically on the urban fringe and the highest resilience is located in the city center, where the "golden triangle" (government, economy, and business offices are located at one spot) of Bandung can be defined. Electricity service is provided from a central supplier (State Electricity Company/*PLN*) for all sub-districts equally and therefore no differentiation in this parameter. The water service is also provided centrally by Bandung Water Company (*PDAM* Bandung) and therefore all sub-districts are affected by similar or regular supply hours of water, which are usually available up to 6-10 hours/day and are capable to provide 76-100% of the sub-district water demand.

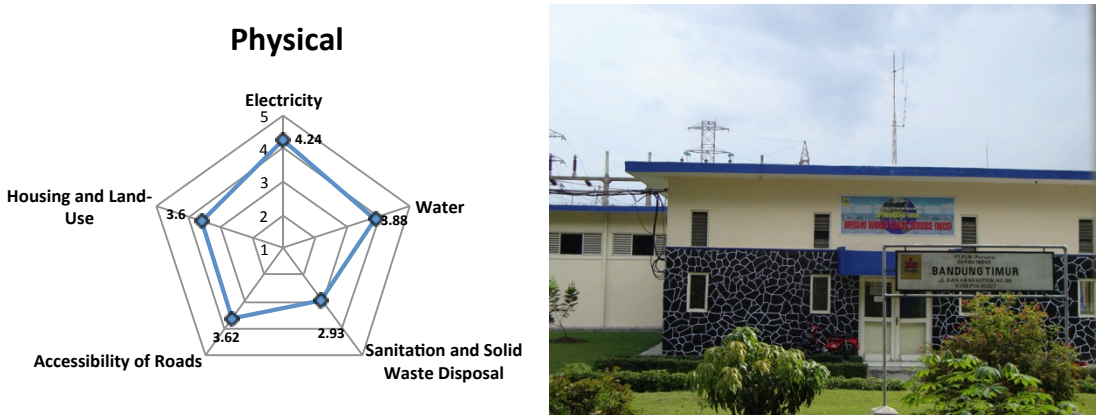


Figure 4.17: The CDRI value of physical dimension and parameters of sub-districts in Bandung (left) and Electricity power station of East Bandung region that contributes to high physical resilience (right).

Social Resilience of Sub-districts

The social resilience levels show that the population and education and awareness have the lowest values among all social resilience parameters. The map in Figure 4.21 indicates that to some extent, sub-district in the northern part of mountain area and few sub-districts at the outer fringes of the city have lower social resilience values than the other parts of the city. The lowest social resilience is found in the sub-district V *(Cidadap)*, which has the resilience value of lower than 3 (2.79). And the highest resilience value is noted in the sub-district XXX *(Gedebage)*, which has the resilience value of higher than 4 (4.31) (see Table 4.7). The factors that contribute to the difference in values are coming from the social resilience's parameters, such as the population and community preparedness during a disaster.

It is noted in the lowest value, the population of the particular sub-district under the age 14 and over 64 years is range between 40-46% of total sub-district population, meaning almost 50% of the population is consisted from the vulnerable groups (children and elderly). And in term of community preparedness during a disaster, the scores are poor for the extent of households that are prepared for a disaster in the provision of logistics, materials, and management. It highlights as well the poor score for the extent of support from NGOs/CSOs or religious organizations after a disaster.

Specifically, sub-districts that are located in the northern part of mountainous area have low social capital, which means that the social cohesion is low among the high-end residents. On the contrary, the sub-district that scores high is the youngest sub-district in the newly developed areas among all and the elderly people have not yet settled in that sub-district and they are equipped with new logistics; therefore it has high score for the population and community preparedness during a disaster. In addition it has a high score for the health and social capital, which is showing that particular sub-district, is not susceptible to diseases and has tight relationship among the community members and their leaders (Figure 4.18).

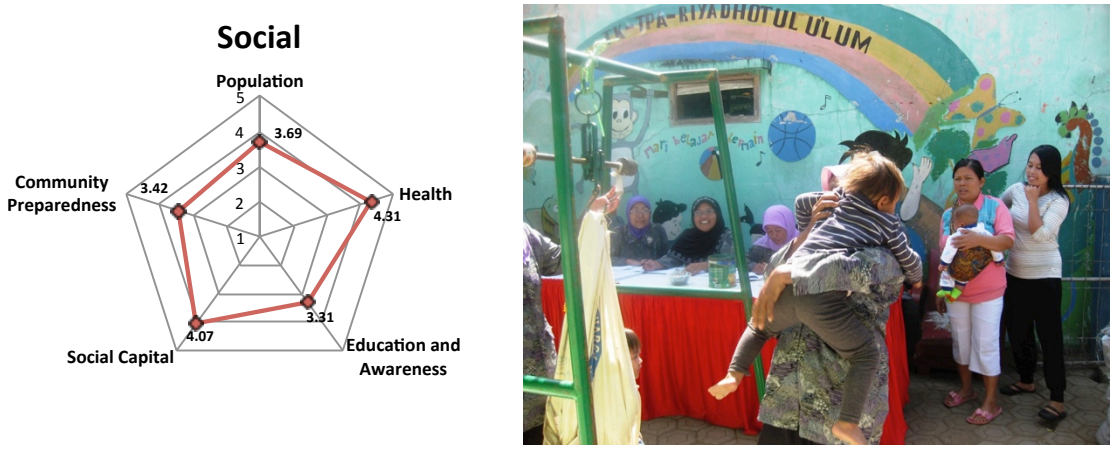


Figure 4.18: The CDRI value of social dimension and parameters of sub-districts in Bandung (left) and activity of integrated health services for children at neighborhood that contribute to high social resilience (right).

Economic Resilience of Sub-districts

The economic resilience levels show that particularly sub-districts in the outer fringes, eastern part of mountainous area and old part have low economic resilience compare to sub-districts located on central, northern part of mountainous area, and part of residential areas (Figure 4.22). The highest economic resilience values are found in particular high-end sub- districts, of which those residents have high economy in terms of income, employment, as well as finance and savings. On the contrary, the youngest sub-district has the highest score in economy resilience for the income parameter. The average number of sources of income per household of more than three (3) sources has contributed to the high resilience value.

In term of the budget and subsidy parameter, that particular sub-district has the availability of providing subsidies or incentives for its residents to rebuild their houses after a disaster and to provide incentives for the health care, although the amount of funds are not distinguished high. Following by the sub-district, of which the "golden triangle" is located in sub-district VIII *(Sumur Bandung),* has slightly less resilience value compare to the youngest sub-district (sub-district XXX = *Gedebage*) (Figure 4.19).



Figure 4.19: The CDRI value of economic dimension and parameters of sub-districts in Bandung (left) and small retails shop in neighborhoods that contributes to alternative source of income in economic resilience (right).

Institutional Resilience of Sub-districts

The institutional resilience shown is not bound to physical resilience parameters, such as electricity and water services, housing and land-use, and natural characteristics nor to social resilience parameter, such as population density. The institutional resilience confirms major parts the administrative purpose of the sub-districts to act on behalf the decision taken by the city government, since the mayor appoints 30 sub-district leaders. The lowest values are marked by sub-districts located in the outer fringes, northern and eastern part of mountainous area that has low values in the parameter of effective of crisis management, lack of knowledge dissemination and management, and low community preparedness.

The overall institutional resilience value varies from 2.5 to 4.5 and has the average score of 3.52. Meaning that the there is room for improvement in any institutional resilience parameters, such as in mainstreaming DRR and CCA, effectiveness of sub- district's crisis management framework, knowledge dissemination and management, institutional collaboration with other organizations and stakeholders, as well as good governance. The highest score of institutional resilience value is contributed by the youngest sub-district, which might has scored good in effectiveness of crisis management framework in terms of the existence in of emergency teams during a disaster and alternative decision making personnel during a disaster (Figure 4.20).

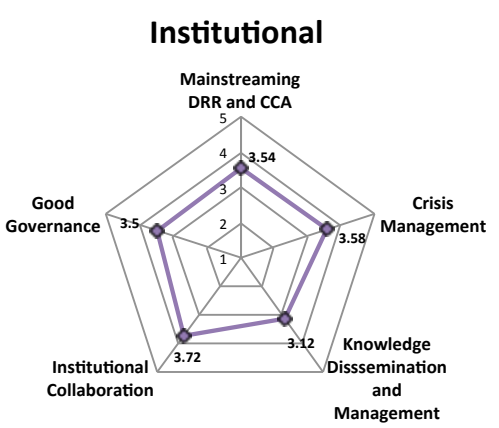




Figure 4.20: The CDRI value of institutional dimension and parameters of sub-districts in Bandung (left) and disaster training and drill for local authorities (right)

Natural Resilience of Sub-districts

The natural resilience values show in the spider diagram underlines high frequency and low consequence disasters such as inundations. Moreover the natural resilience values showed in the map are varied among the sub-districts, depending on the locality of disaster events. However, the lowest natural resilience values can be found in the old part, few in residential, newly developed areas, and northern part of mountainous area due to high climate-related hazards frequency that threatening those sub- districts, such as inundations due to high rainfall intensity (Figure 4.21).

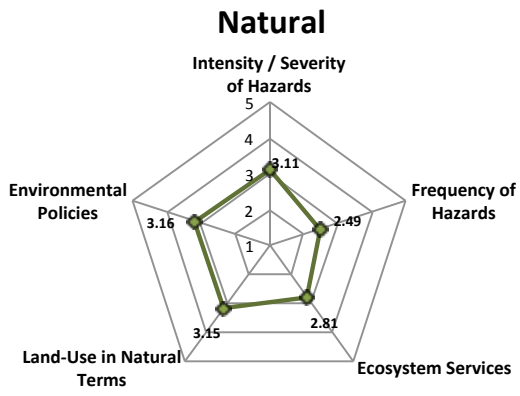




Figure 4.21: The CDRI value of natural dimension and parameters of sub-districts in Bandung (left) and rapid development of northern Bandung that contributes to frequent climate-related disaster (right)

In addition, major factors that contribute to the low resilience in natural dimension in almost all sub-districts are poor in the implementation of environmental policies and land-use or ecosystem services. The old part and high populated residential and newly developed areas have insufficient drainage system and in northern part, lack of open green spaces due to rapid development of constructions by real estates. The variations of the value ranges from 2.3 until 3.97, with small indifferences, which are possibly due to rather small spatial areas of each sub-district and located adjacent to one another.

Figure 4.22 illustrates the resilience of all dimensions of the 30 Sub-districts in the form of maps. This spatial analysis gives the Government of Bandung City the information on which location and key areas they need to focus on. Which administrative units need what kinds of support. Foremost, which risk reduction and resilience activities these sub-districts need to strengthen. In the spatial analysis, in overall, the sub-districts that are located at center/business district, out fringes, and new developed areas have relatively high resilience in all sectors (physical, social, economic, and institutional), except for natural resilience. Frequent floods inundated these sub-districts and have therefore impacted these sub-districts in various sectors that are mentioned earlier.

More to the spatial analysis of the resilience assessment of the 30 sub-districts in Bandung is described in the following section.

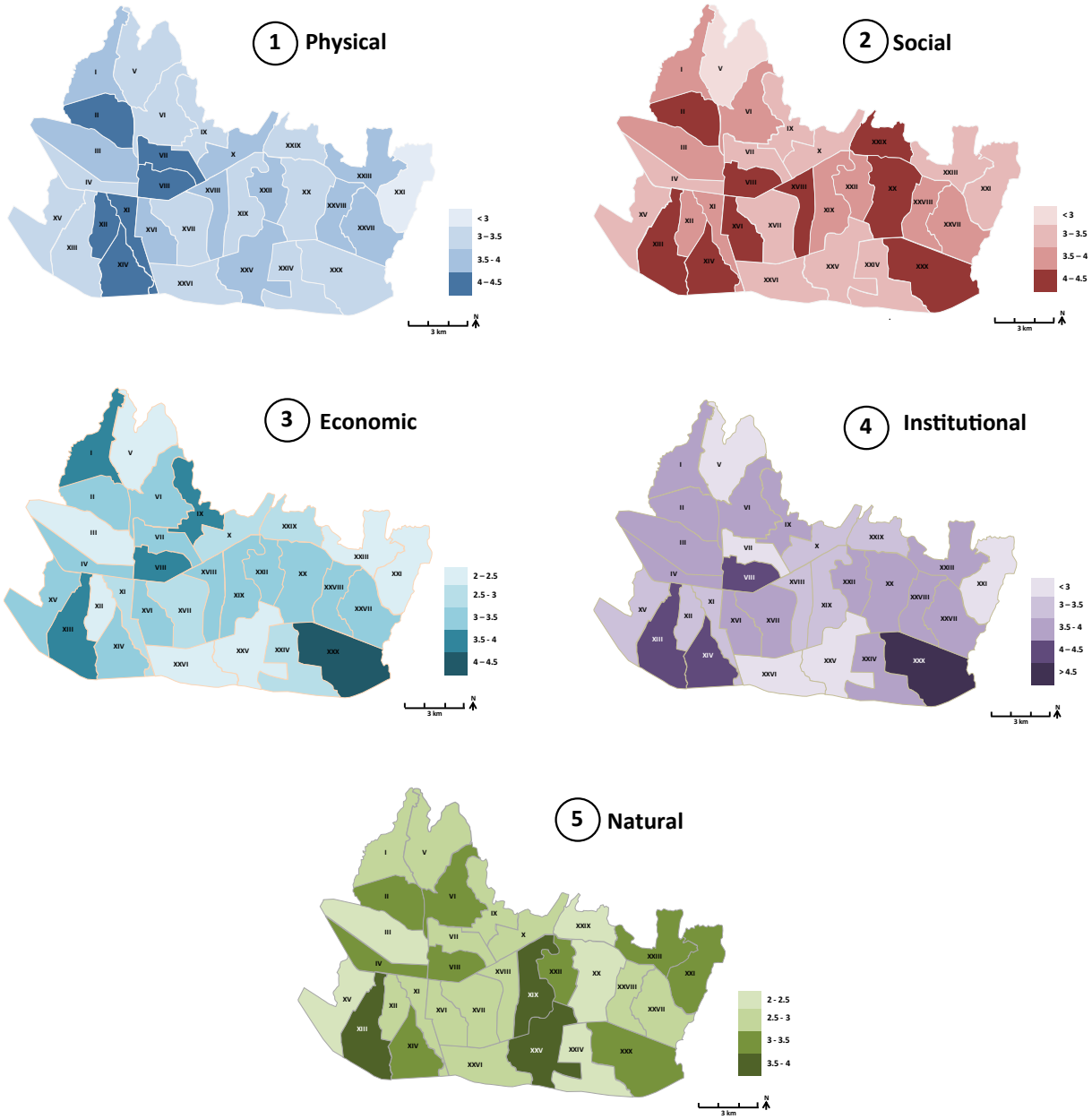


Figure 4.22: Climate Disaster Resilience Index maps of sub-districts in Bandung

The overall CDRI of Sub-districts in Bandung

The overall CDRI values of the sub-districts are shown in the map (Figure 4.23). Generally, by parameter-wise, the lowest resilience values are scored by the poor areas as well as socially disadvantaged, specifically in the economic resilience indicates by the lack budget and subsidy for disaster risk management and reduction and in the natural resilience indicates by the frequency of natural hazards. The highest resilience values are marked for the social resilience indicates in the health sector; the physical resilience by basic lifeline services such as electricity, water, and accessibility of roads; and for the institutional resilience indicates by institutional collaboration with other organizations and stakeholders during a disaster.

Specifically, by location-wise, the lowest physical and economic resilience is marked by sub-district in eastern part of mountainous area; lowest social resilience is scored by sub-district located in northern part of mountainous area; lowest institutional resilience is found in sub-districts located in the outer fringes and eastern and northern part of mountainous area; and lowest natural resilience is scored by sub-district in the southern outer fringe of the city that is located adjacent to main *Citarum River.*

The rest of the majority sub-districts have similar middle-class resilience values, of which the variations of the scores are very small. Nevertheless, all the resilience values show in the diagrams pointed out to have similar values to each other, a potential opportunity to improve at the same starting point of development takeoff will grow collectively towards the enhancement of Bandung climate-related disaster resilience.

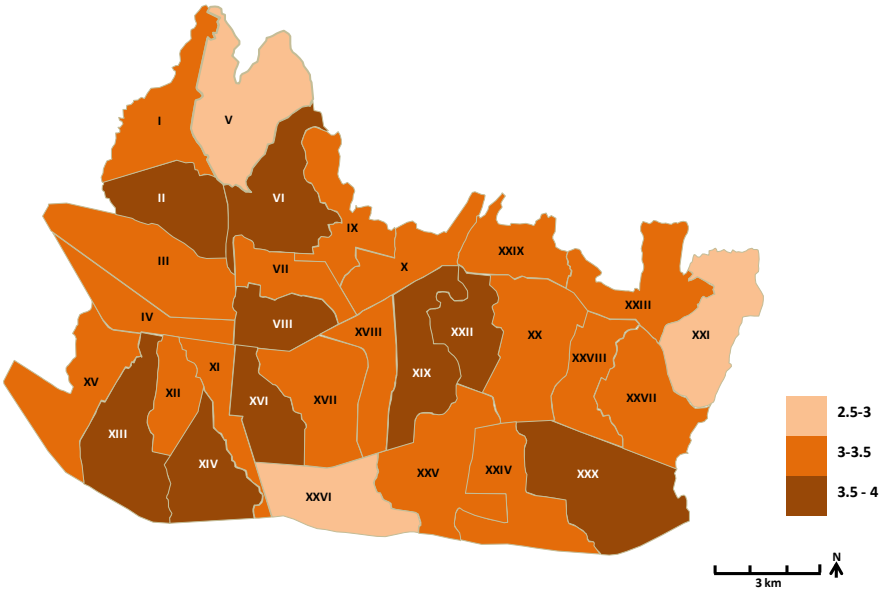


Figure 4.23: Overall Climate Disaster Resilience Index map of sub-districts in Bandung

More on the overall resilience and spider diagrams, Figure 4.24 reveals specific parameters' resilience values of city compared to the average of sub-districts. These spider diagrams provide a visual idea about the current condition of sub-districts and

city in one view and serve as entry points for the Government of Bandung City to undertake appropriate interventions such as appropriate DRR and risk communication plans that enhance community resilience.

Figure 4.25 summarizes the CDRI values of each dimension for the 30 sub-districts in Bandung. The highest CDRI value of the physical dimension is shown thus for sub-districts that are dominated by business, offices, and industrial sectors. Clearly, the physical infrastructures in these sub-districts are further developed rather than sub-districts in residential and out fringes of the city.

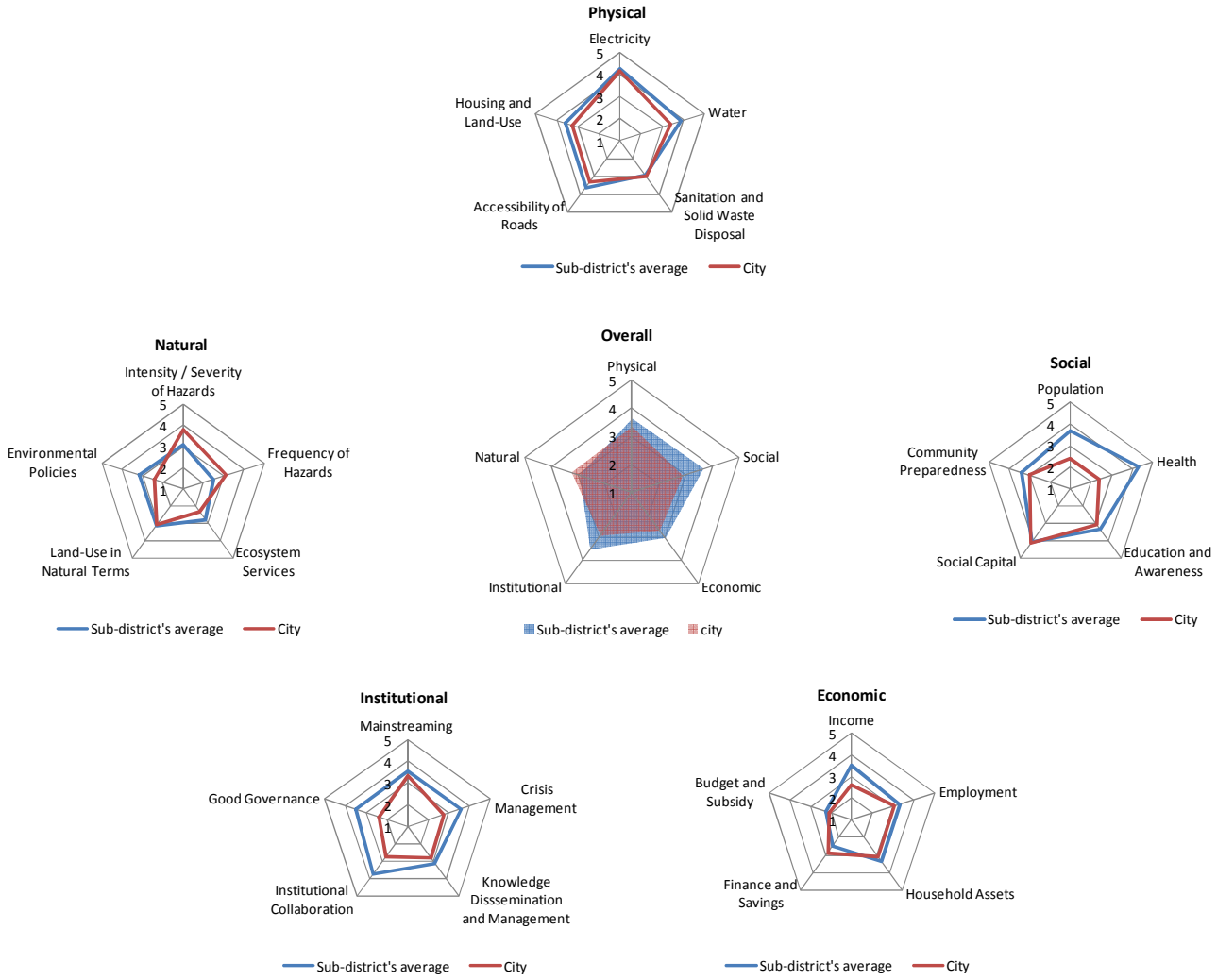


Figure 4.24: Comparison diagrams of the average resilience of the sub-districts in Bandung to city's resilience

The CDRI value of social dimension is seen equally highly distributed among the sub-districts. This implies that all sub-districts in Bandung have high degree of resilience in terms of population, health, etc., as seen in Figure 4.18 and Figure 4.24 (spider diagrams), and calls for sustainable social development. However, it does not mean that this does not have to be communicated to community, especially in sub-district located in the northern part of mountainous area that is less in social cohesion, thus low in

social capital. Particular pre-disaster activities on education and awareness of climate-related disaster need to be strengthened. The CDRI value of economic dimension, on the contrary, shows a scattered variation of distribution. Sub-districts located in the marginal areas of Bandung show a lower value than others. However, highlighting the disaster management aspect of the sub-districts, almost all sub-districts do not have budget and subsidy to fund, in case a disaster occurs. A certain amount of budget needs to be allocated for each sub-district in mitigating their condition independently, in spite of burdening the city.

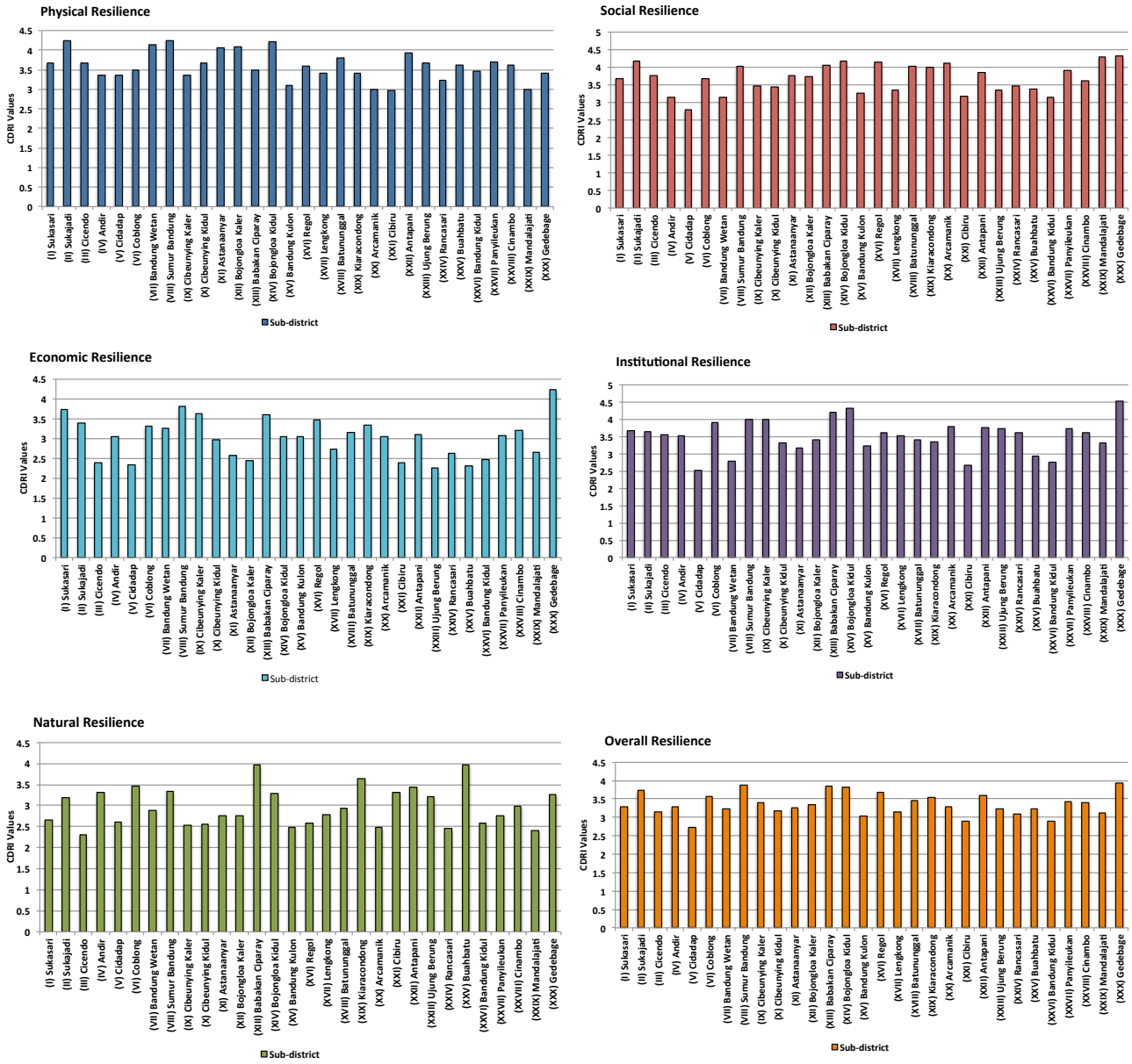


Figure 4.25: CDRI values of each dimension of sub-districts in Bandung

The CDRI value of institutional dimension shows equal high distribution among the sub-districts, particularly for the district that is recently included in Bandung City (newly developed areas in eastern part of city). Good governance, institutional collaboration,

mainstreaming DRR and CCA that are well in place contribute for this high degree of value among sub-districts. On the other hand, again, the disaster risk knowledge and dissemination (Figure 4.24 spider diagrams) need to be upgraded and calls for a large investment in pre-disaster activities. This has to be taken up by the city, by putting investment, for example, budget and subsidy in prepared and awareness in all sub-districts. The disaster risk and knowledge/information ought to be conveyed and requires thus local risk communication strategies. Moreover, the CDRI value of natural dimension was equal low in all sub-districts. This is due to the frequent floods or inundation occurring in almost all sub-districts in Bandung. This has caused frequent disruption of city' activities and in the long run these high frequent and low consequence disasters will have a large impact to community and livelihoods. For example, the parameter of ecosystem services and land use in natural term thus needs to be enhanced at a high pace, to decrease the level of degradation that affects the city. Table 4.7 further lists CDRI values of each dimension of sub-districts in Bandung.

Table 4.7: List of CDRI values of each dimension of sub-districts in Bandung

No.	Sub-District/Kecamatan	Overal CDRI Value	Physical	Social	Economic	Institutional	Natural
I	Sukasari	3.28	3.67	3.69	3.72	3.68	2.66
II	Sukajadi	3.73	4.23	4.17	3.4	3.63	3.19
III	Cicendo	3.14	3.68	3.78	2.39	3.56	2.3
IV	Andir	3.28	3.36	3.14	3.05	3.52	3.32
V	Cidadap	2.73	3.37	2.79	2.35	2.52	2.62
VI	Coblong	3.57	3.48	3.69	3.32	3.91	3.46
VII	Bandung Wetan	3.24	4.14	3.14	3.26	2.78	2.89
VIII	Sumur Bandung	3.89	4.25	4.03	3.81	4.01	3.34
IX	Cibeunying Kaler	3.4	3.37	3.48	3.62	3.99	2.53
X	Cibeunying Kidul	3.19	3.68	3.45	2.96	3.31	2.55
XI	Astanaanyar	3.27	4.07	3.78	2.57	3.16	2.76
XII	Bojongloa Kaler	3.34	4.08	3.73	2.44	3.4	2.75
XIII	Babakan Ciparay	3.86	3.48	4.07	3.6	4.2	3.96
XIV	Bojongloa Kidul	3.81	4.21	4.18	3.04	4.32	3.29
XV	Bandung Kulon	3.03	3.1	3.28	3.04	3.24	2.48
XVI	Regol	3.68	3.58	4.14	3.48	3.61	2.59
XVII	Lengkong	3.16	3.4	3.36	2.72	3.52	2.79
XVIII	Batununggal	3.47	3.81	4.03	3.16	3.41	2.93
XIX	Kiaracondong	3.55	3.4	3.99	3.33	3.36	3.65
XX	Arcamanik	3.29	3	4.11	3.06	3.8	2.47
XXI	Cibiru	2.91	2.98	3.18	2.39	2.66	3.32
XXII	Antapani	3.61	3.92	3.85	3.09	3.76	3.43
XXIII	Ujung Berung	3.24	3.66	3.34	2.25	3.74	3.2
XXIV	Rancasari	3.08	3.24	3.46	2.64	3.62	2.45
XXV	Buahbatu	3.24	3.61	3.37	2.31	2.95	3.97
XXVI	Bandung Kidul	2.89	3.45	3.16	2.48	2.77	2.58
XXVII	Panyileukan	3.44	3.7	3.92	3.08	3.73	2.77
XVIII	Cinambo	3.4	3.61	3.62	3.2	3.6	2.98
XXIX	Mandalajati	3.13	3	4.29	2.65	3.31	2.4
XXX	Gedebage	3.94	3.4	4.31	4.23	4.52	3.26
	AVERAGE	**3.36**	**3.60**	**3.68**	**3.02**	**3.52**	**2.96**

More to the parameters in detailed, Table 4.8 ranks the average value of the sub-districts' CDRI scores, from the highest to the lowest, and with health parameter as being the highest. Sanitation and solid waste disposal, ecosystem services, finance and savings, frequency of hazards, and budget and subsidy are parameters with the lowest scores. This confirms the need of actions for the concerned sectors and requires a mechanism to communicate this widely to communities in neighborhoods. More to the

risk communication mechanism are illustrated in following chapters (Chapter 5 and Chapter 6).

Table 4.8: Average CDRI scores of 25 parameters of 30 Sub-districts in Bandung

CDRI Parameters	CDRI Score
Health	**4.31**
Electricity	4.24
Social Capital	4.07
Water	3.88
Institutional Collaboration	3.72
Population	3.69
Accessibility of roads	3.62
Housing and Land Use	3.6
Crisis Management	3.58
Mainstreaming	3.54
Income	3.52
Good Governance	3.50
Community Preparedness	3.42
Employment	3.35
Education and Awareness	3.31
Household Assets	3.25
Environmental Policies	3.16
Land Use in Natural Terms	3.15
Knowledge Dissemination and Management	3.12
Intensity/Severity of Hazards	3.11
Sanitation and Solid Waste Disposal	**2.93**
Ecosystem Services	**2.81**
Finance and Savings	**2.49**
Frequency of Hazards	**2.49**
Budget and Subsidy	**2.26**

Relationship of CDRI values for sub-districts in Bandung

The CDRI values of dimension were further investigated in a statistical method. It aims to identify possible degree of relationship between the dimensions and parameters (Physical, Social, Economic, Institutional, and Natural) of CDRI at sub-districts in Bandung. This was necessary in order to find possible linkages of resilience; hence possible risk communication, framework, mechanism and DRR interventions can be formulated to enhance community resilience.

The linear regression analysis uses the benchmark score that is based on the coefficient of determination of higher than 0.7. It investigates the relationship between two variables of the scores between 0 and 1. The higher the score of the coefficient of determination (a maximum of 1) shows the high the degree of relationship between those two variables. The correlation method helps to identify the positive high degree of relationships between two variables, whether it is a relationship between each of the five CDRI dimensions and parameters or whether it is the relationship between those CDRI dimensions with the attributing factors. Those attributing factors are geographical locations, different types of areas in city, total population, and population density. This might provide opportunity to the enhancement of resilience of city and its people, featuring the risk communication process.

Following, Table 4.9 shows the correlation results of CDRI dimensions and parameter values of the 30 sub-districts. Based on the results, there are no correlations between the CDRI dimensions at sub-districts in Bandung. This explains that each dimension of the resilience is equally important and independently affected each other. Therefore, the results of resilience assessment in Bandung showed in Figure 4.21 (spider diagrams) a common pattern of dimensions' takeoff point in the improvement of resilience. However, positive high degree of relationship values is identified between the 25 parameters of CDRI. In the institutional dimension; knowledge dissemination and management is related to good governance. For example, the linkage between the effectiveness of sub-districts to learn from previous disasters, availability of disaster training programs for emergency workers, existence of disaster awareness programs for communities, capacity (books, leaflets, etc.) to disseminate disaster awareness programs (disaster education), extent of community satisfaction from disaster awareness programs) depends on effectiveness of early warning systems, existence of disaster drills, promptness of sub-districts to disseminate emergency information during a disaster to communities and transparency of sub-districts to disseminate accurate emergency, and capability of sub-districts to lead the recovery process. Therefore the governance system of sub-districts influences the knowledge dissemination and management of disaster in their areas, thus affecting the institutional resilience of sub-districts in Bandung to disaster and hints for risk communication.

Table 4.9: Degree of relationship between different parameters of the CDRI at sub-districts in Bandung

High degree of relationship	Coefficient of determination (r^2)	Linkage
Knowledge dissemination and management and good governance	0.72	Institutional resilience
Intensity/severity of natural hazards and frequency of natural hazards	0.71	Natural resilience

Other high degree of relationship is between intensity/severity of natural hazards and frequency of natural hazards. For example, in Bandung, the frequency of flood events is influenced by the intensity and the severity of the occurring floods leading to inundations in most areas of city and causing disruption of city's life and impacted the community socio-economically. Most of the flood events are caused by the high amount of precipitation during the rainy season (September until February, up to 1500mm) and human induced issues, such as insufficient drainage system (previously described in Section 4.1.1 and 4.1.2). Consequently, these two factors have an immense role in shaping the natural resilience of different areas in Bandung, thus certain countermeasures, risk reduction activities and communication mechanism have to be designed and adjusted to the needs of neighborhoods.

Table 4.10 and Table 4.11 show the degree of relationship between the CDRI dimensions and attributing factors, such as geographical locations, different types of areas in city, total population, and population density. No relationships are identified between the CDRI dimensions and geographical locations of the sub-districts in Bandung, which underlines that sub-districts have independent resilience values.

However, high degree of relationships is identified between the CDRI dimensions in different parts of Bandung City. In the new developed areas (eastern part of Bandung), the social and economic (r^2= 0.84); social and institutional (r^2= 0.83); economic and institutional (r^2= 0.87); and economic and natural dimension (r^2= 0.85) are closely related. This circumstance is not surprising, since the newly developed areas is the expansion of Bandung, where an equal balance of residential, administrative and business activities can be found in this area. This is a strategy of the city in distributing the growing population equally throughout the city rather than concentrating densely at one spot, which might burden the drainage system. Economic and natural dimension is linked, since the severity, frequency of floods in this area affect the community's economic activity.

Table 4.10: Degree of relationship between CDRI in different type of areas in Bandung

Different types of areas	Coefficient of determination (r^2)				
Center Part	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		NA	0.50	0.014	0.60
Social			0.48	0.65	0.12
Economic				0.18	0.28
Institutional					0.16
Natural					
New developed Areas	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.03	0.003	0.04	0.09
Social			**0.84**	**0.83**	0.65
Economic				**0.87**	**0.85**
Institutional					0.59
Natural					
Old Part of City	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		**0.70**	0.44	0.72	0.25
Social			**0.93**	0.18	**0.80**
Economic				0.03	**0.96**
Institutional					0.001
Natural					
Outer fringes	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.41	0.04	0.21	0.02
Social			0.37	**0.93**	0.22
Economic				0.60	0.07
Institutional					0.16
Natural					
Valley Areas	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		1	1	1	1
Social			1	1	1
Economic				1	1
Institutional					1
Natural					
Residential Areas	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.61	0.0006	0.05	0.27
Social			0.003	0.006	0.57
Economic				**0.75**	0.49
Institutional					0.22
Natural					

In the old part of city, high degree of relationships are showing between CDRI dimensions of physical and social (r^2= 0.70); social and economic (r^2= 0.93); social and natural (r^2= 0.80); and institutional and natural dimension (r^2= 0.96). The physical dimensions stands out in this analysis for the old part of city. The physical infrastructure in the older part of city seems to be neglected and not properly maintained. This is most probably due to most of the attention from government and public organizations that provide basic services are adhered to increase capacity in areas outside the core areas to connect new inhabitants. For example, private housing developers invest the funds into new projects instead conserving the existing infrastructure. This led to socio-economic condition and capacity in this old part of city and eventually affects the resilience. To top that condition, frequent flood events further deteriorate the area and thus affect its institutional arrangement of disaster management.

In the outer fringes of the city, social and economic dimension is highly related (r^2= 0.93). This is understandable that majority of Bandung population are living in this area,

(most dense populated areas of Bandung) have high social development and economic growth. Since most of households are reside closely to each other and contributes to the family's income from more than one source, it contributes to the resilience level in these represented dimensions. Moreover, although in the valley region, a perfect degree of relationship (r^2= 1) is identified, it is discounted from the analysis due to low number of sub-district reside in this region.

Table 4.11: Degree of relationship between CDRI and total population, population density in Bandung

Total Population in sub-districts	Coefficient of determination (r^2)				
Very Low	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.22	0.038	0.28	0.009
Social			0.48	**0.97**	0.35
Economic				0.56	**0.78**
Institutional					0.43
Natural					
Low	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.34	NA	0.10	0.035
Social			0.24	0.33	0.02
Economic				0.60	0.03
Institutional					0.04
Natural					
Medium	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.33	0.07	0.62	0.47
Social			0.10	0.04	0.10
Economic				0.63	0.13
Institutional					0.33
Natural					
High	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		**0.88**	0.23	0.12	0.008
Social			0.11	0.25	0.09
Economic				0.37	0.004
Institutional					0.18
Natural					
Very High	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.18	0.34	0.001	0.002
Social			0.17	0.25	0.58
Economic				0.38	0.31
Institutional					0.34
Natural					
Population Density in sub-districts	Correlation Coefficient				
Low	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.10	0.06	0.02	0.004
Social			0.36	0.28	0.05
Economic				0.25	0.12
Institutional					0.01
Natural					
Medium	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		**0.80**	0.05	0.21	0.10
Social			0.11	0.52	0.007
Economic				0.42	0.02
Institutional					0.04
Natural					
High	**Physical**	**Social**	**Economic**	**Institutional**	**Natural**
Physical		0.21	0.13	0.007	0.02
Social			0.23	0.19	0.10
Economic				0.47	0.28
Institutional					0.47
Natural					

Between CDRI dimensions and total population, high degree of relationships are showed in very low and high total population sub-districts between social and institutional (r^2= 0.97); economic and natural (r^2= 0.78); and physical and social dimension (r^2= 0.88). It is not guaranteed that the socio-economic development is performed better in sub-districts where the total population is low. However, economic growth in the low populated sub-districts of Bandung to a certain extent is affected by the intensity and frequency of hazards. The less number of people lives in a certain region, the less it will affect economically by the disaster event. Moreover, physical infrastructure contributes to the social development of a densely populated community and vice versa. The most densely populated area requires well-established physical facilities, such as basic lifelines and water supply. This implies that the resilience of both dimensions (physical

and social) is intertwined and strongly affected each other in most densely populated sub-districts of Bandung.

Therefore, summarizing the above analysis of the resilience assessment (CDRI), the next step is how to link the resilience assessment (science/evidences/theory) to risk reduction practices. In order to bridge the gap between assessment and practices, communication elicits vital aspect in overall risk management framework. The next section will illustrate the linkage of CDRI (resilience) assessment and the need of risk communication in an urban area, like Bandung.

4.6 The Linkage of CDRI and Risk Communication

Above sections have described the resilience assessment of Bandung to climate-related disasters, advancing the CDRI method. The CDRI assessment was conducted at two stages of administrative units, namely at the city (macro level) and sub-district (micro-city level). This method of assessment is an attempt on how to localize and strengthen the resilience from a macro perspective to micro representation with different multi-stakeholders function and engagement, in achieving one goal; which is building urban resilience to climate-related disasters.

Chapter 2 has discussed that the concept of resilience is closely related to risk reduction; it is pragmatic to apprehend risk reduction tools in order to be able to build resilience in cities. Thus, the resilience assessment, such as CDRI is a high-resolution tool to facilitate local DRR implementation. CDRI was also developed in order to actualize the grounded-driven process at the local levels (Matsuoka and Shaw, 2011). The CDRI provides the tool to assess the resilience at the local/city level. This encompasses the resilience of five dimensions the city owned, (physical, social, economic, institutional, and natural), its strength and capacities. The local government in CDRI is regarded as the key actor for this assessment. However, the results of the resilience assessment (CDRI) are not the end terminal of the assessment. This has to be taken up by the government in the form of coordination of serial actions and filling each other gaps (government and community) and functions that would increase the community resilience of Bandung. At the end, the entire urban components accumulate the resilience and contribute to the implementation of real actions on the ground.

Finally, the last mile of the comprehensive urban resilience assessment is the communication. It is what and how the risk conveyed to the wider public; hence proper actions can be taken and implemented. As have been described earlier in the context of this chapter, once a resilience of a city to climate-related disaster have been measured, the following questions are related to the status of resilience level and capacity of a city, and to what sector is the city at risk? Eventually, how does the city convey the results of resilience assessment and risk information to public; hence appropriate risk reduction actions can be implemented? What kinds of risk communication approaches are to be identified in Bandung? Chapter 2 has extensively illustrated about risk communication. Risk communication highlights an interactive process of exchanging of information and opinion among individuals, groups, and institutions.

The field of risk assessment and risk management has advanced considerably in the past few decades. It has been found that the manner in which the community was informed of the associated risk before, during, and after the event can directly affect whether the event is perceived as being handled successfully or not. Risk communication and its application are then becoming widespread (Maher, 2006). The need for such risk information to climate-related disaster at the local scale in Bandung is one of the central issues, especially for urban development planning. Such information is necessary in order to assess the impacts of climate-related disasters on human and natural systems and to develop suitable adaptation and mitigation strategies at the local level. The end-user and policy-making communities have long sought reliable local scale projections as well as strategies in order to provide a solid basis for guiding the response options, especially for the flood risk in Bandung.

Risk communication has improved in many ways over the years, and there exist now well-established ground rules that communicators, at this respect, local government, must know and use instinctively as they communicate about various risks and hazards (Adler & Kranowitz, 2005). In the current perspective, by providing the public with information, risk communication becomes a two-way communication, which involves providing information, understanding people's perception of the risks, and developing solutions in partnership. As has been described by Shaw and Gupta (2009), information and communication management is the backbone of all the participatory processes involved in urban risk management. It is a cross cutting theme that touches each stage of the urban risk management process and is critical for ensuring that all stakeholders engaged in the activities operate in a coordinate, efficient, and effective manner. Information and communication management could ''soften'' the problems in the participatory process, and ensure collectivity.

According to Takeuchi and Suzuki (2006), in obtaining effective flood risk management, risk communication between residents, local communities, and government agencies will be necessary. Therefore, the disaster prevention knowledge available to each of these groups in Bandung should be improved. And usually, disaster prevention system has three major internal stakeholders. The first one is the government, the second is the community, and the third are the individual members of the community. Besides these, there are other stakeholders like civil society, academics, corporate sectors, media, and international agencies (Takeuchi and Shaw, 2010).

Referring to the above-mentioned statements, for having effective flood risk communication, local government should engage public and collaborate with them and other major stakeholders. Indeed, effective risk communication is a two-way process within participation seen as individuals' and community's democratic right (Adler and Kranowitz, 2005). It is strongly recommended that local government should engage public in a long-term coordinated dialogue using a variety of format, prior, during, and after the disaster, because information and communication management and its associated activities may be inbound with the four stages of disaster management cycle (Shaw and Gupta, 2009) (Figure 4.26).

In terms of importance of understanding the community's interests, to effectively communicate the flood risk issues to a community in Bandung, local government must first understand what issues are important to them. Communities should not be passive recipients of information. There is a need to encourage people to help themselves and communities must be provided with the mechanisms and tools to do so (UN, 2008). Communities need to be active in the information dissemination system and require a technology that is adapted to local needs and conditions.



Figure 4.26: Information and communication issues in disaster management cycle (Source: Mulyasari et al., 2011, adapted from Shaw and Gupta, 2009)

The local authorities should facilitate and empower local actors such as community groups to play a key role in facilitating the risk communication process. Consequently, the involvements of different type of community groups are determining the communication mechanism of climate-related disaster risk. Thus, it highlights the need of risk communication approach through these local actors for Bandung City.

4.7 Way Forward

For the above reasons, therefore the following chapter will characterize important stakeholders, local actors in the community that will act as intermediaries, bridging the communication gaps between the government and community. This is the final stage of the urban assessment, on how the risk and resilience information collected at the root level be conveyed to wider communities in cities that would trigger them in taking appropriate and timely actions.

The following chapter (Chapter 5) will elaborate in detailed the approach and results of risk communication, called SIERA (Social Institutional and Economic Resilience

Actions). SIERA is a tool for conveying the risk and resilience information in social, institutional, and economic resilience manner (assuming that the physical and institutional actions will be delivered by local authorities) through Community-Based Society Organizations (CBSOs) identified in cities, such as the women groups, youth unions, and faith-based organizations to communities as wide as possible (Mulyasari and Shaw, 2012). These actions can be promoted and delivered by various means, such as by community type of activities, printed and electronic media (newspapers, television and radio), as well as by social media (such as interactive communication through social networks). Accordingly, Chapter 5 will illustrate the above three CBSOs as potential actors in risk communication of Bandung in revealing best/appropriate/effective risk communication strategies in enhancing the community-resilience of Bandung to climate-related disasters.

4.8 Key Findings of Chapter 4

To underline the overall results of the resilience assessment at city and micro-city level for 30 sub-districts, Table 4.12 lists the status of resilience values of the five dimensions at city and sub-district perspectives and Table 4.13 highlights the key findings and links to current study.

Table 4.12: Key findings of Bandung CDRI resilience assessment

Dimension	Status Resilience	City Perspective (Parameter-wise)	Status Resilience	Sub-district Perspective (Parameter-and locality)
Physical	▲	▪ All parameters have high value, except: ○ Sanitation and solid waste management (low)	▲	▪ Highest in *center and outer fringes* (dominated by business, offices, and industrial precincts) ▪ *Except* in *mountain area* due to: ○ Poor sanitation and solid waste management ○ Poor accessibility of road network ○ Poor housing and land use
Social	▼	▪ All parameters have relatively high value, except: ○ Population and Health (low) ▪ High in: ○ Social capital, Education and awareness, and Community preparedness	▲	▪ Almost high in all sub-districts ▪ *Except* in *northern part of mountain area* due to: ○ Lack of social cohesion (social capital) ▪ *Except few in outer fringe of city* due to: ○ High population density
Economic	▼	▪ Low in: ○ Income, Finance and Savings, and Budget and Subsidy for disaster management ▪ High in: ○ Employment and Household Assets	▲	▪ Varied from one sub-district to another ▪ Except in *the eastern part of mountain area, few in outer fringes, and old part*, due to: ○ Low and no alternative source of income ○ Low/no budget and subsidy for disaster management ○ High unemployment rate compare to other areas
Institutional	▼	▪ Low in Good Governance on: ○ Effectiveness of early warning system, disaster drill, promptness of city body to disseminate emergency information during a disaster	▲	▪ High in newly developed areas, due to: ○ High in effectiveness crisis management ▪ *Except* in *the outer fringes and eastern and northern part of mountain area*, due to: ○ Low in disaster risk knowledge and dissemination management ○ Low community preparedness ○ Low in effectiveness of crisis management
Natural	▲	All parameters have relatively high value, except: ○ Ecosystem services and Environmental policies	▼	▪ Varied from one sub-district to another, *major contributor for low value:* ○ Low enforcement in environmental policies in land use and ecosystem services ▪ Low in *old part, residential and newly developed areas, and northern part of mountainous area* due to: ○ Insufficient drainage system ○ Less open green spaces due to high construction development

Box 4.1: Key findings of Chapter 4 and linking to the current study

Highlights of Chapter 4 and link to current study
▪ The implementation of resilience assessment in the study is as an approach to institutionalize local initiatives in risk reduction that are not enough reflected in the national context ▪ Resilience assessment at the city level supports the Government of Bandung City in pointing out weaker and stronger sectors in stimulating action planning of DRR and resilience activities. Particularly, city is weak on: o Social, Institutional, and Economic sectors (such as in terms of population; health; income; finance and savings; budget and subsidy for Disaster Management; good governance in disaster management such as establishing early warning system, disaster drill, promptness of city body to disseminate emergency information during a disaster; and disaster risk knowledge dissemination and management). o Therefore city depends on local potentials to increase the resilience of those sectors ▪ Resilience assessment at the sub-city level, sub-districts as micro entities in Bandung, helps to contextualize specific DRR and resilience activities and reveals the local potentials. o Micro-entities are strong in Social, Institutional, and Economic sectors (such as in terms of population; health; community preparedness; social capital; income; and institutional collaboration, except budget and subsidy for disaster risk management is low). o These are the local potentials by local actors that may contribute to local DRR and community resilience and need to be endorsed by city government ▪ Common issues and challenges faced by the Government of Bandung City and its 30 sub-districts such as budget and subsidy for disaster management and environmental policies are depending on the priorities and plans set initial at the city level. However, income and ecosystem services are contextualized and depending on small-scale efforts ▪ In addressing the issues and challenges as the consequence of resilience assessment, local potentials by local actors are crucial in communicating these common risks to wider communities

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Chapter 5
Risk Communication at the Community Level in Bandung

"Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers."
~United Nations, Universal Declaration of Human Rights

Chapter 5
Risk Communication at the Community Level in Bandung

This chapter provides the illustration of local actors such as the Women Group, Youth Group, and Faith-Based Organization that are categorized as Community-Based Society Organizations (CBSOs) and are the largest community groups in Bandung, Indonesia. The chapter illustrates further the example of their disaster risk reduction (DRR) activities and highlights the potential role of three CBSOs as risk communicators in Bandung, Indonesia. A framework is developed for CBSOs' risk communication process in bridging the gap between the local government and the community. A set of indicators in social, economic, and institutional resilience activities (SIERA), with a scope of 45 DRR activities covering three different disaster periods was developed to characterize the delivery process of risk information by these CBSOs through their activities at sub-district and ward levels in an attempt to increase community resilience to climate-related disaster.

5.1 Introduction to Community-Based Society Organizations (CBSOs) in Bandung

The importance of institutionalizing local initiatives is one of the key findings of disaster risk reduction efforts and resilience at the national level (Indonesia's context). Following, one of the key findings in the previous chapter (Chapter 4) identified that local actors are needed in enhancing the resilience to climate-related disasters and addressing the issues, challenges, and risks in Bandung City. Therefore local potentials inhibited by local actors are crucial in communicating these common risks to wider communities. These local actors are described thus as disaster risk reduction drivers at the local context and exist throughout Indonesian region as Community-Based Disaster Society Organizations (CBSOs) for Community-Based Disaster Risk Reduction (CBDRR). Following sections are illustrating the CBSOs in Bandung City, how they are analyzed as risk communicators through SIERA approach and what are their implications to the risk communication in enhancing climate-related disasters in Bandung.

5.2 Characterizing the CBSOs in Bandung

The example of the participation of different CBSOs for CBDRR in Indonesian region, such as in cities like Bandung, is illustrated below. Generally, the CBSOs in Indonesian cities that could be categorized as three major groups are as follow:

- Women Welfare Associations *(TP PKK/Tim Penggerak Pemberdayaan Kesejahteraan Keluarga),*
- Youth Unions *(Karang Taruna),* Youth Disaster Response *(Tagana/Taruna Siaga Bencana),* and Indonesia National Committee for Youth *(KNPI/Komite Nasional Pemuda Indonesia)*, and
- Faith-Based or Religious Organizations *(DKM/Dewan Keluarga Masjid and Pesantren/Islamic Boarding Schools)*.

These three groups were selected for the study because of the followings:
Those groups are typical CBSOs that could be found nationwide in Bandung, whether in rural or urban areas and are mostly working with communities. Since they are working together with and for communities at large, those CBSOs have access to vast human resources and have great influences to bringing the change within the community. Their current status has shifted from the implementer (the length hand of local government) to the conception/creator and mainstreamer of community development activities. Their contributions to the communities are varied in many ways. From the family

planning campaign, health and sanitation education, women empowerment, organizing national independence commemoration event, until public religious education and volunteering. Their efforts in supporting the government to reach wider public have been recognized and are labeled as community educators, intermediaries, and community facilitators. (Mulyasari and Shaw, 2012). Moreover, these three types of CBSOs are mentioned in the framework of CBDRM in Indonesian context, based on the results of serial CBDRM symposiums in Indonesia. Each of those CBSOs is characterized in following sections.

5.2.1 Women Welfare Associations

The Women Welfare Associations or well-known as TP PKK, *(Tim Penggerak Pemberdayaan Kesejahteraan Keluarga)* are one of major CBSOs in Indonesia (Mulyasari and Shaw, 2012). These associations are spread and found throughout the Indonesian Country. They are established in different administrative levels of governance hierarchy, from the national until the smallest administrative units at ward (in the cities) and village level (in rural areas). At the national level, the Women Welfare Association is headed by the wife of the Minister of Home Affairs, at the provincial level is headed by the wife of the Governor, at the city level is headed by the wife of the mayor, at the sub-district level is headed by the wife of the head of the sub-district, and at the ward level is headed by the wife of the ward leader. These positions in return will be changed once a five-year election, in line with their husbands' regional leadership elections.

The Women Welfare Association (TP PKK) is a unique group of women; a semi-formal organization, non-profit social institution that is neutral (not affiliated to any particular political party); yet is subsidized by the government. Referring to their historical root in 1967, according to Central Secretariat of TP PKK (2006), TP PKK was established behind the motivation to improve the condition of Indonesian families. More than 50% of Indonesia's population is women, especially those who are living in rural areas. And most of them could be found in the low economic status and education levels. This is one of the factors that caused low rate of life expectancy, which is for males: 63 years and females: 67 years. The maternal mortality rate (MMR) is quite high at: 307 per 100,000 live births, and the infant mortality rate (IMR) is also significant high, namely: 46 per 1,000 births. Recognizing these, the TP PKK moved to increase its activities, particularly for the efforts of decreasing the MMR and IMR rates. Seeing the unfortunate condition of Central Java Province people, back then, the wife of the Central Java Province Governor, *Madame Isriati Moenadi*, pioneered the establishment of Family Welfare Movement (TP PKK) as a community movement that aims to "family welfare, on the awareness and skills that family own ". TP PKK is a movement that grows from the bottom of the development, for and managed by the community towards the realization of a welfare and prosperous family as their vision.

In order to achieve its vision, TP PKK has adopted ten (10) main programs, including the efforts to meet the basic human needs, namely in fulfilling the physical, mental and social aspects. Those ten main programs are as follow: (1) appreciation and implementing the *Pancasila* (foundation of the Indonesian state of ideology), (2) mutual cooperation (which are attitudes that are rooted in tradition, culture, local

wisdom/indigenous knowledge, community life, etc.), (3) food, (4) clothing, (5) housing and household management, (6) education and skills, (7) health, (8) development of cooperatives life, (9) environmental sustainability, and (10) planning a healthy life (TP PKK, 2006).

When talked about WWAs, why focusing on women's groups? Although women have multi responsibilities in domestic domain (e.g. income earners, food producers and consumers, caregivers of family), however, Enarson (1998) states that women's environmental leadership, indigenous knowledge of local resources and their knowledge of family and community history are significant assets in responding to environmental crisis. Therefore, appropriate DRR activities must be viewed through the women's perspective. Women can be change agents in DRR if they are given important roles in taking appropriate and timely actions in response to warnings. Fordham (2001) refers to a research, which showed that women are more likely to be active during emergent community disasters. Another study in California referred to by Enarson (2006) states that more women than men responded to earthquake aftershock warnings by seeking more information to secure household items and developing family emergency plans.

Although women are often at greater risk than men in disasters, it is the women who make it possible for the community to cope with disasters due to their central social role in disaster coping management, especially in women participation in community resilience development (Enarson, 2000; Khatun, 2003). Post May 2006 Java earthquake information showed that grassroots women played active roles, worked alongside men to organize their communities, and participated in decision making in the absence or before receiving external support, such as running temporary shelters, community kitchens, and aid distribution (UNISDR, 2007). In addition, women ward leaders organized debris cleaning and were resourceful in using the different kinds of assistance received. A non-governmental organization provided them training through a community-based training-of-trainers workshop which included confidence building, decision making support, assistance in the creating training tools, and helping community leaders train nearby communities on how to run community kitchens. Additionally, grassroots leaders from a tsunami-affected area in Aceh shared their experience and knowledge of safe construction supervision, composting and craftsmanship to enhance income (UNISDR, 2007).

The key message of these examples is that women are not "beneficiaries" but key actors in DRR who are able to organize community responses to immediate practical needs. Another example on the role of WWAs in disaster is showed in WWAs of Bandung. Their role is mainly in organizing the community kitchen and organizing training for the community, such as flood preparedness and awareness. For example, the WWA in Sub-district No.15 (*Kecamatan Bandung Kulon*) have regularly invited experts and organizations such as fire fighters and local government to give them and their surrounding community training. Another type of WWAs' involvement in disaster is mobilizing and encouraging the community in volunteering to undertake actions when a disaster occurs. Following table (Table 5.1) illustrates various women DRR characteristic in groups around the globe and Indonesia.

Table 5.1: Women DRR characteristics in Indonesia and around the globe

Women and DRR	Source
▪ Women are more likely to be active during emergent community disasters	Fordham (2001)
▪ Women than men responded to earthquake aftershock warnings by seeking more information to secure household items and developing family emergency plan in California	Enarson (2006)
▪ Women make it possible for the community to cope with disasters due to their central social role in disaster coping management, especially in women participation in community resilience development	Enarson, (2000), Khatun, (2003)
▪ Post May 2006 Java, Indonesia earthquake information showed that grassroots women played active roles, worked alongside men to organize their communities, and participated in decision making in the absence or before receiving external support, such as running temporary shelters, community kitchens, and aid distribution ▪ Women ward leaders organized debris cleaning and were resourceful in using the different kinds of assistance received. A non-governmental organization provided them training through a community-based training-of-trainers workshop which included confidence building, decision making support, assistance in the creating training tools, and helping community leaders train nearby communities on how to run community kitchens ▪ Grassroots leaders from a tsunami-affected area in Aceh, Indonesia shared their experience and knowledge of safe construction supervision, composting and craftsmanship to enhance income to women groups	UNISDR (2007)
▪ Women are more likely to receive risk communication due to their wide social networks and their tendency to provide protections ▪ Women tend to hear and heed warnings from their peers, neighbors, friends, and relatives more than men ▪ Women tend to relay these warnings to their husbands. The influence of women can greatly contribute to the adoption of protective measures and hazard adjustment	Perry and Lindell (1986)
▪ Social networks are effective in communicating or transferring knowledge, which leads to a form of social capital, or shared meaning that contributes to actions toward risk reduction and resilience building ▪ Social networks based on gender could have a more positive social value and greater strategic significance in the communication of vital information. Members of these networks are the keys in offering support and providing access to local knowledge on various community issues. ▪ Social networks provide a large membership base for consultation on various community issues plus a commitment to act	Gandelsonas (2008 , 2010)
▪ A woman in Bangladesh organized a committee of women for flood preparedness. The committee teaches women how to build portable clay ovens, elevate their houses, and use radios to learn of possible floods or changes in climate, resulting in not only saving many lives but also empowering women in society.	Oxfam (2007) in UNISDR (2007)
▪ A study in Indonesia showed that through radio, women contributed to disaster information dissemination at the time of the flash flood in the South Sulawesi regencies	Tanesia (2007)
▪ Groups of women contributed to the reconstruction of houses after the floods that occurred in North Pakistan in 1992 ▪ Women relief workers assessed the needs of women and involved them in the planning and implementation of rehabilitation activities. Local women were registered as heads of their house-holds to ensure efficient distribution of relief goods. ▪ Women's organizations articulated women's needs and were responsible for community development. These are prime examples of how women through social networks were able to contribute to disaster risk communication, preparation, reduction, as well as post-disaster rehabilitation.	Duryog Nivaran (2006)
▪ Women's extensive and close-knit social networks play a significant role toward resilience, and they find government or official communications credible and trustworthy ▪ Participation of women in social networks as a key factor in dis- seminating vital information.	Enarson (2009)
▪ Women tend to participate in trainings and volunteer work for disaster preparedness programs ▪ Women can fulfill a leadership role among organizations concerning disaster issues. Women see disasters as a threat to their home and community that leads them to become active in these groups and extend their traditional domestic roles and responsibilities	Nehnevajsa (1989) in Fothergill (1996), Neil and Phillips (1990)

Thus, the aforementioned characters are inhibited by women in groups, such as Women Welfare Associations (WWAs), could be highly regarded as a potential driver and change of agent for DRR and risk communication activities within the communities. It is seen not only from their possible programs, but also from the women's spirit and strong will to improve their life, families, and surrounding community (Mulyasari et al., in press). Figure 5.1 shows exemplary WWAs activities in cities in Indonesia.



Figure 5.1: Women Welfare Associations activities in cities in Indonesia. WWA as organizer of community meeting in a ward in Bandung (left) and WWA activities of Cengkareng Sub-district, Jakarta in planting home medicines as promoting green urban space and women's economic activity (right) (Photo courtesy left: UNPAD, 2012; right: PKK Cengkareng, 2012)

5.2.2 Youth Unions

Similarly, the youth movement in Indonesian region, like Bandung, has same characters as the women associations. According to Department Social Affairs (2006), *Karang Taruna* is the umbrella organization for the youth. *Karang Taruna* or the Youth Union is a coordinating institution of which several programs ought to be carried out involving all the components and potential in youth of urban as well as rural areas. These youth unions are working in the field of social welfare and community development. The youth unions as far as possible should be able to demonstrate their function and role optimally. As an organization, it has a board of management and a full member of youth participation. Each member can carry out their functions in their respective sectors and are able to work together with the local administration. Having clear activities' programs in accordance with the needs and problems that exist around the youth and surrounding community, those programs are institutionalized and sustained, focusing and involving all elements of younger generation.

In 1960, the Ministry of Social Affairs of Republic Indonesia established the Youth Union (YU), a youth group within the range of age 13 until 45 years old (Ministry of Social Affairs, 2010). The YU is part of a larger youth organization in Indonesia, which can be found at the city and village level. The youth unions' leaders are mostly selected at the city level and elected at the sub-district and ward level for five working years. The Ministry endeavors to raise social responsibility among the youths in Indonesia and therefore established the YUs throughout the country. The YU was established with the purpose of providing guidance and empowerment to the youth in the areas of organizational, economic, sports, skills, advocacy, religious and arts. The YU is a non-political forum, which grows on the basis of awareness and sense of social responsibility of, by and for the community. The YU is mainly engaged in social welfare activities. In addition, as a social organization, YU coaches the youth for development and empowers them to advance productive economic activities with the potential utilization of all available resources, both human and natural. The YU has a Basic Guidelines for its management, which was based on the structure and tenure of the committee in the respective region ranging from the village to the national level.

In the urban areas, one of the Youth Union's strengths is the ability to raise funds that comes from the government and private sectors for the implementation of community program activities. As a case example, for particular events such as yearly national independence commemoration day (August 17th) and religious festivity the youth within the ward are gathered and developed plans in organizing and holding the event. It starts by raising the funds from the community, organizing until implementing the event for the community. The youth that are gathered in the Youth Union are volunteers and considered as a motor engine in rolling the activities within the community. This organization is independent from nature with voluntary work as its base. In the rural areas, the youth has applied another approach to serve and participate in the rural community development, especially in the field of raising the social welfare. One of many components that the youth play important role for rural development, is the community empowerment organization *(LPM/Lembaga Pemberdayaan Masyarakat)*. LPM is a public institution, representing the aspirations of all communities in the rural development in a holistic manner (ideology, political, economic, social, cultural, religious, security and defense) and has the task of organizing meetings in the village; hence the Youth Union has the coordination, consultation, correction task and gives criticisms/suggestions together with the LPM. Thus the Youth Union has the main task of empowering the youth with LPM program to be jointly addressed the social welfare issues with the local government, as a form of community participation (Ministry of Social Affairs, 2011).

In accordance with each Youth Union's conditions, it is expected to respond and manage the social welfare problems of youth and community. In general, LPM as a vehicle for community participation (including the Youth Union) will always give the spirit, encouragement and support the community development through programs that have been planned for the youth. With the provision of their capability and reliability, Youth Union will be able to optimally tackle the social welfare issues. Thus via the LPM's programs, the Youth Union is able to contribute to the youth and community optimally and increase the social solidarity among them. Other community's beneficial issues that are covered by the Youth Union are the prevention of juvenile crime and delinquency as well as drug- and alcohol abuse. As a form of community participation and volunteering; delivering social services and rehabilitation, such as: environmental protection and sanitation, support the vulnerable groups such as children, disabled, women, elderly, and disaster victims, are done by the Youth Union well. Other socio-economic activities like economic development through cooperation with existing social organization, such as the formation of the joint business group, enhancing skills and entrepreneurship are examples that are explored and done by the Youth Union at the national level.

Specified targeted for disaster emergency and response, the Ministry of Social Affairs has formed *TAGANA (Taruna Siaga Bencana*/ Youth Disaster Response) with the personnel of more than 30,000 people throughout Indonesian provinces. It is enacted by Law No. 11 year 2009 about Social Welfare and Ministry Regulation No. 82/HUK/2006. Its member is mostly the youth, but it is not limited to any productive age of people as well (Ministry of Social Affairs, 2011).

Other type of the youth union, which can be found at the national and provincial level, is the so-called KNPI *(Komite Nasional Pemuda Indonesia*/Indonesia National Committee for Youth). KNPI is an umbrella organization of youth assembled and is the core of the strength of Indonesia's youth. In line with KNPI paradigm shift, the role and main duties of KNPI is to oversee the changes in society towards the creation of the Indonesian people who qualified, dignified, just, and prosperous society in an egalitarian and democratic life (KNPI, 2011). It addresses the youth's issues on global scale, as an example, the KNPI is acted as a host for International Youth Forum on Climate Change for the year 2011. Table 5.2 below illustrates several practices of youth involvement in DRR within different spheres in Indonesia and around the globe.

Table 5.2: Youth DRR in Indonesia and around the globe within different spheres

Sphere	Youth DRR	Source
Youth and Schools	• Through conduction of survey in the US, a large number of youth have engaged in community service as part of a school activity. Students volunteer through religious, school, or youth organizations.	Fox, Machtmes, Tassin, and Herbert (2007)
	• Students in El Salvador work with the community in designing risk maps and community emergency plans, setting up early warning systems, and implementing response, mitigation, and risk reduction.	UNISDR (2007a)
	• High school students in Philippines propose and succeed in the relocation of a school from a landslide prone area.	Plan International (2010)
Youth and Formal Organization	• The International Federation of Red Cross (IFRC) and Red Crescent Societies (RCS) in collaboration with the German Red Cross initiate the project, Disaster Preparedness in Schools in Indonesia, by involving the Red Cross Youth. The Red Cross Youth are equipped with training and resources to allow them to lead activities in sharing information with students on disasters and identifying risks around schools. The Red Cross Youth encourage the youth to disseminate information about the project with other community members.	IFRC and RCS (2010)
Youth and Informal/Volunteer Group	• Participation in the Philippine Society of Youth Science Clubs, Inc. (PSYSC), a non- profit NGO with annual membership of more than 100,000, which include elementary school pupils, high school students, and science and math teachers. PSYSC organizes a national summer camp where science clubs members learn how to prepare for hazards and respond to disasters.	Fernandez and Shaw (in press)
	• Bandung Disaster Study Group (BDSG) is a volunteer-based group composed of university students, young researchers and lecturers who are concerned about DRR issues in Bandung City, Indonesia. BDSG focuses on nurturing young people to conduct disaster education activity with various groups and levels of society and developing methods and approaches to DRR education. BDSG has been conducting a Homestay and Youth Exchange Program in DRR with youth groups in Japan since 2010.	BDSG (2013)
Youth and Communities	• *Karang Taruna* (Youth Union) and TAGANA (*Taruna Siaga Bencana*/ Youth Disaster Preparedness Unit) in urban and rural areas in Indonesia actively engage in fund raising, community kitchen, build back the community in terms of repair of damaged houses, and doing community watching (security) during and after a disaster.	Ministry of Social Affairs (2010)
	• Youth of *Muhammadiyah* (Civil Society-Religious-Based Organization) in West-Central Java and Sumatera Province, Indonesia facilitate and conduct disaster training and drills and develop disaster education materials (conducting risk mapping and developing evacuation route) with the communities.	Takeuchi, Mulyasari, and Shaw (2011)

Figure 5.2 below shows the activities by the Youth Unions in cities in Indonesia.



Figure 5.2: Youth Unions activities in cities in Indonesia. Youth Union raising funds for flood affected people (left) and held anti-drugs campaign in Kediri City (right)
(Photo courtesy left: Santika, 2011; right: Tosaren Kediri, 2011)

5.2.3 Faith-Based or Religious Organizations

Many religious organizations or groups are forming within the country; some of them have a strong and long historical background, dating from the old colonial time. Many of them were established as a means of promoting the social welfare as well as education of their members, as an alternative to those provided by the colonial ruler. Several of them have strong roots among the population spread in most parts of the country. In many cases they have charismatic, respected leaders, which represent informal leadership within the communities and often act as the counterpart of the government officials in the daily social and political activities. They are often considered as having a strong potential power to implement disaster reduction awareness programs among their followers. Implementing CBDRR activities among their communities can be considered as an attractive challenge, as many of them have been involved in many disaster relief and recovery activity during disaster situation. Partnered with an academic or research institution that can act as their technical support, these organizations can develop a potential capacity for conducting and implementing CBDRR programs (Mulyasari and Shaw, 2012).

Nahdlatul Ulama and *Muhammadiyah*, two large Islamic organizations with long history in Indonesia, have been implementing CBDRR activities involving school children and *pesantren* (Islamic religious boarding school) students, youth Islamic organizations and communities around *pesantren*. A research center of ITB (Institut Teknologi Bandung), named Center for Disaster Mitigation (CDM), under a collaboration scheme with those two organizations, provided technical support in the capacity building, developing, planning and implementing their CBDRR programs (CDM-ITB, 2007). Those two religious organizations are putting effort for building disaster risk awareness among the community as well as their members, by organizing community workshops and trainings and conducting participatory activities related to understanding hazard in the areas where they live. Facilitation are carried out to bridge the hazard knowledge gap of the people and to develop common sense for safety culture among the people. The programs are designed such as the beneficiaries will include people who lives in rural as well as urban area, as they are both vulnerable to various hazards due to lack of

knowledge, lack of access to infrastructure and services, as well as lack of opportunity and resources which impede the implementation of DRR initiatives.

Another vulnerable group are the children, who are often considered as potential target for disaster awareness program, as they represent the future generation of the country, as well as the fact that they can act as ambassadors or media to communicate the information to their parents and older member of the families. *Nahdlatul Ulama* designed the program to include *pesantren* (Islamic boarding schools), which count for more than several thousand spread out around Indonesia as their capacity building target, because these *pesantren* are expected to act as the local center of excellence in disaster information and as the development agent within their community. *Muhammadiyah* organization targets elementary schools and youth organizations under its jurisdiction for the disaster awareness programs, and expects that the two entities can act as agent of development in building the safety culture among their communities.

To develop the capacity of the religious organizations in implementing CBDRR processes, at the outset, the CDM-ITB had established a clear objective of their programs, who will be the targets and who will be the main actors. Expected output and outcomes as well as tangible, auditable and accountable performance indicators are identified. Need assessment was done in order to gain the information regarding what kind of knowledge do they need, what kind of skill they should have and what capacity in the first place they already have. Once after the needs have been analyzed the transferring process is started. Training and trainings of trainers (ToT) are carried out as the first step necessary to strengthen the capacity of the religious organizations to develop and implement their own (CBDRR) programs as well as their own facilitators. Relevant dissemination materials are developed to be used in the CBDRR implementation programs, such as the materials of introduction and concept of disaster management, knowledge of hazards (earthquake, flood, tsunami, landslides, volcanic eruption, tornado, and fire), methods on how to deliver disaster awareness materials to school children with special characteristic in Islamic teaching; and CBDRR techniques and tools (community participatory hazard and vulnerability assessment, community action planning, psychology, how to communicate with children and adults as well). Simulation, drill, exercise and experiment are used to enhance the training delivery.

As for the term of monetary issue, funding is always one of the crucial issues raised by the community organizations for sustaining CBDRR programs. The strategies to deal with the financial issue include building the capacity to develop sound proposals, seeking and developing networks with national, regional, and local government and non-government organizations, including international multilateral and bilateral aid agencies. Realizing the two years program, a strong and well-managed project organization within the implementing agencies (the religious organizations) with adequate human resources supported by appropriate leadership and good communication are indispensable to the successful implementation of these programs. A strong commitment from related stakeholders will ensure the sustainability of the initiatives.

Another type of Faith-Based or Religious Organization is DKM *(Dewan Keluarga Masjid/Mosque Council)* that can be found at any major mosques at the sub-district and ward level. These Mosque Councils are independent, yet has an organization structure that is headed mostly by the elderly or community leader. Their activities are mainly fund raising for the poor and organizing religious events, such as providing the religious materials and educated the youngsters as well as holding a men and women forum for conveying and discussing not only the religious matter, but to address social issues as well. Therefore due their religious and social function of these mosque organizations that are highly influential in communities, local government have considered FBOs as their partner in conveying their development programs and campaigns. Figure 5.3 below shows the activities by the FBOs in Indonesia.



Figure 5.3: Faith-Based Organization activities in cities in Indonesia. Mosque as evacuation place for disaster affected people (left) and women mosque members prepare meet to be distributed to poor people after a religious event.
(Photo courtesy left: Pikiran Rakyat, 2010; right: Semen Indonesia, 2012)

Thus, to summarize, Table 5.3 provides the summary of the aforementioned CBSOs' characters in Indonesia.

Table 5.3: Summary of Community Society Organizations' character in Indonesia

Community Society Organizations (CSOs) Type	Characters
Women Associations/ *TP PKK*	• Women participation • Independent • Yearly subsidized budget • Headed by the wives of appointed administrative leaders • Established from National until Ward level • Focusing on Family Welfare
Youth Unions/*Karang Taruna, TAGANA, KNPI*	• Youth participation • Volunteer • Fund raising from community and donors • Headed by the elected youth leader • Established in urban as well as in rural areas • Focusing on the socio-economic issues
Faith-Based or Religious Organizations/*Pesantren, DKM*	• Unlimited age of participation • Independent and volunteer • Fund raising and small amount of government subsidy • Headed by community leader (high influenced person) • Focusing on religious and social activities

Source: (Mulyasari and Shaw, 2012)

The following sections will describe the social capital that is inhibited by the CBSOs and how this capital can strengthen risk communication process in the community.

5.2.4 Social Capital of CBSOs for Risk Communication

Previously, different types of CBSOs in Indonesian city, such as Bandung have been mentioned and their characteristics have been described. Possible factors that enable their activities link with disaster risk reduction is exemplified in Table 2..Chapter 2. Further step would be how to capitalize all above mentioned to be an effective Community Based Disaster Risk Reduction. In detail, this section describes how those characters; benefits of the CBSOs can be captured and utilized in mobilizing the efforts and attempts of the community to reduce the underlying risks. Consequently, the CBSOs are the social capitals and marked as potential "vehicle" for the community to address their needs and participation in disaster risk reduction.

Before elaborating of how to capitalize the above three CBSOs for CBDRR, one asked why the CBSOs enhance social capitals. Following arguments has been made by Putnam (2000): First, social capital allows the communities to resolve collective problems more easily. People often might be better off if they cooperate, with each doing her/his share. Second, social capital greases the wheels that allow communities to advance smoothly; where the people are trusting and trustworthy, and where they are subject to repeated interactions with their fellow citizens, in everyday business and social transactions that are less costly. A third way is that social capital improves the lot, by widening the awareness of the many ways in which the fates are linked. When the people lack connection to others, they are unable to test the veracity of their own views. The networks that constitute social capital also serve as conduits for the flow of helpful information that facilitates achieving the goals. Social capital also operates through psychological and biological processes to improve individual's lives. Community connectedness is crucial, whereas being connected is nowadays demand. Consequently, CBSOs such as WWAs, YUs, and FBOs in Bandung could at the first place regarded as facilitators, intermediaries, and public educators or informal educators. Again, Putnam's (2000) discussed the social capital that provides informal educators with a rationale for their activities. The classic working environment for the informal educator is the group, club or organization, or the CBSOs. Below are several rationales are pointed out by Putnam (2000):

First, the simple act of joining and being regularly involved in organized groups has a very significant impact on individual health and well-being. Working in the appropriate manner that people may join groups – whether they are organized around enthusiasms and interests, social activity, or economic and political aims – can make a considerable contribution in it. Encouraging the development of associational life can also make a significant difference to the experience of being in different communities, for example the case of schooling is highlighted. Educational achievement is likely to rise significantly, and the quality of day-to-day interaction is likely to be enhanced by a much greater emphasis on the cultivation of extra-curricula activity involving groups and teams. As Shaw and Takeuchi (2009) have also proposed that the education in risk reduction should go beyond textbooks and it should also involve experiential learning.

The books may provide the knowledge, but it is more important to transform the knowledge into practice in the form of practical training such as disaster drill, capacity building, and experiential learning through people, community, and CBSOs in Bandung.

Second, informal education's longstanding concern with association and the quality of life in associations and CBSOs can make a direct and important contribution to the development of social networks as well as the relationships of trust and tolerance that is usually involved. Within WWAs, YUs, and FBOs in Bandung, there are place for bridging, bonding and linking the social capital. Such informal education activities can be implemented, for example through town watching, disaster drills, cultural performances, and parents- and local community involvements. These activities can be distinguished in their learning process and tools (Mulyasari et al., 2011). Basically, those activities bring communities into contact with other community members, bond a linkage and eventually form a social capital, society networks, and society organizations or community society organization.

Third, according to Putnam's (2000) analysis, for example, a crime can be reduced, educational achievement can be enhanced and better health can be fostered through the strengthening of social capital. Significantly, this entails working across communities – and in particular sustaining the commitment and capacities already involved in CBSOs, and encouraging those on the cusp of being actively involved. Last but not least, interaction within the CBSOs, enables people to build communities and to commit themselves to each other, and knit the social fabric. There have been a number of definitions of social capital; Begum (2003) had summarized the following: "Social capital is a resource, private and public, inherent in the structure of relationships in organizational social networks and interpersonal relationships".

Begum (2003) also mentioned that according to this view, social capital is not a characteristic that can be looked at in isolation; rather, it achieves meaning relative to other forms of capital, such as physical, financial, human and cultural; and community resources at large, such as infrastructure, government social spending and public investment, and role of private business. In addition according to what Putnam (2000) has mentioned earlier that social capital entails working across communities, Begum (2003) stated that social capital could also be used to promote objectives of participation and community involvement that are key to many government regeneration initiatives. WWAs and YUs in Bandung have set their priorities of working areas inline with governmental programs (see Section 4.1 Chapter 4 and Section 5.2.1 and 5.2.2), while FBOs are regarded as local government's partner in community development. This means that the renewed focus on community involvement is part of systematic efforts to establish greater links between the community and the government.

Thus, mentioned issues above are describing how the existence of the WWAs, YUs, and FBOs in Bandung as a social capital can be captured and adopted. They take shape as the motor engine for the community in Bandung to commonly undertaken risk communication process, wrapped up in their DRR activities in enhancing the resilience.

5.2.5 Survey of CBSOs in Bandung for Risk Communication

CBSOs such as WWAs, YUs, and FBOs, were therefore surveyed on their risk communication at communities through their activities. There are three types of survey for the CBSOs, targeting the organizations that are the closest to communities. The targets of the respondents are the heads and leaders of each organization. These leaders are influential persons and regarded as the motivators of the communities. More on the rationale to select them, as the respondents, are further explained in each organization's section (following sections). The Profile of the surveys is presented in Table 5.4

Table 5.4: Profile of the surveys of CBSOs in Bandung

CBSOs	Respondent	Where	Specific detail
Women Welfare Associations (WWAs)	Heads of WWAs	WWAs at ward levels (total 150 = 150 heads = 150 organizations)	No specific age limit
Youth Unions (YUs)	Leaders of YUs	YUs at ward level (total 150 = 150 leaders = 150 organizations)	No specific age limit
Faith-Based Organizations (FBOs)	Leaders of Mosque Councils	Mosque at wards (total 150 = 150 leaders = 150 organizations)	No specific age limit. One mosque per ward was selected. The mosques are located within neighborhoods and not on major roads or office-based.

The next section describes the approach of these three CBSOs risk communication at communities; through what kind of method they are analyzed to pinpoint their risk communication processes and actions that might be of effective in enhancing the resilience of Bandung and its communities.

5.3 Risk Communication Approaches through SIERA

The potential of CBSOs in contributing to DRR leading to disaster resilience and how disaster risk and reduction activities can be conveyed and implemented in communities, needs to be explored in a specific approach. Previously mentioned, these DRR activities can be reflected in their day-to-day life and regular programs and have a scope of outreach as wide as possible (until the household level).

The CBSOs inhibit DRR activities reflected in the resilience dimension that are close to CBDRR. In Chapter 4, Kyoto University in collaboration with the Government of Bandung City (represented by Bandung Development and Planning Agency/BAPPEDA Kota Bandung) (KU, Government of Bandung City, ITB, 2012) conducted a climate and disaster resilience mapping in November 2010 by advancing the Climate-Disaster Resilience Index (CDRI) method developed by Joerin and Shaw (2011), which have been also discussed in Chapter 4. Chapter 4 also illustrated the linkage of resilience assessment and risk communication in increasing the resilience. The following section delineates the risk communication process of CBSOs named SIERA (Social Institutional Economic Resilience Activities) approach.

5.3.1 The Evolution of SIERA Approach

This study investigated the potential role of CBSOs in delivering risk information to communities and how it can be best implemented in a specific approach. At the initial stage of the approach, a climate and disaster resilience mapping in November 2010 using the Climate-Disaster Resilience Index (CDRI) method developed by Joerin and Shaw (2011) is conducted. The CDRI is a tool to measure the resilience of a system (city with its government, institutions, infrastructures, and communities) towards climate-related disasters. The CDRI of Bandung City underpins the need to address various aspects of resilience that are challenged before the occurrence of a disaster. The CDRI provides a comprehensive baseline assessment that addresses the linkages of the system, those between various aspects of actors and components of the city. This resilience assessment looks at five (5) dimensions and twenty-five (25) parameters. Resilience is of importance in the disaster risk reduction approach because it measures the capacity of a system, such as a city system that has various forms of dimensions (physical-, social-, economic-, institutional-, and natural resilience) to respond and recover from shocks and stresses. Once the resilience is measured, targeted and specific actions could be then implemented to enhance resilience and at the same time reduce risks. The results of the resilience assessment have been elaborated in the previous chapter (Chapter 4).

Based on the CDRI tool, the resilience dimensions that can be strengthened and implemented by CBSOs are social, institutional, and economic ones. Social resilience and economic resilience are the most determining factors of resilience that give the course of sustainable development. Social resilience is an important component in circumstances under which individuals and social groups adapt to environmental change. Adger (2000) states that ecological and social resilience may be linked through the dependence on the ecosystem of communities and their economic activities. Additionally, social resilience is fundamentally linked to the economic system in terms of its structure and distribution of assets.

Conjointly, referring to the definitions of resilience in Chapter 2, the ‘‘process-related’’ definition of resilience elaborated by Sapountzaki (2012) refers to ecological, social, and socioecological systems (SES). In relation to that, Folke et al. (2002) characterized one of the basic features or determinants of resilience attitudes, which is ‘‘the degree to which the system is capable of self-organization.’’ The concept of self-organization is transferred to complex adaptive systems that have the potential to learn by experience, process information, and adapt accordingly. Stacey et al. (2000) refer to the term self-organization as ‘‘agents interacting locally according to their own principles or intentions in the absence of an overall blueprint of the system.’’ It is the relation of resilience to theory that brings it very close to sustainability. Thus, social, institutional, and economic resilience activities (SIERAs), through DRR activities of CBSOs, enhance the resilience in social, institutional, and economic dimensions and pave the way toward sustainability.

In the relation of the cross cutting issue, such as gender, the SIERA approach is also an attempt at extracting the women’s perspective in mainstreaming DRR activities. Ariyabandu and Wickramasinghe (2003) point out that mainstreaming the gender

perspective into DRR put women as equal partners with men in the roles of decision-maker and beneficiary. Therefore, the SIERA approach is also the process of bringing women's perspective into mainstream activities of governments at all levels, as a means of promoting the role of women in the field of development by integrating women's values into development work and communicating risk and risk reduction efforts to wider communities.

SIERA integrates these three dimensions and analyzes the DRR activities through primary indicators for different disaster phases (before, during, and after). To use SIERA in different disaster phases is important to describe community's coping strategies during the whole disaster cycle. McEntire (2001) emphasizes that a holistic approach is needed to the disaster problem and what is needed is an approach that addresses all agents and all actors, and all phases pertaining to disaster vulnerability. In this respect, the scope of SIERA approach sets then the course of DRR activities corresponding to three dimensions and 15 primary indicators. In total, there are 45 scopes of community's DRR activities that will describe the whole concept of the SIERA (Table 5.4). The dimensions and the primary indicators are adopted one by one from the previously mentioned CDRI dimensions and parameters (Joerin and Shaw 2011).

Subsequently, the formulation of the scope of DRR activities is based on literature review of community's issues, including women's, followed by preliminary field observation of CBSOs' activities carried out in the communities in Bandung, like women's in WWAs, youth in YUs, Mosques' in FBOs, and based on the consultation with experts at regional and local level (WWAs and YUs at provincial, city, sub- district, and ward level). For example, SIERA approach focuses on how Bandung's WWA conducts DRR activities to enhance the resilience of social, institutional, and economic aspects as described in the CDRI. It also obtains the risk perceptions of women and their communities (Mulyasari et al. in press). In addition, the dimensions and the parameters in the CDRI are tailored to Hyogo Framework for Action (HFA) and consequently CDRI facilitates the HFA (Matsuoka and Shaw 2011). Thus, SIERA likewise indirectly addresses the HFA. In summary, SIERA is an approach in conveying the risk and resilience information in social, institutional, and economic resilience manner through typical CBSO's activities identified in Bandung City such as women's groups like WWAs, youth's groups like YUs and Mosques like FBOs.

Moreover, based on the CDRI tool, the resilience dimensions that are close to Community-Based Disaster Risk Reduction (CBDRR), which CBSOs can implement, are in the domain of social, institutional, and economic dimension. Social and economic resilience are the most determining factors of resilience that give the course of sustainable development. Social resilience is an important component in circumstances under which individuals and social groups adapt to environmental change. Adger (2000) raises the opinion that ecological and social resilience may be linked through the dependence on ecosystem of communities and their economic activities and those make social and economic resilience as one whole undeniable package. Additionally, social resilience is institutionally determined, in the sense that institutions permeate all social systems and institutions thereby fundamentally establishing the economic system in terms of its structure and distribution of assets. Thus, SIERA, an approach that

integrates these three dimensions was developed. SIERA stands for Social Institutional and Economic Resilience Activities, of which CBSO's activities can possibly best conduct risk communication process, contribute disaster risk reduction and at the same time enhance the resilience of city/sub-district/ward in the aspect of social, institutional, and economic issues (Table 5.5).

Table 5.5: Social, Institutional, and Economic dimensions and its parameters for the SIERA approach

Dimension	Social	Economic	Institutional
Parameter	Population	Income	Mainstreaming of DRR and CCA
	Health	Employment	Effectiveness of sub-district's crisis management framework
	Education and awareness	Household assets	Knowledge dissemination and management
	Social Capital	Finance and savings	Institutional collaboration with other organizations and stakeholders
	Community preparedness during a disaster	Budget and subsidy	Good governance

To summarize, the SIERA approach for risk communication confirms that disaster management should no longer only imply a response attitude. In turn, what is needed is an approach that addresses all agents and all actors, and all phases pertaining to disaster vulnerability (McEntire, 2001). In this respect, the scope sets the course of CBDRR activities, which are plausible to be implemented by the CBSOs at the city, sub-district, and ward level. Thus the essence of SIERA approach is that each scope of CBDRR of each CBSO corresponds to the three dimensions (social, institutional, and economic) and fifteen primary indicators, adopted from CDRI that sums up 45 CBDRR in total. Table 5.6 Illustrates the SIERA approach for risk communication process by the three CBSOs.

Table 5.6: The SIERA approach

Dimension	Primary indicators	Scope of DRR activities		
		Before Disaster	During Disaster	After Disaster
Social	▪ Population ▪ Health ▪ Education and Awareness ▪ Social Capital ▪ Community Preparedness			
Institutional	▪ Mainstreaming Disaster Risk Reduction and Climate Change Adaption ▪ Crisis Management ▪ Knowledge Dissemination and Management ▪ Institutional Collaboration ▪ Good Governance	*Community-Based Society Organizations: Women groups Youth Groups Faith-Based Organizations DRR Activities* ***(See Table 5.10)***	*Community-Based Society Organizations: Women groups Youth Groups Faith-Based Organizations DRR Activities* ***(See Table 5.16)***	*Community-Based Society Organizations: Women groups Youth Groups Faith-Based Organizations DRR Activities* ***(See Table 5.26)***
Economic	▪ Income ▪ Employment ▪ Household Assets ▪ Finance and Savings ▪ Budget and Subsidy			

Accordingly, to underline, the formulation of the CBSOs' resilience activities or named hereafter CBSOs' SIERA, was developed to identify what kind of DRR activities that may lead the community resilient to climate-related disasters through their risk reduction activities based on the literatures. Particularly the activities of three CBSOs that are being researched, were obtained and based from the field observation and informal interviews with the Women Welfare Associations, Youth Unions, and Faith-Based Organizations in Bandung, as well as based on the regional experts' view from women's, youth's, and religious' perspective. The next section illustrates each of those three CBSOs risk communication framework.

5.3.2 CBSOs Risk Communication Framework

Chapter 2 has extensively illustrated the essence of risk communication. Risk communication is regarded as an important component of disaster risk management (DRM) because it shapes people's perceptions of risk and influences their actions with respect to disaster preparedness and disaster response (The World Bank, 2012). Risk communication also influences the intervention of decisions that are made throughout the disaster management cycle. In some cases, the credibility of the information source takes a long time to build and needs to be well established before a disaster strikes. For example the case 2004 Aceh Earthquake has awaken Indonesia's communities in the core of risk communication process. Not only relying on hard measures (installing buoys as early warning instruments), but also it has to mainstream the soft measures (risk awareness and preparedness, encrypting the risk communication and information chain in communities, etc.) along the way, parallel to physical constructions.

According to The World Bank (2012), disaster preparedness is often perceived as being mainly a governmental responsibility, with information and directives traveling from the top down. That is the case to some extent, since local communities generally lack the tools and skills needed to conduct scientific risk assessments and fully understand the underlying risk in their localities without expert assistance. The problem with the top-down approach is that policies may be imposed on communities without taking local conditions into account, and communities may become overly dependent on information generated by the government.

Highlighting the notion once again about the importance of risk communication is that successful risk communication occurs when there is holistic learning, facilitation, and trust. In holistic learning, the gap in knowledge between the information sender and receiver is minimal. For example, Takeuchi et al. (2012) mentioned that hazard maps, booklets, and videos can all help narrow that gap when it comes to disaster education and risk communication. Normally, the information generators or senders are government agencies, universities, or research institutions that have the capacity to assess risk and the political mandate to implement DRM measures. The information receivers are the communities, businesses, and individuals who have knowledge of the local area and are the ultimate users of the risk information (Takeuchi et al., 2012).

Takeuchi et al. (2012) also mentioned that risk communication consists of understanding of risk and implementing of risk reduction plans. To make risk

communication successful, three elements are necessary namely holistic learning, facilitation, and trust. Communication cannot go smoothly when there is a gap between information sender and receiver. Thus, to reduce gaps, measures should be carried out through both hard measures such as enhancing engineering structures, and soft measures such as disaster education and evacuation training. Soft measures are particularly important for community. To sustain and save lives, people need to act. Previous scholars studied the risk communication (Takeuchi et al., 2005 and Kawashima et al., 2006 in Takeuchi et al., 2012) and tried to develop and implement supporting tools for the understanding of risk information. However, information sender should not only try to help local residents understand risk information, but also need to build relationships including trust with community people for successful risk communication. To achieve successful risk communication, trust is the most important element (Hovland and Weiss, 1951). Due to this particular trust element therefore CBSOs in Bandung is viewed and perceived as the bonding components of communities, bridging the communication, and networking between communities, local government, and other relevant stakeholders.

Figure 5.4 shows the basic risk communication framework of Bandung, adapted from Kikkawa (1999) and based on communication on natural hazard approaches (Höppner et al., 2010) that have been analyzed in Chapter 2. In the current risk communication framework, on the left side of the graph is the information sender and on the right side is the information receiver. Usually, the information sender is the government, university, or research institution, which has specialized-focused information on disaster prevention, risk reduction, and mitigation. On the other hand, the information receivers are the communities and individuals who have a lot of local information. However, as per Bandung case, these CBSOs are taken essential role in bridging the communication process between government and community in Bandung. These entities may and can act as information intermediaries' between sender and receiver.

To formulate communication strategies for enhancing climate-related disaster resilience of Bandung, the study is using Climate Disaster Resilience Index (CDRI) tool, mentioned earlier chapter (Chapter 4) and Social Institutional Economic Resilience Activities (SIERA) as the approach, illustrated in earlier section (section 5.3.1). The communication linking-hub is that CDRI assesses the resilience of Bandung Government's component, represented by the sub-districts' authority in physical, social, economic, institutional, and natural dimensions. And SIERA assesses the resilience of Bandung Communities' component, represented by CBSO, such as Women Welfare Associations, Youth Unions, and Faith-Based Organizations (religious leader) in three out of five dimensions (social, institutional, and economic). Those CBSOs will then convey the disaster risk information to the communities through SIERA approach. SIERA analyzes DRR activities through primary indicators for different disaster phases of before, during, and after disaster events. And those CBSOs are also the three targeted survey groups for the communication strategy. The overall disaster risk communication framework for Bandung is shown in below figure (Figure 5.4).

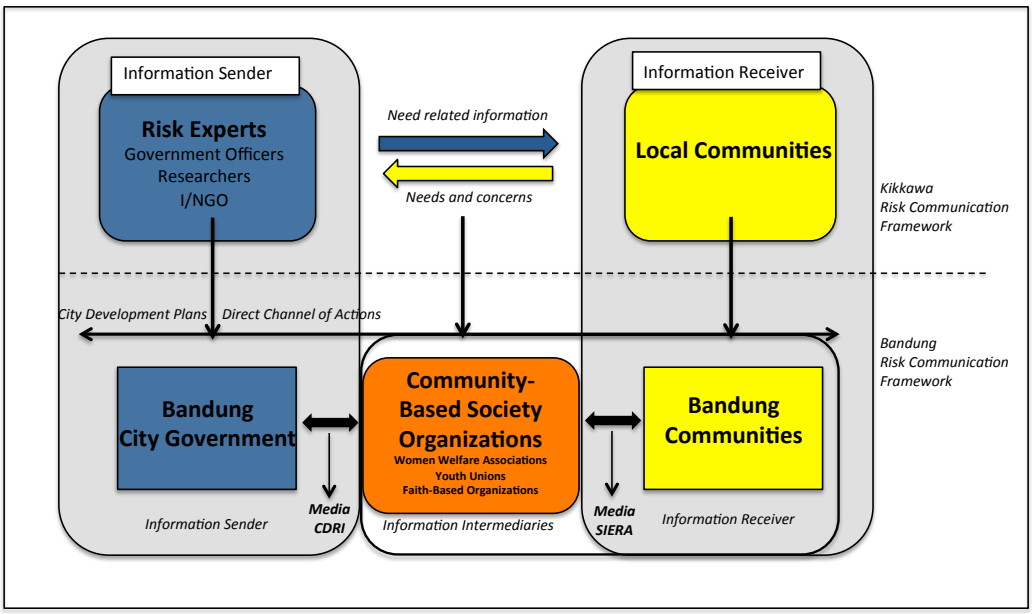


Figure 5.4: CBSOs' Risk Communication Framework for Climate-related Disaster Resilience of Bandung

The following sections illustrate the approach of each CBSO in performing their risk communication process through SIERA approach.

5.3.3 CBSOs Data Collection Process for Risk Communication

A questionnaire survey was conducted targeting the three CBSOs (WWAs, YUs, and FBOs) at the ward level since November 2010 until November 2012. The respondents were the leaders of the WWAs, YUs, and FBOs at the ward level. A quantitative-qualitative questionnaire approach was undertaken and utilized for this study with the aim of analyzing the role of the CBSOs at the ward level in perceiving DRR in the community. Moreover, it aims to investigate the potential role of CBSOs as risk communicators/disaster risk informants through their DRR activities within an informal risk communication network in the community.

Bandung City's administrative unit is divided into 30 sub-districts and 151, therefore the total number of targeted each CBSOs at wards is 151. The response rate of the CBSOs is varied between 78% and 100%. The survey questionnaire was structured into three parts. The first part focused on the CBSOs' ward leaders' perceptions of each social, institutional, and economic DRR activity according to the priority level based on the time-frame (WWAs), importance (YUs), and urgency (FBOs) of each proposed activity in each disaster phase. The second part stressed on their on-going CBSOs DRR activities highlighting those that are currently being undertaken (on-going) out of the 45 YUs' SIERA (Table 5.6). Finally, the third part focused on the conduction of risk communication issues (risk knowledge, source, media, and partnership) of the CBSOs.

Previously mentioned, the data was collected and analyzed for the 1st stage at the ward level. However, for the purpose of an overview analysis for risk communication process in the city, the CBSOs data was aggregated into respective sub-districts, likewise the

micro-city level resilience assessment in Chapter 4, to reveal common patterns of CBSOs' risk communication SIERA (RC SIERA) participation in different type of areas of Bandung City. Figure 5.5, Table 5.7, and Table 5.8 shows the data collection location and its details. The list of the wards and questionnaire forms for the three CBSOs (WWAs, YUs, and FBOs) can be found in Appendix 1, 3, 4, and 5.

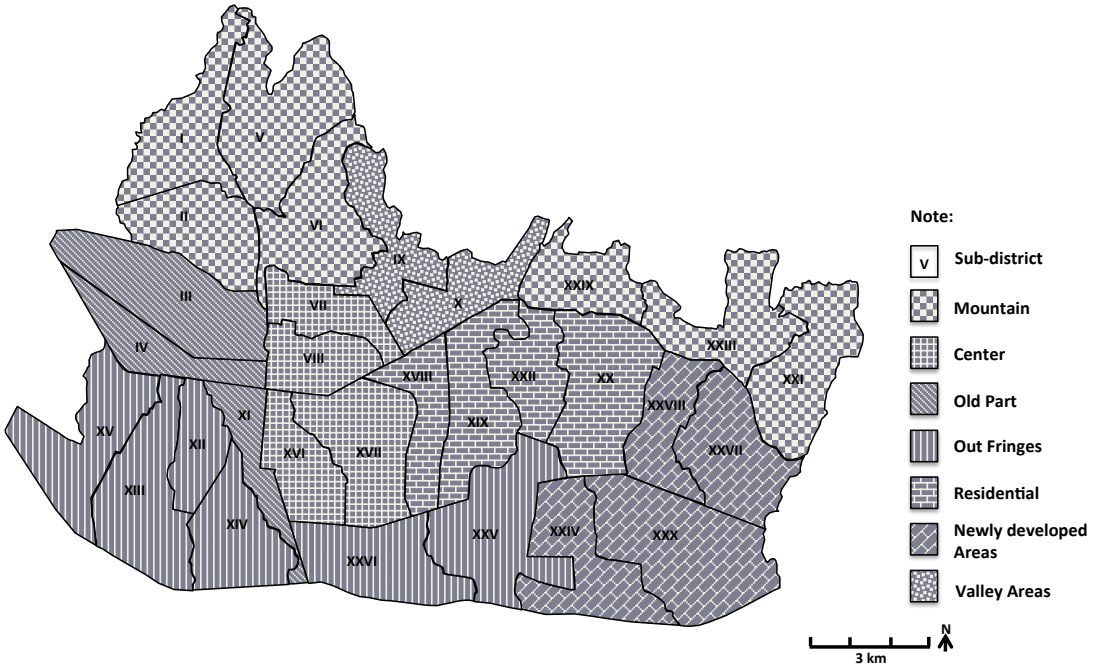


Figure 5.5: Map of Bandung City and locations of CBSOs questionnaire survey

Table 5.7: Details of locations of CBSOs questionnaire survey

No.	Sub-district	Geographical Location	No. of wards	Area (km^2)	Total Population	Population Density
I.	Sukasari	Mountain	4	6,27	79.211	12.633
II	Sukajadi	Mountain	5	4,30	104.805	24.373
III.	Cicendo	River, Plain	6	6,86	96.491	14.066
IV.	Andir	River, Plain	6	3,71	94.361	25.434
V.	Cidadap	Mountain	3	6,11	56.325	9.218
VI.	Coblong	Mountain	6	7,35	127.588	17.359
VII.	Bandung Wetan	River, Plain	3	3,39	29.807	8.793
VIII.	Sumur Bandung	River, Plain	4	3,40	34.446	10.131
IX.	Cibeunying Kaler	Plain	4	4,50	68.087	15.290
X.	Cibeunying Kidul	Plain	6	5,25	104.575	19.919
XI.	Astanaanyar	River, Plain	6	2,89	66.658	24.065
XII.	Bojongloa Kaler	Plain	5	3,03	117.218	38.686
XIII.	Babakan Ciparay	Plain	6	7,45	143.203	19.222
XIV.	Bojongloa Kidul	River, Plain	6	6,26	83.600	13.355
XV.	Bandung Kulon	River, Plain	8	6,46	138.644	21.462
XVI.	Regol	River, Plain	7	4,30	79.316	18.446
XVII.	Lengkong	River, Plain	7	5,90	69.307	11.747
XVIII.	Batununggal	River, Plain	8	5,03	116.935	23.248
XIX.	Kiaracondong	River, Plain	6	6,12	127.616	20.852
XX.	Arcamanik	River, Plain	4	5,87	65.607	11.177
XXI.	Cibiru	Mountain	4	6,32	67.412	10.666
XXII.	Antapani	River, Plain	4	3,79	72.006	18.999
XXIII.	Ujung Berung	Mountain	5	6,40	72.414	11.315
XXIV.	Rancasari	River, Plain	4	7,33	72.046	9.878
XXV.	Buahbatu	River, Plain	4	7,93	92.140	11.619
XXVI.	Bandung Kidul	River, Plain	4	6,06	57.398	9.472
XXVII.	Panyileukan	River, Plain	4	5,10	37.691	7.390
XXVIII.	Cinambo	River, Plain	4	3,68	23.762	6.457
XXIX.	Mandalajati	River, Plain	4	6,67	60.825	9.119
XXX.	Gedebage	River, Plain	4	9,58	34.299	3.580
	Total Sub-districts: 30		**Total wards: 151**			

Table 5.8: Details of CBSOs data collection

CBSOs	Targeted Sub-districts	Surveyed Sub-districts	Targeted Wards	Surveyed Wards	Response Rate
Women Welfare Associations (WWAs)	30	30	151	119	78.8%
Youth Unions (YUs)	30	30	151	145	96%
Faith-Based Organizations (FBOs)	30	30	151	151	100%

Based on Table 5.6 and Table 5.7, all three CBSOs are surveyed for the total 30 sub-districts in Bandung City. However, WWAs and YUs in few wards at certain sub-districts were not responded to the survey (Table 5.8). However, the total average response rate for the CBSOs is above 90%. Once the data are collected, quantitative analysis is conducted by advancing statistical method (e.g. linear regression of coefficient determination [r^2]). To complement the quantitative analysis, a qualitative method was applied, such as utilization of secondary data (e.g. preliminary field observation on CBSOs' activities that are carried out at city/sub-districts/wards in Bandung through informal interviews, as well as consultation with experts at regional and local level (WWAs, YUs, and FBOs at provincial, city, sub-district, and ward level) and through extensive literature review of women's, youth's and religious' issues in DRR. Results and key findings of the CBSOs risk communication are discussed in following sections

5.4 Risk Communication through Women Welfare Associations

In highlighting women's risk communication as an important part of disaster risk management, how should the risk message then be conveyed? To answer this question, an analysis on how women communicate disaster risk is conducted through a case study of Bandung. As mentioned in Chapter 4, West Java Province is the densest populated region in Indonesia to which Bandung contributes approximately 2.5 million citizens. Bandung is divided into 30 sub-districts and 151 wards and is located in various topographies such as mountains, rivers and plains. Bandung is described as a promising city with opportunities in business and has extensive administrative, commercial, and industrial activities as well as being the center for higher education (Bandung City Government, 2011). These have contributed largely to its urbanization and results to a rapid growth in the city's population.

The resilience assessment at city micro-entities underlines the need of local actors in communicating risks and further raises questions such as: Who are at risk? What are the threats? Who are the stakeholders involved? What is the link between the senders and the receivers? By which media do senders and receivers interact? Women compose 49% of the total population of Bandung and reside in sub-districts of which 26 out of 30 are usually inundated during high-precipitation, with 68 identified regular local inundations spots by the Bandung Construction and Water Service (*Dinas Bina Marga dan Pengairan* in Bappeda Kota Bandung, 2010).

Women in Bandung, who are working in the field of industry, trade, and services, are exposed to the risk more than men by around 55% (Bandung Statistical Agency, 2011). When floods occur, women's activities are affected. The main goal of women's risk

communication is to determine how the risks can be conveyed and addressed to the women and the wider community. To enhance the resilience of women and their community, women in WWAs with their social networks can convey risk information. Figure 5.5 has shown the framework of risk communication as adapted from Kikkawa's (1999) and (Höppner et al., 2010) for risk communication approach. With women at the center of risk communication, they could act as intermediaries between their communities and the government, as well as direct risk informants to other women and to wider communities in Bandung.

WWAs are key actors in community activities because they include most of the women in the families. Totaling 49% of the population of Bandung, some of the women have an important role as women's leader and a certain level of authority in the community. Women associations exist at from the national, provincial, and local levels up to the lowest administration unit, the wards. Although the WWA movement is steered at the national level by the wife of the Minister of Home Affairs as head, the policies and programs are customized depending on the local context. Previously mentioned, the wife of the mayor heads WWAs at the city level, WWAs in sub-districts are headed by the wives of sub-district leaders, and WWAs at the ward level are headed by the wives of the ward leaders.

Since the Bandung City Government consists of 30 sub-districts and 151 wards, accordingly, there are 30 WWAs existing at the sub-district level and 151 at the ward level, which have direct link to women in the households at wards. The term of the WWA leaders terminates at the end of their respective husband's term. Major activities of WWAs in Bandung are in the areas of economic empowerment, health, and to some extent, direct disaster preparedness. WWAs in Bandung take the role in the community in organizing the community kitchen and training for community's flood preparedness and awareness.

Figure 5.6 shows few WWAs activities in Bandung. In one of the sub-districts, WWAs have regularly invited experts and organizations such as fire fighters from the Bandung Fire Department and specialists from the local government to conduct training. Another type of WWA involvement in disaster management is mobilizing and encouraging the community in volunteering to undertake actions when climate-related disasters occur.



(a) (b)



(c) (d)

Figure 5.6: Women Welfare Associations activities in Bandung: (a) WWAs members participated in a disaster training and drill, (b) Head of WWAs Bandung City launched "Bandung Green and Clean Campaign 2010-2012", (c) WWAs coordination meeting in a ward, and (d) Head of WWAs Bandung City opened one day seminar for WWAs members on Healthy Lifestyle

During the 2009-2010 flooding, WWA in *Cijerah* and *Caringin* Wards in *Bandung Kulon* Sub-district were actively involved in curbing waste disposal to adjacent rivers, monitoring water levels, disseminating up-to-date disaster information to communities, raising a budget for repairing river embankments to ward and sub-district authorities, and coordinating relief efforts with neighborhood groups and households. Because disasters pose a threat to their home and the community, women become active in these groups and have taken a role beyond those, which are traditional (Neil and Phillips 1990). Moreover about the WWAs in Bandung, the relationship of WWAs with the communities is exemplified in Figure 5.7.

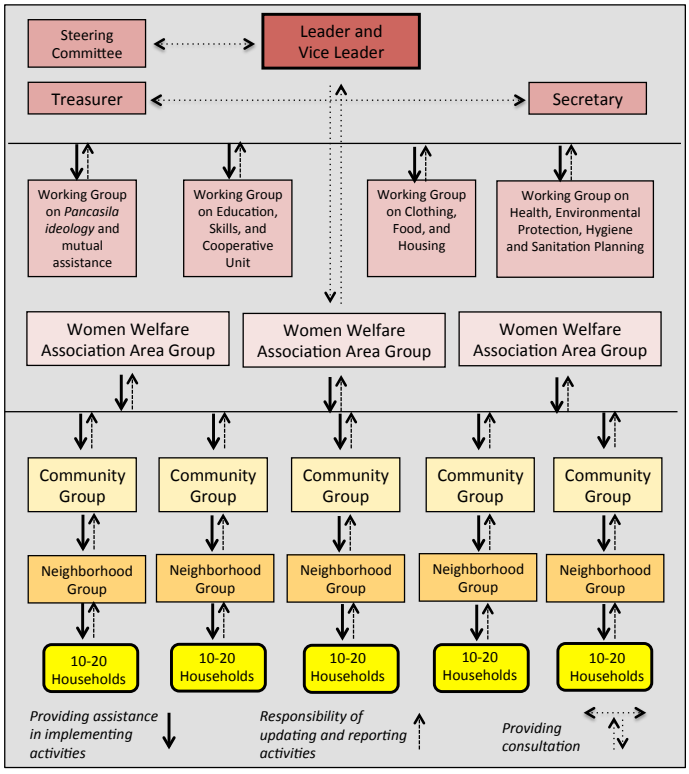


Figure 5.7: Mechanism of the Women Welfare Associations movement at ward level (TP PKK, 2006)

WWAs unit at the ward level is close and has direct link with communities (neighborhoods until households). There are three main mechanisms of WWA's movement that describe the relationship between WWAs and communities. Those movements are as follow: providing assistance in implementing activities, responsibility of updating and reporting activities, and providing consultation for communities. Keeping this in mind, the WWAs at wards can perform risk communication actions to community, wrapped up in their DRR activities. Therefore, they are being investigated with SIERA approach and elaborated in the following sections.

5.4.1 WWAs Risk Communication through SIERA

The SIERA of WWAs' approach, hereafter named as WWAs' SIERA is an attempt at extracting the women's perspective in mainstreamed DRR activities. Ariyabandu and Wickramasinghe (2003) pointed out that mainstreaming the gender perspective into disaster risk reduction put women in as equal partners with men in the roles of decision maker and beneficiary. Therefore, the SIERA approach is also the process of bringing women's perspective into mainstream activities of governments at all levels. It is as means of promoting the role of women in the field of development by integrating women's values into development work and communicating risk and risk reduction efforts to wider communities.

Subsequently, the formulation of the scope of women's DRR activities is based on literature review of women's issues as well as the preliminary field observation of CBSOs' activities carried out in the communities in Bandung, like women's in WWAs, and based on the consultation with experts at regional and local level (WWAs at provincial, city, sub-district, and ward level). Table 5.9 indicates the linkages between the scopes and the literature concerning gender differences in risk management.

Table 5.9: Linkages between Women DRR scope in SIERA and literature

Women DRR scope in SIERA	Literature	Reference
Mobilization of other women in taking preparedness action	The influence of women can contribute to the adoption of protective measures and hazard adjustments; the participation of women in social networks marks as a key factor in disseminating vital information	Perry and Lindell, (1986), Enarson, (2009)
Women relaying the early warnings	Women are more likely to receive risk communication due to their social networks and their tendency to provide	Perry and Lindell (1986)
Provision of women's and communities' post-disaster's needs	Women's organization articulated women's needs and were responsible for community development	Duryog Nivaran, 1996
Organizing and conducting training for disaster preparedness	Women tend to prepare their families and communities for disaster more than men; women tend to participate in trainings and volunteer work for disaster preparedness programs	Leik et al. (1982) and Nehnevajsa (1989) in Fothergill (1996)
Women's organization supporting women in securing the livelihood, providing access to resources, and finding alternative livelihood after a disaster	Women in poverty lack status, power, and resources, which led to their risk in disasters	Morrow and Enarson (1994)

Women DRR scope in SIERA	Literature	Reference
Women's organization gathering the disaster information	More women than men obtain additional disaster information in order to protect their homes	Leik et al. (1982)
Involving women in decision-making processes through women's organization	Women have the most effective communication skill because of their tendency towards shared communication and active listening	McKenna (1994), Newell (2001)

Drawing upon the above literature review and preliminary observation of typical WWAs' activities, the WWAs' Social Institutional Economic Resilience Activities (SIERA) can be framed (Table 5.10). A coding to simplify the understanding of reading WWAs' activities was applied in Table 5.10. For example SIERA Code S1. B stands for S (Social dimension), 1 (number of activity), and B (Before a disaster). The SIERA Code S1. D stands for S (Social dimension), 1 (number of activity), and D (During a disaster). And SIERA Code S1. A stands for S (Social dimension), 1 (number of activity), and A (After a disaster). This coding applies the same for other numbers (S2 until S5). Moreover, the SIERA Code starts with I stands for Institutional dimension, and lastly, the SIERA Code starts with E stands for Economic dimension. These coding are applied for the Youth Unions' and FBOs' SIERA (Table 5.16, and 5.26).

Thus, WWAs SIERA approach focuses how WWAs in Bandung implement risk communication process through their DRR activities, to enhance the resilience of social, institutional, and economic aspects, as described in the CDRI. It also obtains the risk perceptions of women and their communities (Mulyasari et al., in press). In addition, dimensions and parameters in the CDRI tailored to Hyogo Framework for Action (HFA), of which CDRI facilitates for the HFA (Matsuoka and Shaw, 2011). Thus SIERA likewise indirectly addresses the HFA. In summary, SIERA is an approach in conveying the risk and resilience information in social, institutional, and economic resilience manner through typical CBSO's activities identified in Bandung City such as women group like WWAs.

Following the WWAs SIERA approach presented in Table 5.10, a survey was conducted targeting the WWAs at the ward level in November 2010 (Figure 5.8). The survey questionnaire was structured into two parts. The first part focused on the women ward leaders' perceptions of each social, institutional, and economic resilience activity according to the priority level based on a timeframe for each proposed activity (short: less than 2 years, medium: 2 to 5 years, and long-term: more than 5 years) according to each disaster phase (before, during, and after disaster). The second part stressed on their on-going SIERA; out of 45 scopes of SIERA, which of those are being currently undertaken (ongoing activities).

Table 5.10 and Figure 5.8 are presented in the following pages.

Table 5.10: WWAs SIERA

Dimension	Primary Indicators	Scope of WWAs DRR Activities					
		BEFORE Disaster	SIERA Code	DURING Disaster	SIERA Code	AFTER Disaster	SIERA Code
Social	Population	▪ Family planning	S1. B	▪ Protection of vulnerable groups	S1. D	▪ Provision of needs to vulnerable groups	S1. A
	Health	▪ Health campaign	S2. B	▪ Health Care package	S2. D	▪ Designing post-disaster health care packages	S2. A
	Education and Awareness	▪ Awareness and drill	S3. B	▪ Emergency and early warnings	S3. D	▪ Education and access to resources	S3. A
	Social Capital	▪ Decision making process	S4. B	▪ Mobilization	S4. D	▪ Cultural event organization	S4. A
	Community Preparedness	▪ Training and courses	S5. B	▪ Organization of vulnerable groups	S5. D	▪ Responding to on-going needs	S5. A
Institutional	Mainstreaming	▪ Sensitizing disaster management plan	I1. B	▪ Utilization of disaster management plan	I1. D	▪ Review of disaster management plan	I1. A
	Crisis Management	▪ Training for volunteers	I2. B	▪ Engagement of community leaders	I2. D	▪ Data collection and communication to officials	I2. A
	Knowledge Dissemination and Management	▪ Networking	I3. B	▪ Networking	I3. D	▪ Development of disaster awareness materials	I3. A
	Institutional Collaboration	▪ Linking government and cross-institution	I4. B	▪ Disaster information gathering	I4. D	▪ Disaster management forums and meetings	I4. A
	Good Governance	▪ Establishing early warning system with local government	I5. B	▪ Inform updates to officials	I5. D	▪ Reconstruction and rehabilitation plan	I5. A
Economic	Income	▪ Training/Courses	E1. B	▪ Income security	E1. D	▪ Support for finding alternative livelihood	E1. A
	Employment	▪ Securing alternative livelihood	E2. B	▪ Access to resources	E2. D	▪ Women empowerment	E2. A
	Household Assets	▪ Introducing small-scale insurance	E3. B	▪ Inventory of non-and destroyed household assets	E3. D	▪ Mobilization	E3. A
	Finance and Savings	▪ Collective cooperative schemes	E4. B	▪ Monitoring allocation of funds	E4. D	▪ Micro-credit and soft-loan system	E4. A
	Budget and Subsidy	▪ Sensitization of disaster risk management budget allocation	E5. B	▪ Fundraising	E5. D	▪ Linking local government in rehabilitation of education sector	E5. A



Figure 5.8: Pictures during WWAs questionnaire survey in November-December 2010. Clockwise: Preliminary meeting with Head of WWAs Bandung City and WWAs Task Force members, Head of WWAs Bandung City opened the questionnaire survey, Heads of WWAs of 119 wards attended the survey.

The survey was conducted with these women leaders due to their deep understanding of women's issues in disaster and their trust relationship with women and their surrounding communities. From these, insights into appropriate actions for preparedness and mitigation, emergency response, as well as reconstruction and assistance especially when a disaster occurs can be obtained. The study was conducted with support from the Bandung Planning and Development Agency, Health Agency and WWAs at the city level. Primary data were obtained from the Women WWAs ward leaders' questionnaire survey as well as from focus group discussions with the head of Bandung WWA at city level, the Working Group Leaders, and WWAs Officers at some wards as key informants for secondary data. From a total of 151 wards, 119 women's ward leaders participated in the study.

5.4.2 Data Analysis and Findings of WWAs Risk Communication

1. The perceptions of WWAs

Almost all SIERA before a disaster are given long term by the head of WWAs at wards. The pre-disaster SIERA is given priority in the long term by the women ward leaders based on the questionnaire survey results. This means that women expect resilient actions to be formulated and implemented in advance over a period of five years, rather than ad-hoc actions. This emphasizes the need for sustainable planning at the

community level. Subsequently, SIERA during disaster is given short-term priority by the women ward leaders. This shows that actions will be implemented right after a disaster while bearing in mind those short-term decisions after a disaster should have a long-term vision for sustainability. Following the time priority given by women wards leaders after a potential disaster, women's perceptions vary among the SIERAs. These variations are due to women ward leaders' perspectives on the set of DRR activities linked to their ward's needs.

Further results indicate in Figure 5.9 that close to 40% of women ward leaders in Bandung City consider DRR activities before a disaster as necessary to be implemented in the long run for health (social), 35% in mainstreaming of DRR and Climate Change Adaptation (CCA) (institutional), and 40% in finance and savings (economic). During the disaster, 45% perceive community preparedness in social dimension, 44% in effectiveness of ward crisis management in institutional dimension, and 39% in budget and subsidy in economic dimension as important and directly needed. The priority of DRR activities after a disaster was perceived differently. Almost the majority of women ward leaders (41%) see DRR activities such as education and awareness aspect in social dimension, 36% in institutional collaboration in institutional, and 39% in employment aspect in the economic dimension, as priorities for long term investment. These show that firstly, women ward leaders perceive these actions, which are close and related to their daily and regular activities, as measures in reducing disaster risk in various dimensions. Secondly, it indicates that their perceptions of DRR activities throughout the different dimensions have the potential of increasing the safety of their surrounding community, making the way for community disaster resilience. Figure 5.9 summarizes the perceptions of heads of WWAs at wards for SIERA.

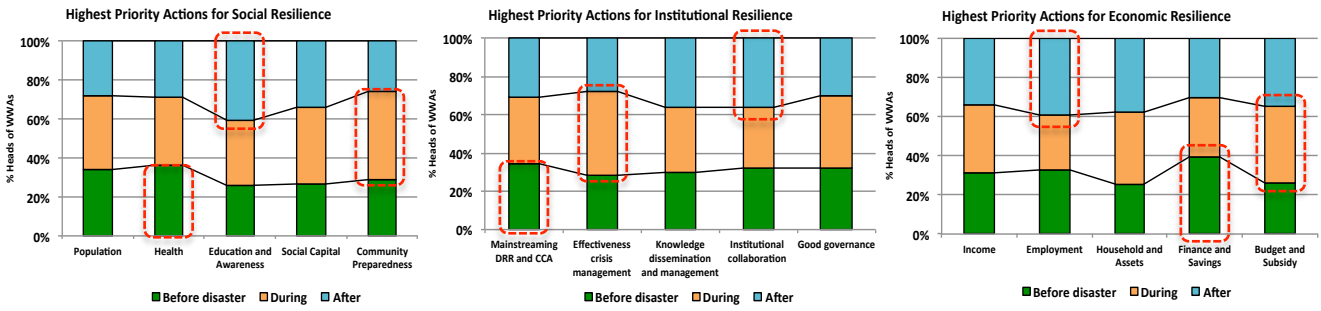


Figure 5.9: WWAs SIERA perceptions for social, institutional, and economic resilience in different disaster phases

If one looks further into details, in terms of social resilience, for example WWAs DRR activities in health (conducting health concerns campaign for community to raise hygiene's awareness such as for water-borne disease and dengue fever before a disaster), in community preparedness (organizing vulnerable groups such as children, elderly, etc. to safer for evacuation purpose during a disaster), and in education and awareness (empowering and conducting trainings for women to have better access to resources and supporting them in finding alternative livelihood) obtain more attention and concern by the majority of the women at wards (Figure 5.9).

In terms of institutional resilience, the WWAs DRR activities in mainstreaming DRR and CAA, institutional collaboration with other organizations/stakeholders, and good governance are the most perceived important. Respected DRR activities such as sensitizing the local government at ward level to develop disaster management plan for all hazard types before a disaster, cooperating with government to set up disaster unit office and updating the condition of refugees to emergency teams during a disaster, and organizing meetings and forums within ward and inviting the outside stakeholders for effective disaster management after a disaster are setting the course towards community resilience (Figure 5.9).

In terms of economic resilience, the heads of WWAs at ward perceived finance and savings, budget and subsidy, and employment are the most crucial in determining a resilient community in economic aspect. DRR activities such as initiating affordable saving schemes in the form of collective cooperative funds to be used if a disaster occur, raising fund and ensuring that the obtained funds from government and outside stakeholders distributed equally, and supporting and equipping women with ability to have better access to resources in formal and informal sectors are therefore their options to enhance theirs and community's resilience (Figure 5.9).

When all three dimensions that shape the intervention of women's DRR activities are looked at collectively, the key proposed DRR activities surface. Disaster phases aside, women ward leaders in Bandung, in their capacity as community organizers and based on their long term experiences in knowing what is best for them and the community; recognize the importance of DRR activities in the economic sense. Economic vulnerabilities have made women realize the essence of taking vulnerability reduction measures which would enhance disaster preparedness and lead to economic resilience. Therefore, 73% of heads of WWAs at wards in Bandung felt the need in promoting and implementing activities in the economic dimension as the first priority rather than social or institutional ones (Figure 5.10).

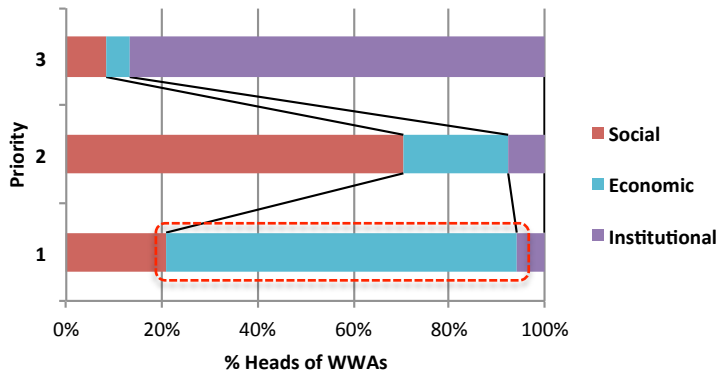


Figure 5.10: Prioritization of SIERA by heads of WWAs at wards

Figure 5.11 shows in detailed the strength of specific economic DRR activities priority in different disaster time frame that WWAs would like to implement for their community at wards. For example in before the disaster, income and finance and savings are

showed the most desired. Likewise in during the disaster, income, budget and subsidy, and household and asset are most important. Later after disaster, still income, budget and subsidy, as well as employment are equaled crucial. This shows first that women in WWAs are caring not only in individuals (household) well-being, but in their community as well (disaster management budget and subsidy for ward). Secondly, the long-term activities implies that WWAs aims for sustainable economic resilience for hat particular actions and thus at fist glance, these activities provide a risk communication platform between women and communities.

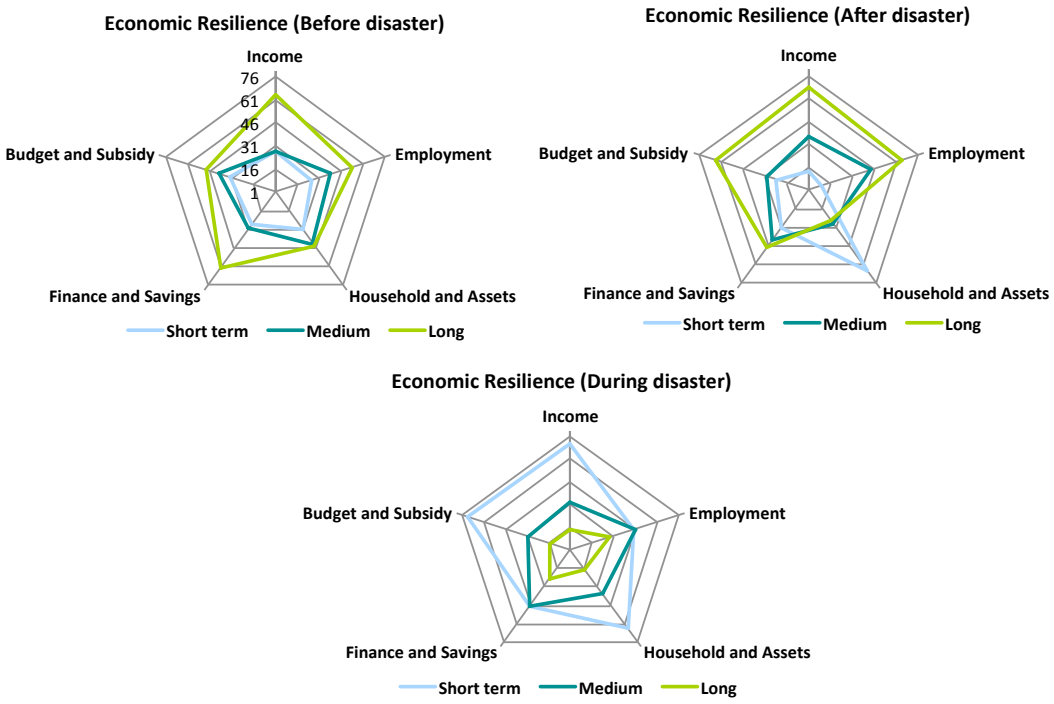


Figure 5.11: The strength of economic DRR activities priority of WWAs in different disaster time frame

The following sections describe the current WWAs DRR activities and correlation analysis, and what are their implications to the risk communication process in Bandung.

2. The ongoing activities of WWAs

The questionnaire survey also tried to determine the ongoing activities of women in wards. In their roles as manager of the household, care taker of the family, government information disseminators in the community, and *"the eyes and ears"* of everything happening around them, the women in WWAs are leaders in the forefront. The women engage in a wide range of activities such as conducting health campaigns for women, children, and the elderly; conducting trainings for women for skills upgrading which allows the generation of additional income in the family; and many more. These activities are done in a monthly, quarterly, and annually basis.

The WWAs in Bandung have their own plan and programs that synchronize with the city government's policies and priorities. By helping in the advancement of women, the associations contribute to strengthening the society. The regular family size in Bandung is five to six with a woman as a mother and/or wife in one household. Women are able to communicate plans, programs, and activities to family members during daily interactions. These will be captured, stored, and eventually invested at home. Men (husbands), children, youth, and the elderly benefit from women inclusion in DRR activities. Although the perception results mentioned earlier showed that women see activities within the economic dimension as a top priority, the SIERA results in Figure 5.12 shows that DRR activities within the social dimension are done more often (43% monthly activity).

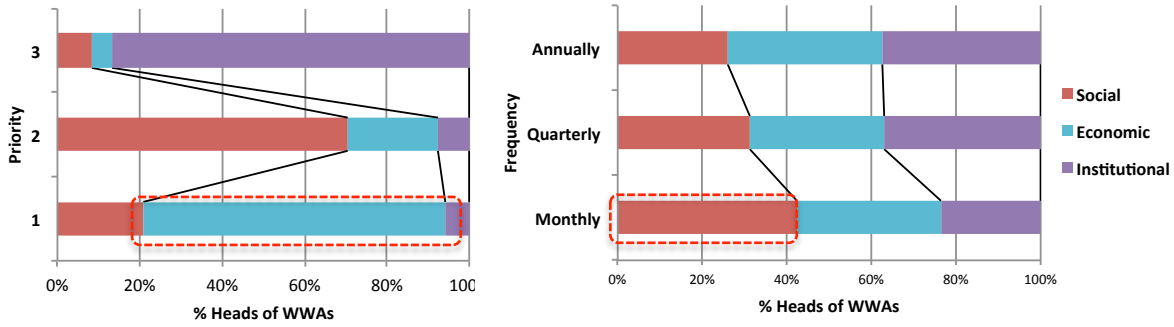


Figure 5.12: Prioritization (left figure) and Frequency (right figure) of DRR activities of heads of WWAs based on SIERA approach

This is reflected in the health programs following government policies and priorities. For example, Bandung City promotes a family planning campaign to control population growth. To have a wider impact in communities, Bandung City Government engages WWAs in implementing the city government's programs. Data from the Bandung Women Empowerment and Family Planning Agency recorded that 67.4% of fertile couples in Bandung are using birth controls and participate in family planning campaigns (Bandung Statistical Agency, 2011). More than half of the wards in Bandung conduct monthly campaign on family planning, as shown in Figure 5.13(a). This shows that WWAs, by the nature of their activity, have significant influence and positive impact in communities.

Another example shown in Figure 5.13(a) is the frequent provision of reproductive health care in Bandung. Almost 80% of the wards have this activity in a monthly period. Additionally, more than 70% of the wards conduct monthly health campaigns for other members of communities as well, such as babies' and toddlers' development growth and nutrition check-ups, elderly health and nutrition control check-ups, among others. These activities are not only on women's health; it also integrates the health of other vulnerable groups, such as children and elderly. Based on their regular activities, the risk reduction characteristics are reflected and can be classified in SIERA. The WWAs

activities are spatially distributed in Figure 5.13(a), (b), and (c) and lists their ongoing activities.

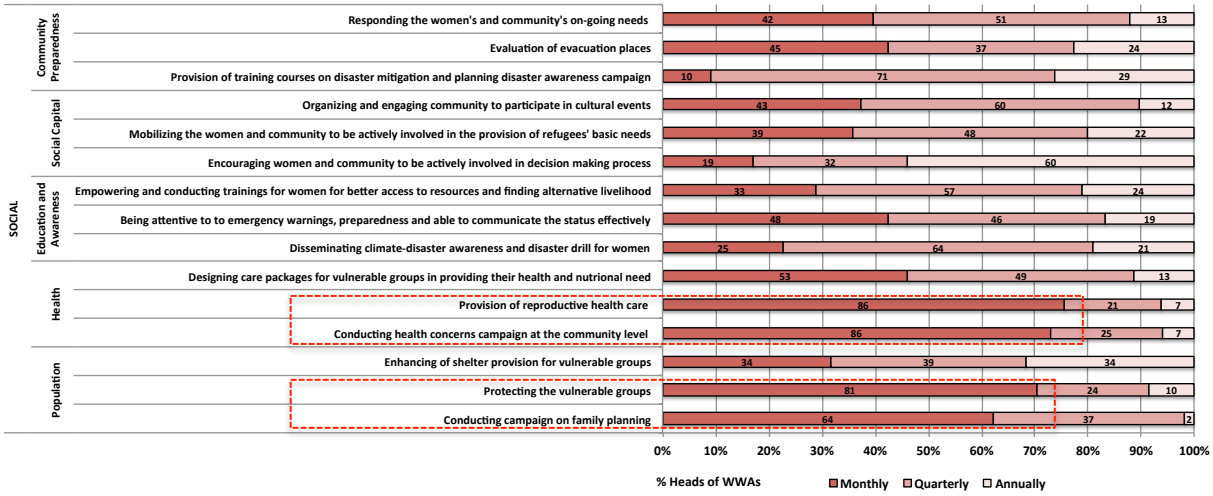


Figure 5.13(a): Frequency of current Women Welfare Associations activities in Bandung - Social

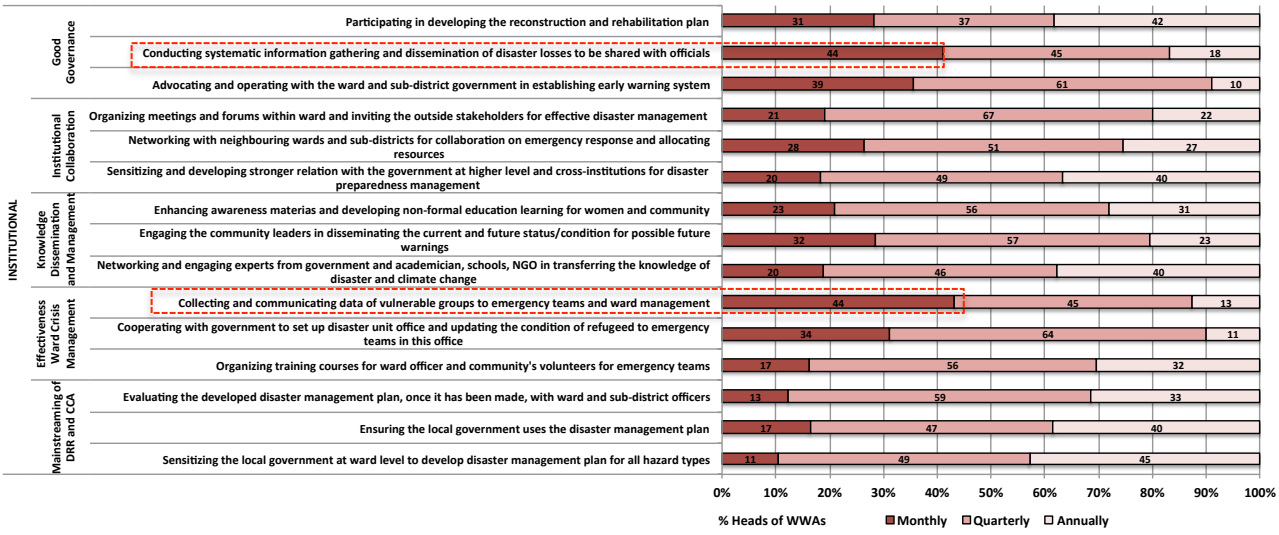


Figure 5.13(b): Frequency of current Women Welfare Associations activities in Bandung - Institutional

Institutionally, women in WWAs at wards have initiated risk communication process. Activities, such as conducting systematic information gathering of disaster losses to be conveyed to authorities and collecting and communicating data of vulnerable groups to local authorities are frequently. These indicate the readiness of WWAs as risk communicators in neighborhoods (Figure 5.13[b]). Economically, WWAs' activities are frequently dominated by organizing trainings in handicrafts, marketing, and small business in giving the women to be economically empowered, particularly for women-headed households (Figure 5.13[c]).



Figure 5.13(c): Frequency of current Women Welfare Associations activities in Bandung - Economic

3. Relationship of WWAs SIERA for risk communication

Five out 45 WWAs DRR activities of the WWAs SIERA described the verbal communication process and named hereafter the RC SIERA (Table 5.11). The RC SIERA comprises of a set of indicators that correspond to the risk communication activities done by women in WWAs. The indicators, which are included in the social and institutional dimensions, are meant to address the challenges faced by women in Bandung. Indicators such as education and awareness are crucial at the stage of pre-disaster. Disaster risk information should be accumulated and informed, which leads towards disaster awareness. During a disaster, conveying and updating the situation enables women and surrounding communities to decide and take action. In terms of ward's effective crisis management, women in WWAs collect data of disaster-affected communities and deliver the data to the ward authority.

Table 5.11: WWAs Risk Communications SIERA (WWAs RC SIERA) depicted from the SIERA approach

Dimension	Primary Indicator	Disaster Phase	RC SIERA	SIERA code
Social	Education and Awareness	Before	***Awareness and drills*** (Disseminating climate-related disaster awareness and conducting disaster drill at ward level for women)	S3. B
		During	***Emergency and early warnings*** (Being attentive to emergency warnings and preparedness and communicating the information status effectively)	S3. D
Institutional	Effectiveness Crisis Management	After	***Data collection and communication to officials*** (Collecting and communicating data of vulnerable groups to emergency teams and ward government)	I2. A
	Good Governance	Before	***Establishing early warning system with the local government*** (Advocating and cooperating with the ward and sub-district government in establishing early warnings systems)	I5. B
		During	***Informs and updates officials*** (Conducting systematic information gathering and dissemination of disaster losses to be shared with officials)	I5. D

Women contribute to good governance by participating in early warning activities. Hence the promptness of warning and emergency information to women and surrounding communities can be understood. These have underlined that women in organizations are able to articulate women's needs and take responsibility for the community (Duryog Nivaran, 1996).

A statistical method (linear regression analysis) is applied with the benchmark score of the coefficient of determination (r^2) higher than 0.7. It investigates the relationship between two variables of the scores between 0 and 1. The higher the score of the correlation coefficient (a maximum of 1) shows the high the degree of relationship between those two variables. This method helps to identify the positive high degree of relationships between two variables, whether it is a relationship between each of the five risk communications SIERA or whether it is the relationship between those RC SIERA with the attributing factors. Those attributing factors are geographical locations, total population, density, and total schools, which feature the risk communication process. It identifies the following: whether women in different geographical locations are affected differently than in other locations, if certain risk communication processes were carried out; whether the number of the population living in that particular ward can affect the risk communication process; or whether the total schools (or total formal education institutions) could possibly affect the risk communication process as well. It seeks the possibility of which types of risk communication strategies can be carried out, where, and what factors are attributing to make it success.

This quantitative method has the aim to seek the micro-variation types of risk communication strategies at the micro-city level (the wards samples are aggregated into the corresponding sub-district). It is emphasized that the data was collected at wards (ward level) and the initial analysis for the perceptions and ongoing activities are at the ward level as well. However, for the relationship analysis purpose, the data was analyzed at sub-district level. Thus the wards data are aggregated into the respected sub-districts. This was done in order to find possible risk communication process that can be linked with the resilience assessment conducted at sub-districts (see Chapter 4). Once the risk communication strategies are identified, the next step would be to make those strategies sustain.

No relationships are identified between the RC SIERA of perceptions and ongoing WWAs' activities. Therefore, the first RC SIERA analysis is shown by the cross analysis between the perceptions and the ongoing RC SIERA of women's ward leaders with the same dimensions, indicators, disaster phase, and its scopes (Figure 5.14). The results show that most of WWA leaders at ward level (94% women's ward leaders) perceive that advocating and cooperating with the ward and sub-district government in establishing early warning systems (I5.B/Good Governance/before disaster) has to be done prior the disaster. The reason is that women prefer to establish a solid warning system such as developing inundation warning in advance before distributing the information. Although in the on-going activities they have done both activities in more or less equal proportion. Secondly, it also reflects that women find the government communications credible, as stated by Enarson (2009), when describing

trustworthiness among women social networks. For this, the relationship between WWAs and Bandung City Government needs to be strengthened and sustained.

These resilience activities in the social and institutional dimensions enhance the city's social and institutional resilience through CBSO's activities like WWAs. Collecting and communicating data of vulnerable groups for the emergency teams and ward government (I2.A/Effectiveness crisis management/after disaster) is perceived and undertaken equally (100% of women's ward leaders in the category of RC SIERA perceptions and on-going). This implies that although there is less literature on women's behaviors in emergency preparedness than men, the case of Bandung WWAs confirms that women prepare their families and communities for disaster and obtain additional disaster information in order to protect their homes more than men (Leik et al., 1982; Fothergill, 1996).

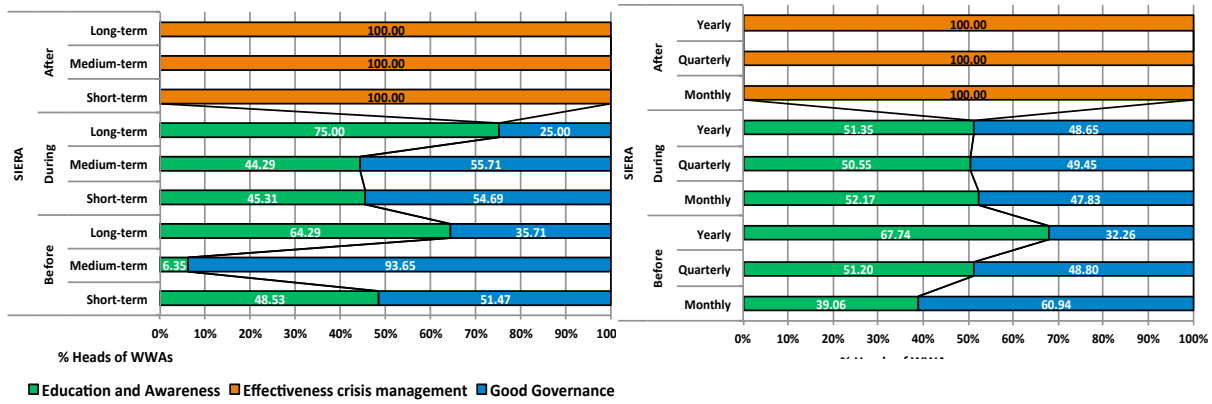


Figure 5.14: WWAs RC SIERA perceptions (left) and ongoing RC SIERA (right)

3.a Relationship between WWAs RC SIERA

The findings show that there is a significant relationship (level of significance of 0.7 and above) between RC SIERA S3.B and S3.D ($r^2 = 0.73$) (Table 5.11). It shows that disaster awareness and drills conducted by women at the ward level has a high relationship with the emergency and early warnings scope. It implies that these two types risk communication activities work in all 30 sub-districts and indicates that sufficient climate-related disaster risk information received by women leads to the enhancement of their risk awareness in conveying the appropriate early warnings. In addition, there is a significant relationship between RC SIERA I5. B and I5.D ($r^2 = 0.80$). It shows that establishing an early warning system with local government and informs the updates of during disaster to officials interpret a strong collaboration between women in WWAs at sub-districts with local governments through this risk communication process. This should be considered as an asset to risk communication process that should be maintained by both parties (the WWAs and Bandung City Government). These results confirm what Neal and Phillips (1990) said concerning women perceiving disasters as a threat to their home and community leading them to become proactive towards risk communication (Enarson, 2009).

3.b Relationship between WWAs RC SIERA and attributing factors

The relationships between RC SIERA and its attributing factors such as different geographical locations, population (total population and density), and education institutions (total schools) are elaborated below and summarized in Table 5.12 and Table 5.13.

3.b1 Relationship between WWAs RC SIERA and geographical locations

A high degree of relationships between the RC SIERA and locations are shown in sub-districts, which are located in mountainous areas for the correlation between the RC SIERA S3.B and S3.D ($r^2 = 1$), RC SIERA S3.B and I5.B ($r^2 = 1$), RC SIERA S3.D and I5. B ($r^2 = 1$), RC SIERA S3.B and I5. D ($r^2 = 0.76$), RC SIERA S3.D and I5. D ($r^2 = 0.76$), and RC SIERA I5.B and I5. D ($r^2 = 0.76$). This means that women inform and update officials during a disaster has a strong relationship with establishing early warning systems with the local government, emergency and early warnings as well as conducting awareness and drills. This implies that before updating women and community about the situation during a disaster, a certain amount of awareness, preparedness, and strong collaboration with local governments has to be capitalized first by women in WWAs, especially in vulnerable locations, such as mountainous areas. The next correlation results show there is a significant relationship between RC SIERA S3.B and S3.D ($r^2 = 0.74$) as well as between RC SIERA I5.B and I5. D ($r^2 = 0.79$) among sub-districts located at the riverside areas. This shows that conducting awareness and drills leads women and communities to have received sufficient climate-related disaster risk information and enhance their risk awareness. Subsequently, it interprets that a strong collaboration exists between women in WWAs and the sub-district government in areas prone to floods. It implies that these types of risk communication activities should be further strengthened for flood risk reduction (Table 5.12).

Table 5.12: Degree of relationship between WWAs RC SIERA and geographical locations

WWAs RC SIERA	(Sub-district Sample = 30)	Coefficient of determination (r^2)				
	RC SIERA	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**0.73**	0.44	0.55	0.53
Emergency and early warnings	**S3. D**			0.50	0.59	0.52
Data collection and communication to officials	**I2. A**				0.64	0.67
Establishing early warning system with local government	**I5. B**					**0.80**
Informs and updates officials	**I5. D**					
WWAs RC SIERA	**Geographical Location**	**Coefficient of determination (r^2)**				
	Mountainous N = 4	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**1**	0.11	**1**	**0.76**
Emergency and early warnings	**S3. D**			0.11	**1**	**0.76**
Data collection and communication to officials	**I2. A**				0.11	0.56
Establishing early warning system with local government	**I5. B**					**0.76**
Informs and updates officials	**I5. D**					
	River N = 27	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**0.74**	0.48	0.53	0.52
Emergency and early warnings	**S3. D**			0.54	0.59	0.53
Data collection and communication to officials	**I2. A**				0.67	0.68
Establishing early warning system with local government	**I5. B**					**0.79**
Informs and updates officials	**I5. D**					
	Plain N = 26	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		0.68	0.51	0.50	0.51
Emergency and early warnings	**S3. D**			0.57	0.54	0.50
Data collection and communication to officials	**I2. A**				**0.73**	0.68
Establishing early warning system with local government	**I5. B**					**0.81**
Informs and updates officials	**I5. D**					

Lastly, there is a significant relationship between RC SIERA 12.A and I5. B (r^2 = 0.73) as well as RC SIERA I5.B and I5.D (r^2 = 0.81) in the sub-districts located at plain/low land areas (Table 5.12). This means that establishing early warning systems with local government is closely related with informing the updates during a disaster. This implies that solid and women-sensitive early warning system, especially in sub-districts that are usually inundated during heavy rainfall, has to be established with the support of local governments. These activities should be prioritized, enabling WWAs to convey proper risk information to women and communities in their areas. The results show that the influence of women can greatly contribute to the adoption of protective measures and hazard adjustments (Perry and Lindell, 1986).

3.b2 Relationship between WWAs RC SIERA and total population

There is a significant relationship between RC SIERA I5. B (r^2 = 0.77) and sub-districts with a very high number of total population (Table 5.13). This means that establishing early warning systems with the local government may become effective depending on the size of the population. This communication activity will work for large size populations, composing of various types of vulnerable populations (children, elderly, persons with disabilities, etc.). This result also indicates a strong relationship of the above types of risk communication activities to the attributing factors, such as geographical locations and the size of the population. Knowing the size and locations of high-risk people in a certain jurisdiction facilitates effective risk communication outreach (Breakwell, 2000; Beckjord et al., 2008).

3.b3 Relationship between WWAs RC SIERA and other attributing factors (population density - total schools)

No significant relationship identified between WWAs RC SIERA and other contributing factors such as population density and total schools (as formal education institutions). This implies that the density of people living in sub-districts and the level of formal education of women and communities in Bandung do not determine and prevail the risk communication process done by the WWAs.

Table 5.13: Degree of relationship between WWAs SIERA and other attributing factors (total population, population density, and total schools)

WWAs RC SIERA		Coefficient of determination (r^2)				
	Total Population	Very Low	Low	Medium	High	Very High
Awareness and drills	S3. B	0.01	0.10	0.06	0.05	0.53
Emergency and early warnings	S3. D	0.19	0.06	0.06	0.23	0.62
Data collection and communication to officials	I2. A	0.02	0.03	0.002	0.001	0.45
Establishing early warning system with local government	I5. B	0.01	0.14	0.14	0.05	**0.77**
Informs and updates officials	I5. D	0.02	0.14	0.35	0.21	0.66
WWAs RC SIERA		Coefficient of determination (r^2)				
	Population Density	Low		Medium		High
Awareness and drills	S3. B	0.20		0.03		0.02
Emergency and early warnings	S3. D	0.02		0.007		0.20
Data collection and communication to officials	I2. A	0.002		0.37		0.002
Establishing early warning system with local government	I5. B	0.03		0.007		0.003
Informs and updates officials	I5. D	0.0005		0.06		N/A
WWAs RC SIERA	Total Schools	Coefficient of determination (r^2)				
Awareness and drills	S3. B	0.01				
Emergency and early warnings	S3. D	0.11				
Data collection and communication to officials	I2. A	0.03				
Establishing early warning system with local government	I5. B	0.02				
Informs and updates officials	I5. D	0.02				

5.4.3 WWAs Risk Communication Interface

Following the correlation analysis, an overview of WWAs of their risk information source is obtained. Based on the informal conversation through telephone conducted in February 2012 with the Secretary of WWA of Bandung City, women in WWAs unanimously found the local authority, specifically those from the Communication and Information Service *(Diskominfo)* and a well-known reputed regional newspaper (covering Bandung City and West Java areas) named *Pikiran Rakyat*, are the trustworthy sources (Table 5.14). It shows that women put more value to city government and printed media as trustworthy and reliable sources of information on climate-related hazards and disaster risks, which confirmed Enarson's (2009) statement that women find government or official communications credible.

Table 5.14: WWAs risk communication source and mechanism

Woman Welfare Associations (WWAs)	**Priority**		
	1	**2**	**3**
Source of disaster risk information	Local Government	Printed Media (Newspaper)	WWAs SIERA (women and community activities)
Risk communication mechanism	WWAs SIERA (women community activities)	Electronic Media (Radio)	Printed Media (Newspaper)

Due to the unique organizational character of WWAs, where the leaders of women at the city, sub-district, and ward levels are the respective spouses of the mayor, the sub-district leaders, and the ward leaders, the women's leaders in Bandung have formed an effective working partnership with the local government. This is evident through the collaboration of WWAs with the local authorities, such as the Environmental Monitoring Body *(BPLHD Kota Bandung)* as well as the Communication and Information Service *(Diskominfo Kota Bandung)* of Bandung City to deploy and convey the information in an easily understood language transmitted through commercial radio (FM radio) in conveying risk information to other women and communities. WWAs have made use of a FM radio station for conveying environmental and flood risk in the Green and Clean Campaign of year 2011 and 2012. The WWAs rank community activities first and mass media second, such as commercial radio *(Rase FM)* and newspaper *(Pikiran Rakyat)* for wider reach of risk communication.

The use of mass media is mainly for all communities (including women who work outside their home and are at the same time housewives who do not have much time for participating in women activities at their area). This shows how women in WWAs can act as the intermediaries for risk communication in Bandung. They have advanced their social networks and tools (i.e. women's activities and mass media) that may function as effective means to transmit risk information as raised by Gandelsonas (2010). Potentially, social networks based on gender can have a positive social value and a strategic significance in the communication of vital knowledge and information, as also argued by Gandelsonas (2008). Thus the members of such networks as WWAs can be decisive in risk communication processes. WWs can offer their peers support and access to local knowledge and neighborhood contacts as well as provide a large membership base for consultation on various community issues. This substantially leads to a commitment to act on the risks.

5.4.4 Implications to WWAs Risk Communication Approach

Findings from earlier section articulate that women in groups such as WWAs through their activities play an important role in the DRR for the community. Socially, the WWA provide health care and protection for vulnerable groups in the community and facilitate access to services. Economically, WWAs upgrade women's livelihoods through the provision of skills in generating source of income and negotiating claims to rights and resources. Institutionally, WWAs collect and disseminate information as well as sensitize, engage, develop networking and establishing early warning system with local government. For this, WWAs support government' programs on social, health, and environmental issues that were identified in WWAs' activities, such as family planning campaign, designing children, maternal and elderly health care packages, constructing organic wells (bio pores) for flood risk management, and waste management in "Bandung Green and Clean Campaign 2011-2012" partnering with environmental agency and mass media (FM radio station). Although the WWAs conduct DRR activities more on the social aspects, they aspire to have more activities towards economic empowerment. This implies that woman's group can contribute to women's economic security in the community as important part of DRR.

Since DRR activities are inserted and embedded in women groups' daily and regular programs, it is worth to note that the women in Bandung have enormous potential as DRR drivers and risk communicators. WWAs have the capacity in "translating" programs and activities in a way that they are close to women affairs and benefitting family members as well. Therefore, investing in DRR sound activities, which are embedded in the social, institutional, and economic dimensions of WWAs will not only accelerate the safety and security of women but their families as well and eventually the whole community. Partnering with women community-based organizations, which are at the grassroots level and are voluntary with a high level of engagement, can ensure a holistic DRR participation of the community. However, disasters do not discriminate. As further scope of research on the gender issues on how men and women react differently upon the SIERA have to be analyzed. Further scope of study on this would be very important and will be conducted by the authors.

The diverse ranges of women groups' activities in Bandung are exemplified in the study but a single common thread binds them together. Each activity is an effort to shift the identity of women from victims and beneficiaries to key actors in building, shaping and sustaining resilient communities. Based on their responses during the study, women find themselves in undertaking these multiple roles for their communities are acting beyond their usual domestic roles and responsibilities to strengthen community capacities to cope with disasters. Women in groups drive the DRR process and subsequently build an active citizenship that addresses development priorities, reduces vulnerabilities and paves the way towards resilient community.

Furthermore, the increase in the risks of climate related disasters affect the vulnerable groups including women. Women's risk to disasters is influenced by gender differences in risk exposure, perception and preparedness behavior; women's exclusion from risk communication; and women empowerment and participation in risk communication to enhance resilience. In addition, women's socio-economic characteristics (health,

disaster preparedness, household economic condition, etc.) and women's living environment (geographical locations and hazard prone areas) also contributed to women's vulnerabilities and risks to disasters.

Moreover, WWAs SIERA aims also to identify the types of risk communication activities that can be conducted in Bandung. It focuses on those processes in which women in WWAs can act as risk communicators. Firstly, a risk communication framework was modeled for women risk communication process in Bandung (Figure 5.5). Secondly, a set of indicators categorized within the social, economic, and institutional resilience activities (SIERA), with a scope of 45 activities implemented throughout three different disaster periods (before, during, and after) was developed to characterize the delivery of risk information by women in WWAs (Table 5.10). The data was collected through a questionnaire survey using the SIERA approach by asking women's leaders at the ward level about their perceptions on these 45 scopes, on-going activities, and their risk information source and dissemination process. Thirdly, a statistical analysis was applied to determine the relationship between the following variables: the period of disaster, the type of the activity (social, institutional, economic), and other attributing factors (location, population, and type of educational institution) in finding types of risk communication activity that work for women and communities.

Through the qualitative as well as quantitative analysis, five risk communication processes were identified and implemented by WWAs for women in Bandung (Table 5.11). These were 1) awareness and drills, 2) emergency and early warnings, 3) data collection and communication with officials, 4) establishing early warning systems with the local government, and 5) informing and updating the officials during a disaster. When their perceptions and on-going activities were compared, several activities such as dissemination of disaster risk information, conveying early warnings to their peers, and involvement of the local government have matched with their risk communication plans and implementation processes. The results show that WWAs' activities in Bandung's communities have already performed certain level of risk communication, embedded in their activities.

Responding to women's issues, in terms of gender differences in risk exposure, perception, and preparedness behavior, the relationship of RC SIERA indicators between S3.B and S3.D showed a significant relationship that implies that risk awareness of the women can be enhanced if sufficient climate related disaster risk information are provided to WWAs before a disaster occurs. It entails that a broader partnership among WWAs and the city government of Bandung can bring greater participation of women in developing and disseminating information related to disaster awareness among women who are excluded due to lack of mobility and social isolation. It will reduce the gap of gender perception about disaster risk due to the improvement of women's knowledge.

Similarly, in terms of women's exclusion from risk communication networks, RC SIERA analysis supports the global understanding of why good governance role is essential in enhancing community resilience. The correlation between I5.B and I5.D displayed a significant relationship and highlights that high engagement of WWAs in advocating and

cooperating with the ward and sub-district government in establishing early warning systems. This supports WWAs in conducting systematic information gathering and disseminating disaster losses information in their local areas to government officials. It signifies that information associated with the climate related hazards through early warning systems would be disseminated to the most vulnerable section especially to women in Bandung city through the WWAs networks.

As a result, women can take proper actions to overcoming their physical barriers before and during disasters. Thus, cooperation among local government in the districts and sub-district levels with the WWAs for the establishment of early warning system will also address the issues of women exclusion from communication networks. Finally, women can be empowered in risk communication through WWAs and through the use of the RC SIERA approach. These provide women's groups as local actors, a platform to interact and a commitment to act with the local government and community in enhancing community resilience as the follow up of resilience assessment in Chapter 4. In addition, the support of mass media (commercial radio and) can enable WWAs to take and make decisive actions and bridging the gap of information between government and communities. This situation has led women in Bandung through WWAs to act beyond their usual domestic roles and responsibilities as risk communicators.

5.5 Risk Communication through Youth Unions

In general, the YUs in Indonesia are packed with youth-community targeted programs. The YUs of Bandung has ten core programs: Organizational Public Service; Education Training and Research Development; Business and Economy; Community Service and Relation; Women Empowerment; Sport, Art, and Culture; Spiritual and Mental Guidance; Population and Environment; and Law Advocacy and Human Rights. The YUs in Bandung is focusing on the Social Welfare and Productive Economic Business Effort. They are engaging large-scale private businesses, such as the National Telecommunication Company and largest nation tobacco industry. In 2010, the celebration of 50 Years Anniversary of Bandung Youth Union, a "Social Service Month" included activities such as bazaars (foods, handicrafts and skills) that are organized by each sub-district and wards. The income from the bazaar was donated to the needed in their sub-districts and wards. Thus, apart from the economic sector, the YUs of Bandung are dealing with other social welfare issues, such as: hunger, street children and youth, social health security insurance, and widower (women-headed families) as well as disaster. Figure 5.15 shows the structure of Youth Unions in Bandung.

In dealing with disasters, most of the YU's members in Bandung are also TAGANA (participation is up to 45 years old for the member and 45+ for the broad of trustee). The Social Service Agency of Bandung City recruits TAGANA Bandung. It is a volunteer-based organization, with a very small amount of compensation. Most of their activities are disaster-response based such as community kitchen, logistics, shelters, communication and networking with local government, agencies, and other volunteer and humanitarian-based organizations, as well as setting up a quick response team. Almost 70% of the YUs members are TAGANA, which implies that TAGANA and disaster issues are seen as important part of the YUs.

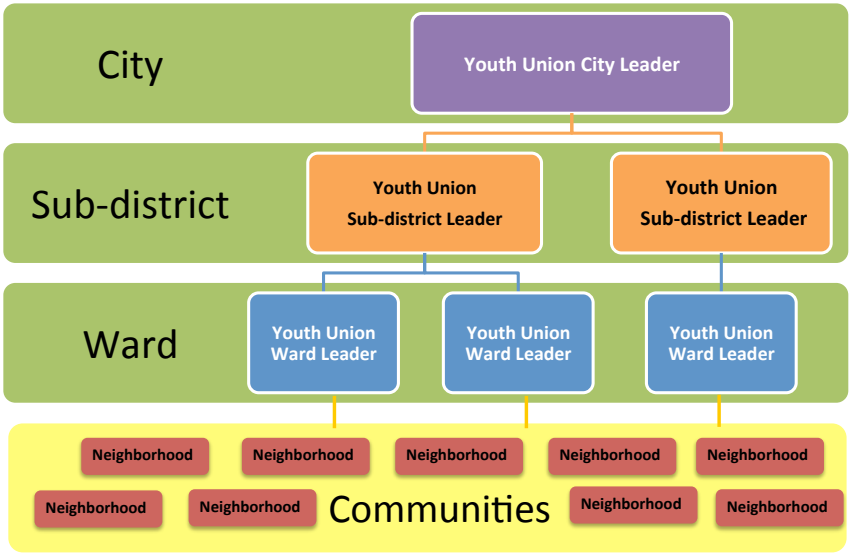


Figure 5.15: The structure of the Youth Unions in Bandung

The YUs and TAGANA always has been a close partner in DRR, since both organizations are under the same "guardian" organization (Ministry of Social Affairs of the Republic Indonesia). Figure 5.16 shows few activities of Youth Unions.



Figure 5.16: Youth Unions activities in Bandung. Clockwise: Vice Mayor of Bandung City opened the Youth Unions Service Month in 2010, Youth Union in newly developed residential areas is doing neighborhood cleaning, Youth Union in outer fringes of city is constructing a venue for youth activities, Youth Union in newly developed areas is distributing meat after a religious event to surrounding communities.

TAGANA, is a social/volunteer-based organization engaged in the field of disaster and community-based disaster management. The establishment of TAGANA is an effort to empower young people in various aspects of disaster management, particularly on community-based activities. The last four years, TAGANA has conducted many humanitarian activities in disaster and social welfare aspect, which is recognized by the public as one the foremost humanitarian activists. TAGANA was established by the Ministry of Social Affairs (2011) with the slogan *"We are the first to help and care"*. The role of TAGANA in disaster management is as communicator, motivator, and facilitator. According to TAGANA (2013), following are TAGANA's activities in *(i) before:* data collection of vulnerable population in disaster prone areas; disaster risk assessment; dissemination, awareness, and trainings/drills; updating equipment and tools for emergency response; information and communication networking with government, agencies, and related organizations; developing action plan; monitoring and evaluation, *(ii) during*: activation of all communication system; collecting data and information in disaster stricken area; mobilizing the youth and other community for emergency response; distribution of aids, *(iii) after*: collecting data on disaster losses; developing rehabilitation plan; disaster loss assessment; evaluation and reporting.

Thus in Bandung, since the members of TAGANA is part of YUs and vice versa, their activities within communities in disaster management are blended, contributed, and strengthened to one another. The next section below describes the same SIERA approach as for women group in the previous section, focusing on the activities of youth groups within a community in sub-districts and wards of Bandung. The SIERA approach will thus describe on how YUs' activities could contribute to DRR and provide the platform for interaction in communicating the disaster risks for the community and eventually build and enhance community resilience.

5.5.1 YUs Risk Communication through SIERA

With the YUs' DRR interventions in three domains (social, institutional, and economic) as the interaction media for the communities, the YUs could be able to convey the risks and trigger other youth and communities in taking actions. Aside from above reason, the YUs' SIERA is also an attempt to address the key barriers of youth participation in DRR and risk communication.

There are key barriers, which may hamper the communication process. Mitchell, Haynes, Hall, Choong, and Oven (2008) opined that the earlier model of risk communication does not mention the specific role of youth as either the source or the receiver of risk information. These barriers are summarized in Table 5.15. With this in mind, the DRR activities initiated and implemented by youth for youths and communities have to become more instilled and embedded in the community's daily lives. The youth-centered DRR needs a platform to perform the risk communication process by interacting and engaging the whole community to participate in DRR activities.

The type of YUs' DRR activities in the social, institutional, and economic dimensions are determined to ensure the support and facilitation from communities (incl. adults) based

on two main reasons. Firstly, adults may benefit from these YUs' DRR activities and secondly, these YUs' DRR activities comprised in those three dimensions are closely related to communities' daily coping activities in enhancing resilience.

Table 5.15: Key barriers of youth risk communication

Issue	Youth risk communication Barrier	Source
• Youth do not appear in the earlier model of risk communication, whether youth act as the sender or receiver of risk information. • Top-down approach that place scientific institutions at the top and public (youth) at the bottom, which make the assumption of an ignorant public, whose knowledge "deficit" requires to be provided with simple information.	Unspecific role of youth in communication process	Mitchell, Haynes, Hall, Choong, and Oven (2008)
• Paternalism and the belief that parents are able to pass the risk information on to their children to protect their safety. It assumes that parents can make responsible and appropriate decisions and choices about the risks faced by their children.	Parents-centered decision	

Table 5.16 describes the approach for YUs in communicating the risks to the community by their DRR activities, embedded in social, institutional, and economic aspect. The coding of S1.B, etc. to simplify the reading, applies the same as it was explained for WWAs'. The YUs DRR activities are formulated based on the common YUs' and TAGANA's activities in Bandung, literature and insights from the head of Bandung YUs and TAGANA. Figure 5.17 shows some of TAGANA activities in Bandung.



Figure 5.17: TAGANA activities of Bandung City. Mayor of Bandung City opened TAGANA training activity (left), TAGANA held regular disaster training and drills (middle and right). (Photo courtesy: TAGANA Bandung City, 2013)

The same approach as for the WWAs in analyzing the risk communication process by the YUs, SIERA survey questionnaire was conducted targeting the YUs at the ward level in November 2011 as the follow up of micro level resilience assessment (see Chapter 4). The respondents were the YU leaders at ward level (151 wards). A quantitative-qualitative questionnaire approach was undertaken and utilized for this study with the aim of analyzing the role of the youth within YUs at the ward level in perceiving DRR in the community. Moreover, it aims to investigate the potential role of YUs as risk communicators/disaster risk informants through their DRR activities within an informal risk communication network in the community. Out of 151 ward YU leaders, 145 responded to the questionnaire. The survey questionnaire was structured into three parts.

Table 5.16: YUs SIERA

Dimension	Primary Indicators	YUs DRR Activities					
		BEFORE Disaster	SIERA Code	DURING Disaster	SIERA Code	AFTER Disaster	SIERA Code
Social	Population	• List most vulnerable households	S1. B	• Collection of used clothes and goods for donation	S1. D	• Gather and collect disaster loss data for authority	S1. A
	Health	• Plant trees to enhance healthy environment for community	S2. B	• Report health condition of vulnerable groups to authority	S2. D	• Clean the debris waste after floods and/or waste after fires	S2. A
	Education and Awareness	• Disseminate disaster awareness and conduct drills	S3. B	• Emergency and early warnings	S3. D	• Organize regular safety campaigns	S3. A
	Social Capital	• Participation in community meetings/gatherings	S4. B	• Mobilization in aids distribution	S4. D	• Organize and engage community in cultural events	S4. A
	Community Preparedness	• Community mapping	S5. B	• Organization vulnerable groups to safer areas	S5. D	• Identification of logistic needs for the community	S5. A
Institutional	Mainstreaming	• Sensitization of disaster management plan	I1. B	• Ensure the disaster management plan is used	I1. D	• Mobilization of youth in disaster management plan review	I1. A
	Crisis Management	• Mobilization of youth in volunteering training and first aid	I2. B	• Mobilization of youth in neighborhood watching	I2. D	Coordination, gather, and communication data of vulnerable groups to authority	I2. A
	Knowledge Dissemination and Management	• Dissemination of disaster and risk knowledge	I3. B	• Collaboration with community leader in early warning	I3. D	• Enhance disaster awareness materials	I3. A
	Institutional Collaboration	• Networking	I4. B	• Collaboration with other stakeholders in taking care refugees	I4. D	• Engage disaster experts for youth and community forums/meetings	I4. A
	Good Governance	• Participation in early warning system development	I5. B	• Gather information of disaster loss for authority	I5. D	• Engage youth in rehabilitation and reconstruction process	I5. A
Economic	Income	• Facilitation the establishment of youth's business association and network	E1. B	N.A	E1. D	• Engage outside experts in providing youth skills in setting-up home industries	E1. A
	Employment	• Engage private sector in giving youth entrepreneurship	E2. B	N.A	E2. D	• Facilitation the private sector in building youth capacity	E2. A
	Household Assets	• Inform in securing household assets in case of a disaster	E3. B	• Inventory of non-and destroyed household assets	E3. D	• Mobilization in restoring and cleaning the household assets	E3. A
	Finance and Savings	• Encourage community in bank saving practice	E4. B	• Support local government in financial aids distribution	E4. D	• Youth cooperative unit campaign	E4. A
	Budget and Subsidy	• Sensitization of disaster risk management budget allocation	E5. B	• Fundraising	E5. D	• Linking local government in rehabilitation of education sector	E5. A

The first part focused on the YU ward leaders' perceptions of each social, institutional, and economic DRR activity according to the priority level based on the importance of each proposed activity (very important: important and absolutely for direct implementation; important: important but not necessarily for direct implementation; less important: might be of importance; not important: not important at all) in each disaster phase.

The second part stressed on their ongoing YUs DRR activities highlighting those that are currently being undertaken (ongoing) out of the 45 YUs' SIERA (Table 5.16). Finally, the third part of the questionnaire focused on the conduction of risk communication issues by YUs (risk knowledge, source, media, and partnership). The next section will elaborate the findings and implications of the YUs, one of major CBSOs in Bandung as risk communicators.



(a) (b)

(c) (d)

Figure 5.18: Pictures during YUs questionnaire survey in October-November 2011: (a) Preparation meeting with BDSG as facilitators in the survey, (b) Preliminary meeting with the regional coordinators of Youth Unions, (c) and (d) 145 Youth Unions at wards participated in the survey.

5.5.2 Data Analysis and Findings of YUs Risk Communication

1. The perceptions of YUs

First, the YUs have rated their SIERA differently than women (WWAs). Although the YUs perceived the SIERA on their importance (very important to not important), however, Figure 5.19 classifies only the most chosen activities for each SIERA in different disaster time frame ("very important" and "important" only).

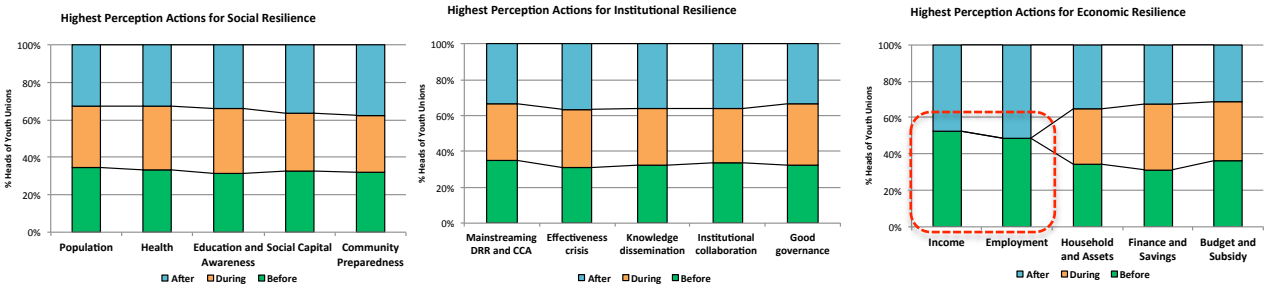


Figure 5.19: YUs SIERA highest perceptions for social, institutional, and economic resilience in each disaster time frame

Based on Figure 5.19, YUs at wards have perceived all SIERA equally important in all disaster time frame (before, during, and after disaster). Although the YUs in Bandung are famous for their Productive Economic Business (Section 5.5), this effort has not taken as a platform to communicate the risks, especially during disaster. YUs in Bandung has close collaboration with TAGANA or Youth Disaster Response (Section 5.5), as YUs' members are also members of TAGANA, YUs put emergency response activities at the forefront and invest economic resilience activities in income and employment in before and after a disaster. Table 5.17 shows the activities that are perceived highest (very important and absolutely direct implementation) from Figure 5.19. It shows those highest perceived activities for the timeframe before a disaster and highlights that YUs in Bandung perceived that they have shifted their paradigm of emergency response to disaster awareness and preparedness in disaster management. And through this momentum, risk communication might intervene and work in community, consider the YUs are put in the center as risk communicators.

Table 5.17: Highest perceived activities for social, institutional, and economic resilience in each disaster time frame

Dimension	Primary Indicators	Disaster Time Frame and its activity
Social	Health	*Before disaster:* Planting trees to enhance healthy environment for the community
Institutional	Effectiveness crisis management	*Before disaster:* Mobilizing the youth in volunteering training and first aid
Economic	Income	*Before disaster:* Facilitation of the establishment of youth's business association and network

More details for YUs SIERA in each disaster time frame and its weightages that are derived from Figure 5.19 are shown in Figure 5.20(a), (b), and (c). It is also showed in Figure 5.20(a), (b), and (c) that the YUs' DRR activities for community preparedness, good governance, and employment for the following social, institutional, and economic resilience was given the highest weightage (value of 5) by the heads of the YUs at wards. The weightages might not be the same as their highest perceived SIERA (Table 5.16), this implies that there are variations of concern and needs of YUs at different wards represented by their heads, which may adjust to their wards' condition.

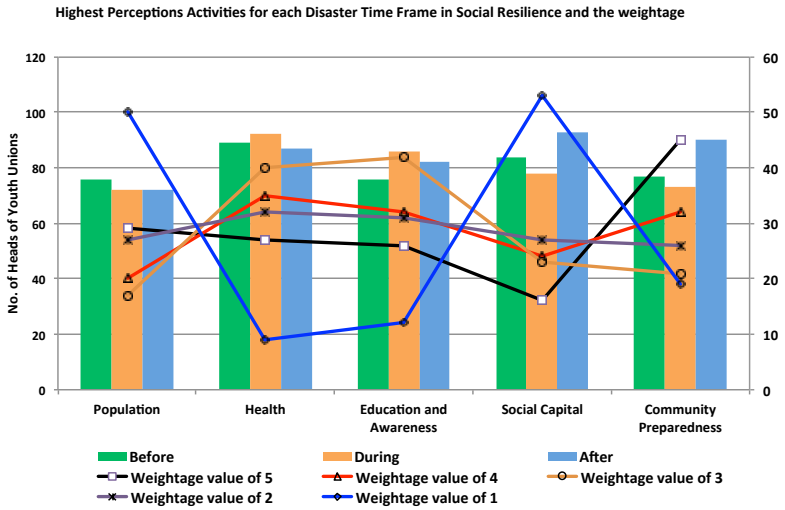


Figure 5.20(a): YUs SIERA highest perceptions for social resilience in different disaster time frame and the weightage

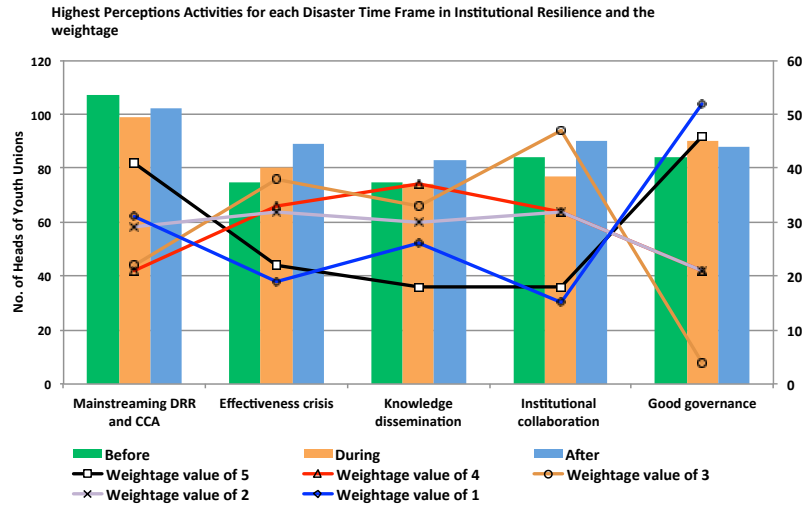


Figure 5.20(b): YUs SIERA highest perceptions for institutional resilience in different disaster time frame and the weightage

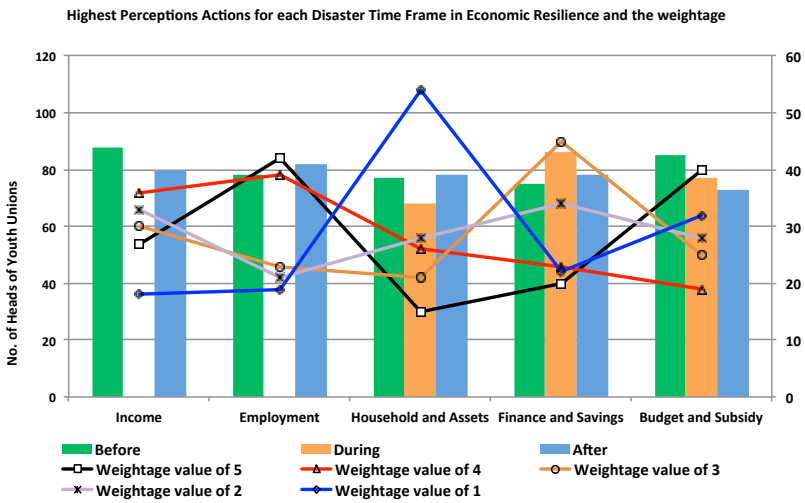


Figure 5.20(c): YUs SIERA highest perceptions for economic resilience in different disaster time frame and the weightage

Moreover, the heads of the YUs at wards prioritized the SIERA of social and economic equally as their first priority of actions over institutional ones (Figure 5.21). These were inline with the YUs' ten core of Bandung YUs' working programs in strengthening the community in socio-economic and welfare sector, such as in: Organizational Public Service; Education Training and Research Development; Business and Economy; Community Service and Relation; Women Empowerment; Sport, Art, and Culture; Spiritual and Mental Guidance; Population and Environment; and Law Advocacy and Human Rights (Section 5.5).

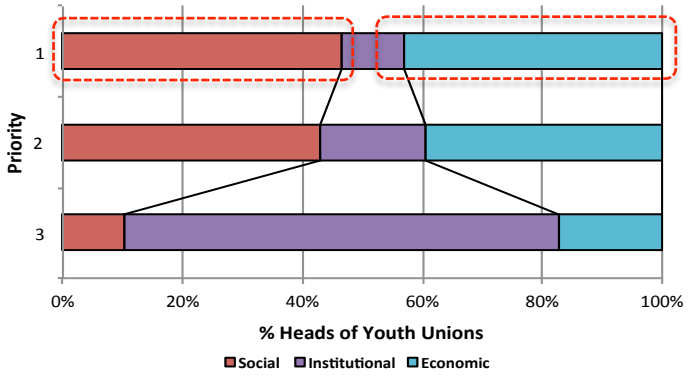


Figure 5.21: Prioritization of SIERA by heads of YUs at wards

2. The ongoing activities of YUs

Likewise the WWAs, the YUs' activities at wards in Bandung that are being conducted, can be classified in social, institutional, and economic aspect according to its frequencies (monthly, quarterly, and annually) (Figure 5.22[a], [b], and [c]).

In terms of social dimension, few heads of YUs responded to occasional and irregular activities, depending if a disaster occurs. But YUs' common activities are as follow: collecting used goods and clothes; gathering and recording fatalities, damages, and loss data; checking-up, recording, and reporting health condition of vulnerable groups to authority; and mobilization of youth in distributing government's aids/support. But, most common YUs activity is cleaning the debris/waste from rivers in their neighborhoods.

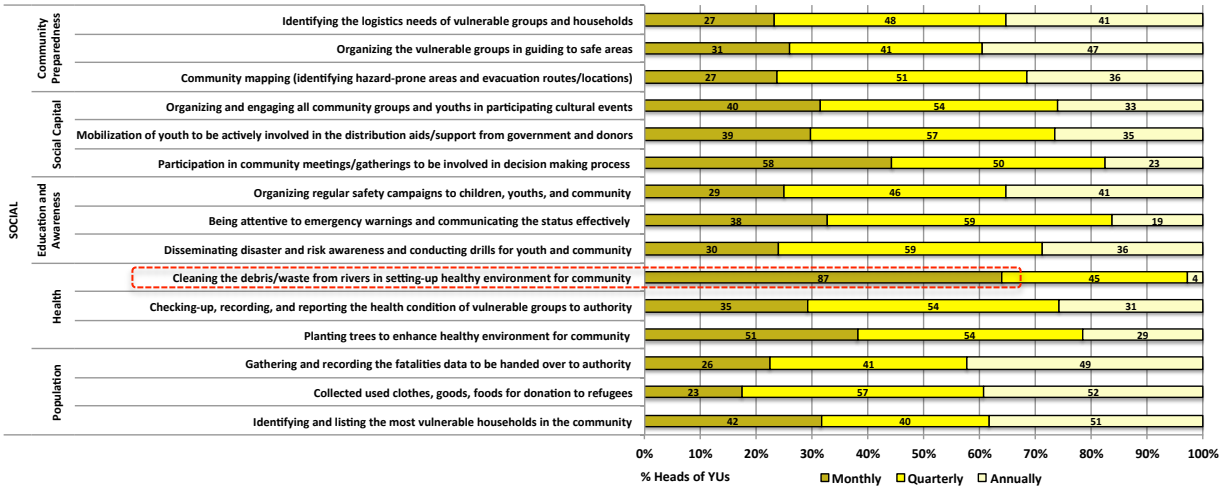


Figure 5.22(a): Frequency of current Youth Unions activities in Bandung - Social

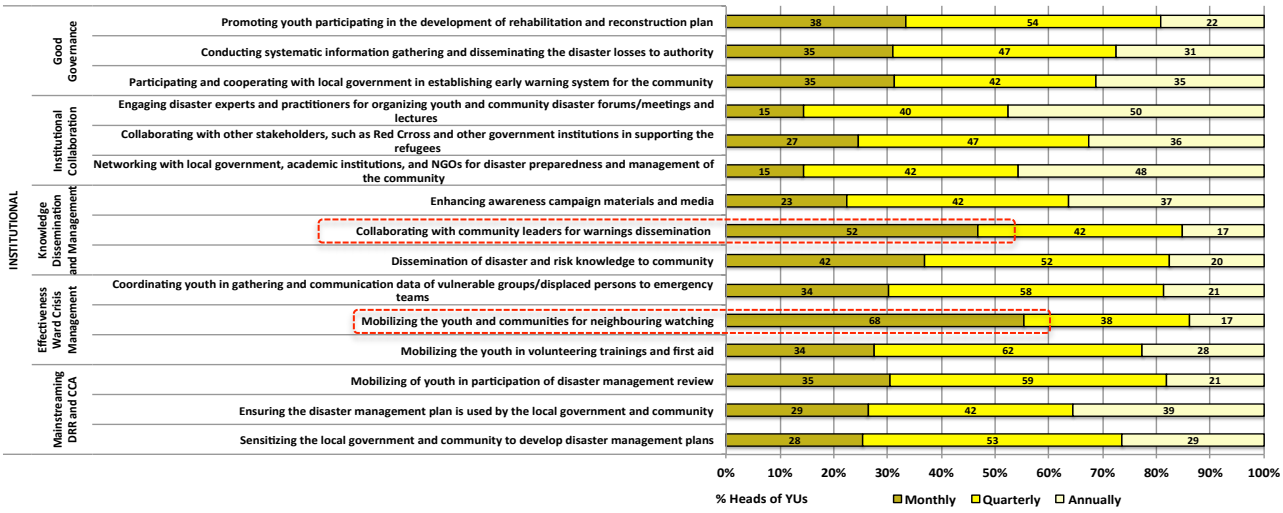


Figure 5.22(b): Frequency of current Youth Unions activities in Bandung - Institutional

In terms of institutional dimension, heads of YUs responded following activities: coordination of youth in gathering and communication data of vulnerable groups/displaced persons to emergency teams; collaboration with community leaders for warning dissemination; collaboration with other stakeholders (i.e. Red Cross) in supporting refugees; and conduction of systematic information gathering and

disseminating disaster losses to authority. However, what YUs do regularly with communities, is mobilizing the youth and male community members in taking part in community watching. YUs are also collaborating with community leaders in disseminating warnings.

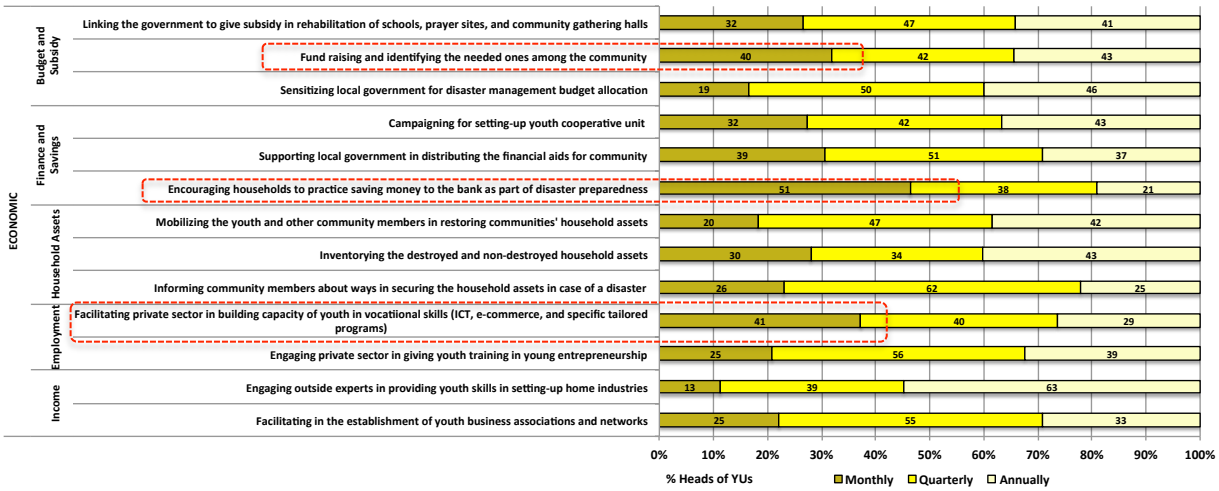


Figure 5.22(c): Frequency of current Youth Unions activities in Bandung - Economic

And in terms of economic dimension, few heads of YUs responded to occasional and irregular activities, such as: inventorying the destroyed and non-destroyed household assets; and fund-raising and identifying the needed among the community. But most of YUs conduct money saving promotion to households in terms of cooperative units, facilitating small-scale companies in building ICT skill of youths, and fund raising.

Above examples show that YUs are being active if a disaster occurs/ or if an event happens. Their ongoing activities in terms of risk reduction are focused on emergency responses, although most of leaders perceive that YUs should shift from emergency response to preparedness. This calls in strengthening their participation and engagement in pre- and post-disaster that might affect the risk communication process.

3. Relationship of YUs SIERA for risk communication

Likewise the WWAs, the data was quantitatively analyzed using a statistical method and to reveal the strength of relationship between two variables. A benchmark score that is used in this method is based on the r^2 value of coefficient determination (linear regression analysis) of higher than 0.7. It investigates the relationship between two variables of the scores between 0 and 1. The higher the score of the r^2 towards the maximum (1) shows the high the degree of relationship between those two variables. This correlation method helps to identify the positive high degree of relationship between two variables (perceptions vs. ongoing). The data for this analysis was taken only for the perceptions towards positive actions (very important and important) and summation of ongoing activities (monthly, quarterly, and yearly). The relationship analysis results in Table 5.18 for the YUs' perceptions and undertaken activities in different disaster timeframes significantly show a high degree of relationship (r^2= 0.94)

during the disaster. This implies that the YUs of Bandung plus the TAGANA are very active when a disaster occurs. In addition, based on informal discussions with the head of Bandung Youth Unions, TAGANA and their members invest their time on DRR mostly during a disaster. Their activities are mostly logistics, such as mobilizing the youth in distribution of aids and goods (foods, used clothes, etc.), transportation, evacuation shelters, developing network and collaboration with the local government and Red Cross for first aid and medical treatment, setting up of community kitchen, and fundraising. Less frequency of activities before and after a disaster can be noted. For example, a limited number of disaster trainings and drills are implemented by the TAGANA among school children even if this is not a regular activity. However, the above-mentioned DRR activities during a disaster highlight these as opportunities for building community resilience to disasters (Norris et al., 2008).

Table 5.18: Degree of relationship between YUs SIERA perceptions and ongoing activities

(N= 145 Youth Unions)	**Ongoing Activities (Coefficient of determination of [r^2])**		
Perceptions	Before	During	After
Before	0.13	0.01	0.01
During	0.02	**0.94**	0.001
After	0.21	0.14	0.0002

Moreover, discounting the lack of YUs' DRR involvement in other disaster time frames, the YUs and TAGANA may engage the youth-led volunteer group such as BDSG (Table 5.3) and strengthen the YUs' Productive Economic Business (PEB) in pre-and post-disaster. For example, in forming and maintaining collaboration and partnership before a disaster, YUs and TAGANA will make a great investment in terms of shaping a culture of safety through the conduct of disaster drills and trainings. Since the BDSG has the experience and has developed skills, techniques and methods in this area, it will not only make a positive impact to YU and TAGANA members but the whole community.

If one looks further into details of the correlation analysis for the ongoing activities in different disaster time frame of YUs SIERA, the results show similar towards strong relationship between the perceptions and nearly each of the frequency of the ongoing activities (monthly, quarterly, and yearly) for during the disaster (Table 5.19). This emphasizes that the risk communication might take place in what, where and when the YUs are carrying their most DRR activities.

Table 5.19: Degree of relationship between YUs SIERA perceptions and frequency of ongoing activities

(N= 145 Youth Unions)	**Ongoing Activities (Coefficient of determination of [r^2])**								
	Before			**During**			**After**		
Perceptions	**M**	**Q**	**Y**	**M**	**Q**	**Y**	**M**	**Q**	**Y**
Before	0.0005	NA	0.13	0.04	0.04	0.03	0.04	NA	0.10
During	0.11	0.11	0.03	0.60	**0.88**	0.50	0.03	0.0004	0.09
After	0.02	0.009	0.10	0.06	0.12	0.12	0.12	0.0002	0.45

3.a Relationship between YUs RC SIERA

This quantitative method has also the aim to seek the micro-variation types of risk communication strategies at the micro-city level (the wards samples are aggregated into the corresponding sub-district), which might function. Once the risk communication strategies are identified, DRR actions that would enhance the resilience of the community can be actualized. Likewise the WWAs', Table 5.20 describes the RC SIERA of YUs.

Table 5.20: YU's Risk communications SIERA (YUs RC SIERA) depicted from the YUs SIERA approach

Dimension	Primary Indicator	Disaster Phase	RC SIERA	SIERA code
Social	Education and Awareness	Before	***Awareness and drills*** (Disseminating climate-related disaster awareness and conducting disaster drill at ward level for youth and communities)	S3. B
		During	***Emergency and early warnings*** (Being attentive to emergency warnings and preparedness and communicating the information status effectively)	S3. D
Institutional	Effectiveness Crisis Management	After	***Data collection and communication to officials*** (Collecting and communicating data of vulnerable groups to emergency teams and ward government)	I2. A
	Good Governance	Before	***Establishing early warning system with the local government*** (Advocating and cooperating with the ward and sub-district government in establishing early warnings systems)	I5. B
		During	***Informs and updates officials*** (Conducting systematic information gathering and dissemination of disaster losses to be shared with officials)	I5. D

The data was collected at the ward level. However, for purposes of analysis, the data was aggregated into respective sub-districts in order to reveal common patterns of YUs' RC SIERA participation in different type of areas of Bandung City and inline with the conducted local level resilience assessment in Chapter 4. The findings show that there is a significant relationship (level of significance of 0.7 and above) between RC SIERA I5.D and I2.A (r^2 = 0.76) (Table 5.21). It shows that the activity of gathering the status of disaster information during a disaster, such as disaster losses for the authority has a high relationship with the conveying of the condition data of vulnerable groups, such as elderly, pregnant women, children, disabled persons, etc., after a disaster. This implies that these two types risk communication activities might function in all 30 sub-districts and indicates that YUs at the ward level can be the intermediaries or risk communicators for their communities.

Table 5.21: Degree of relationship between the YUs RC SIERA

YUs RC SIERA	(Sub-district Sample = 30)	Coefficient of determination (r^2)				
	RC SIERA	S3. B	S3. D	I2. A	I5. B	I5. D
Awareness and drills	S3. B		0.35	0.33	0.29	0.29
Emergency and early warnings	S3. D			0.69	0.43	0.45
Data collection and communication to officials	I2. A				0.58	**0.76**
Establishing early warning system with local government	I5. B					0.67
Informs and updates officials	I5. D					

3.b Participation and relationship of YUs RC SIERA

The participation and relationship of RC SIERA of YUs of Bandung is summarized in Table 5.24. To reveal common patterns of YUs' RC SIERA participation in different types

of areas in Bandung City, the 30 sub-districts are divided into seven types of areas (Table 5.24), depending on the nature and dynamics of the city. The grouping was derived from observations when implementing the questionnaire survey to YUs in wards and based on the CDRI analysis (sub-district resilience assessment) in Chapter 4. The rationale for this analysis is based firstly, on the division of percentage of youth population residing in each of the 30 sub-districts (Table 5.22).

Table 5.22: The youth population in 30 sub-districts of Bandung

No.	Sub-district	No. of wards	Area (km²)	Total Population	Total Youth Population
I.	Sukasari	4	6,27	79.211	28,7238
II	Sukajadi	5	4,30	104.805	56,272
III.	Cicendo	6	6,86	96.491	44,371
IV.	Andir	6	3,71	94.361	45,515
V.	Cidadap	3	6,11	56.325	26,652
VI.	Coblong	6	7,35	127.588	49,028
VII.	Bandung Wetan	3	3,39	29.807	15,476
VIII.	Sumur Bandung	4	3,40	34.446	18,970
IX.	Cibeunying Kaler	4	4,50	68.087	24,979
X.	Cibeunying Kidul	6	5,25	104.575	51,445
XI.	Astanaanyar	6	2,89	66.658	34,150
XII.	Bojongloa Kaler	5	3,03	117.218	51,812
XIII.	Babakan Ciparay	6	7,45	143.203	44,336
XIV.	Bojongloa Kidul	6	6,26	83.600	64,554
XV.	Bandung Kulon	8	6,46	138.644	64,737
XVI.	Regol	7	4,30	79.316	37,923
XVII.	Lengkong	7	5,90	69.307	32,983
XVIII.	Batununggal	8	5,03	116.935	59,485
XIX.	Kiaracondong	6	6,12	127.616	63,380
XX.	Arcamanik	4	5,87	65.607	27,304
XXI.	Cibiru	4	6,32	67.412	20,124
XXII.	Antapani	4	3,79	72.006	12,631
XXIII.	Ujung Berung	5	6,40	72.414	26,391
XXIV.	Rancasari	4	7,33	72.046	30,063
XXV.	Buahbatu	4	7,93	92.140	47,687
XXVI.	Bandung Kidul	4	6,06	57.398	26,386
XXVII.	Panyileukan	4	5,10	37.691	16,996
XXVIII.	Cinambo	4	3,68	23.762	8,979
XXIX.	Mandalajati	4	6,67	60.825	29,806
XXX.	Gedebage	4	9,58	34.299	11,597
	Total Sub-districts: 30	**Total wards: 151**			

Source: Bandung Statistical Agency (2011)

Secondly, on the participation level measured by the given weightage for each sub-district based on the activeness of YUs in wards for that particular sub-district for each YUs RC SIERA (whether all, some, or not all the YUs at wards conducted that RC SIERA) (Figure 5.23 until Figure 5.27).

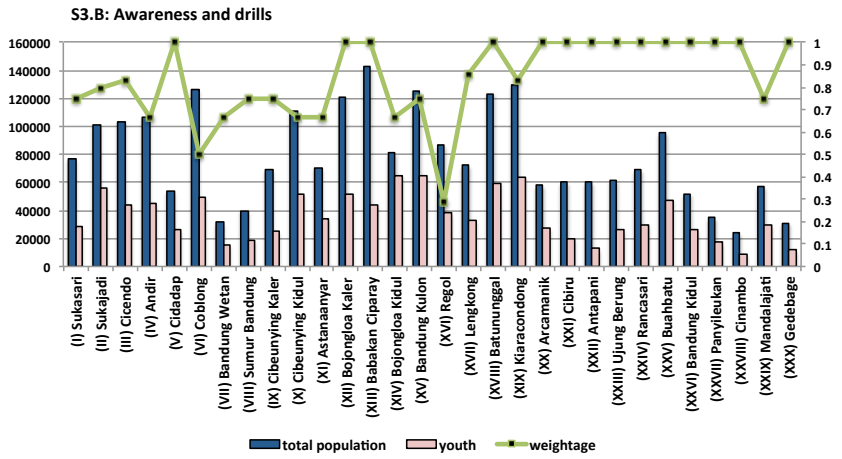


Figure 5.23: The level of participation of YUs at sub-districts measured by the weightage for RC Awareness dissemination and drill (S3.B)

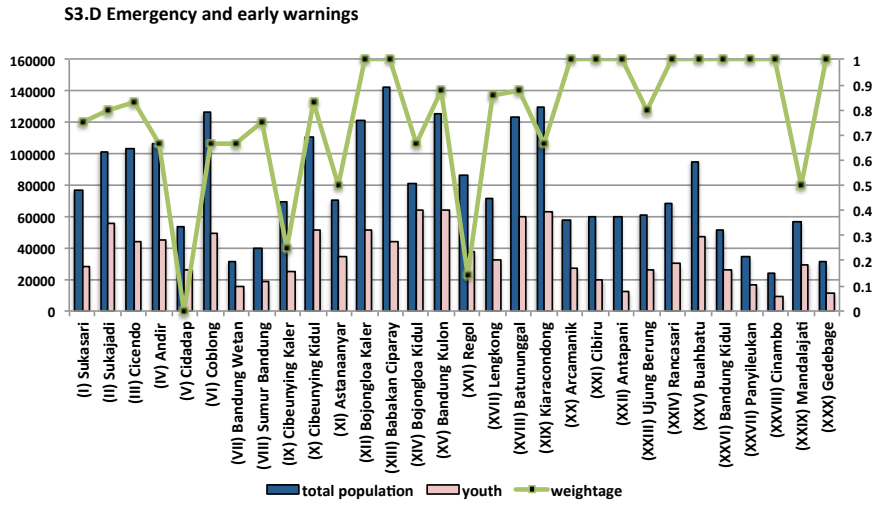


Figure 5.24: The level of participation of YUs at sub-districts measured by the weightage for RC Emergency and early warnings (S3.D)

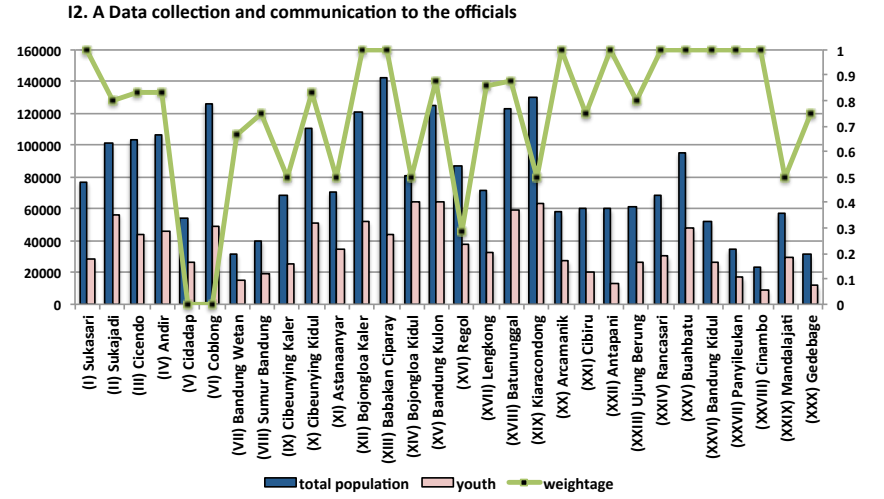


Figure 5.25: The level of participation of YUs at sub-districts measured by the weightage for RC Data collection and communication to the officials (I2.A)

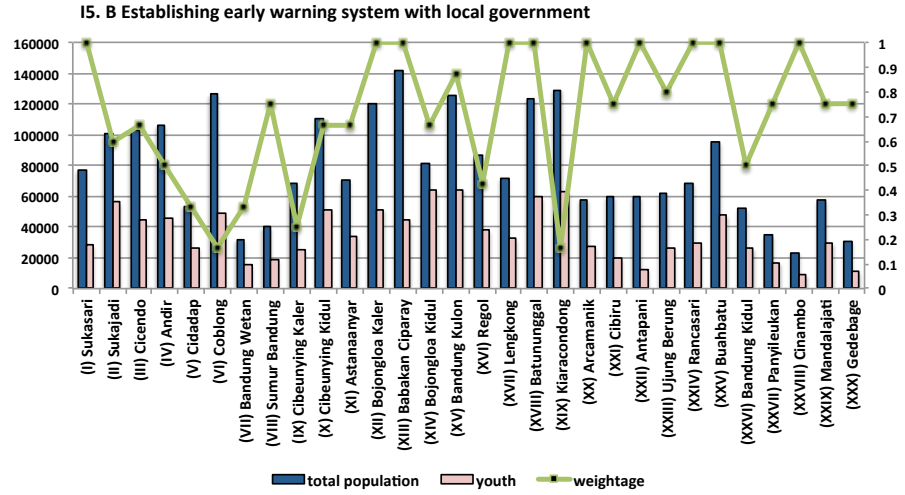


Figure 5.26: The level of participation of YUs at sub-districts measured by the weightages for RC Establishing early warning system with local government (I5.B)

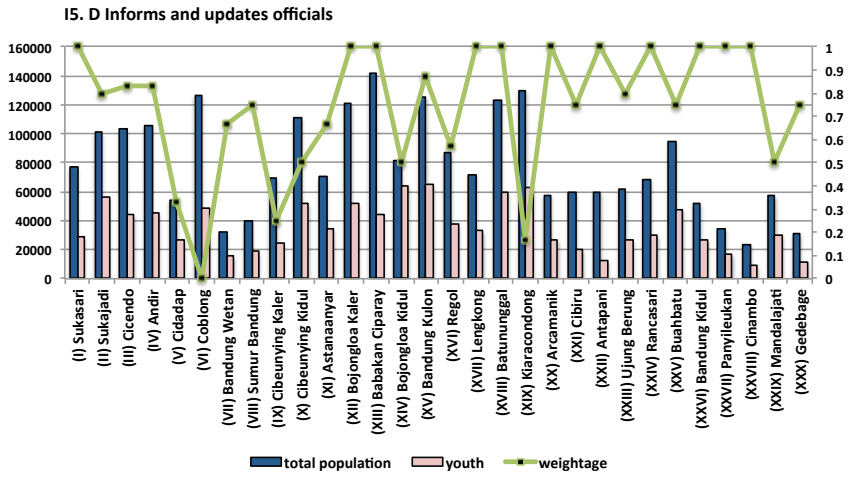


Figure 5.27: The level of participation of YUs at sub-districts measured by the weightages for RC Informs and updates officials (I5.D)

And thirdly, it is based on the degree of relationship between RC SIERA in different types of areas (Table 5.23). Moreover, all the five types of RC SIERA are important and dependently impacting the risk communication process. However, the strength of the relationship may vary between the RC SIERA in different types of areas.

Table 5.23: Degree of relationship between YUs RC SIERA in different type of areas of Bandung

YUs RC SIERA	Sub-district in	Coefficient of determination (r^2)				
Among different types of areas	**Mountainous Area**	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		NA	NA	0.12	0.23
Emergency and early warnings	**S3. D**			0.49	0.30	0.23
Data collection and communication to officials	**I2. A**				0.84	**0.91**
Establishing early warning system with local government	**I5. B**					**0.83**
Informs and updates officials	**I5. D**					
	Center Part Area	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**0.99**	1	0.47	**0.71**
Emergency and early warnings	**S3. D**			0.99	0.41	0.64
Data collection and communication to officials	**I2. A**				0.47	**0.71**
Establishing early warning system with local government	**I5. B**					**0.83**
Informs and updates officials	**I5. D**					
	Newly developed Areas	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		NA	NA	NA	NA
Emergency and early warnings	**S3. D**			NA	NA	NA
Data collection and communication to officials	**I2. A**				0.33	1
Establishing early warning system with local government	**I5. B**					0.33
Informs and updates officials	**I5. D**					
	Old part Areas	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**0.75**	0.25	0.25	0.25
Emergency and early warnings	**S3. D**			**0.75**	0	**0.75**
Data collection and communication to officials	**I2. A**				0.25	1
Establishing early warning system with local government	**I5. B**					0.25
Informs and updates officials	**I5. D**					
	Out fringes Areas	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**0.89**	**0.80**	NA	0.54
Emergency and early warnings	**S3. D**			**0.98**	0.14	**0.72**
Data collection and communication to officials	**I2. A**				0.15	**0.75**
Establishing early warning system with local government	**I5. B**					NA
Informs and updates officials	**I5. D**					
	Valley Areas	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		1	1	NA	1
Emergency and early warnings	**S3. D**			NA	NA	NA
Data collection and communication to officials	**I2. A**				1	1
Establishing early warning system with local government	**I5. B**					NA
Informs and updates officials	**I5. D**					
	Residential Areas	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		**0.86**	**0.94**	**1**	**1**
Emergency and early warnings	**S3. D**			**0.99**	**0.86**	**0.86**
Data collection and communication to officials	**I2. A**				**0.94**	**0.94**
Establishing early warning system with local government	**I5. B**					**1**
Informs and updates officials	**I5. D**					

In terms of participation, business, government service, and higher education institutions dominate the center part of city. Although many youths pursue higher education, these youths do not reside in this area, thus there are not many youths living in this part of city. The same applies for the old part of city, which is dominated by public services such as old stores, markets, and some heritage constructions. Less youth population lives in this old part compared to the other types of areas. Therefore, this explains why the level of YUs RC SIERA participation is low for both areas (Table 5.24). In terms of the degree of relationship between YUs RC SIERA and different types of areas, establishing early warning system with local government is weak in both center and old part of city. Possible barriers for the low and weak participation from the YUs, there is no support from adults and local government, as well as interest from the youth. Moreover, less youth participated (due to low percentage of youth population) in DRR and RC for both areas.

To address these barriers, providing YUs some incentives or modality in running their youth business program such as Productive Economic Business (PEB), which YUs commonly received from the private sector/companies, would trigger their interest. In addition, by strengthening the YU's PEB, the YUs can contribute economically to the community especially after a disaster. Providing the youth access to economic resources will increase household income and improve economic resilience. Peary (2012) investigates the power of social media throughout the disaster cycle. The use of social media, such as Facebook by the YUs and TAGANA to inform and remind their members about their non-DRR activities is common. However, what needs to be emphasized is the channeling of wider options of usage, such as updating risk information along with recommended countermeasures/DRR and RC actions in enhancing the resilience.

The youth residing in mountainous and valley areas are more active compared to those at the center and old part of the city (Table 5.24). The participation level of YUs for RC SIERA in these sub-districts according to their weightage is higher than YUs in the center and old part of city (value between 0.6 and 1.0). Although the degree of relationship between YUs RC SIERA and valley areas shows perfect score ($r^2=1$), but due to limited sample, it discounted from the relationship analysis and consider as weak. Thus, the degree of relationship results of RC SIERA show that both areas (mountain and valley) have weak relationship in terms of dissemination of disaster awareness and conducting disaster drill at ward level for youth and communities. These occur due to less support and facilitation that YUs receive from adults and local government. The same also applies that there is less interest and inequality of involvement of youth within YUs in DRR and RC participation, which become key barriers.

In achieving full level participation and strong relationship particularly for awareness and drill, the YUs in these sub-districts may wish to engage other youth groups such as the BDSG (Table 5.2), due to their knowledge, experience, and activities in pre-disaster. In the same way, the BDSG may obtain additional value in partnering with the YUs for their DRR Homestay program since the YUs have a strong tie with the community not only with the YUs in Bandung City but also the YUs in other cities and regions.

Table 5.24: Summary of Participation and Relationship of RC SIERA of Youth Unions of Bandung

Types of area	Dynamics of Youth Unions	Youth Population	Participation/Relationship				
			Awareness and drills	Emergency response and early warnings	Data collection and communication to officials	Establishing early warning system with local government	Inform and update official
Center	Less number of youth and less member of youth union, thus less youth activities and no dynamics of youth. Areas dominated by business, service, government, and education sector.	Low	Low / Strong	Low / Strong	Low / Strong	Low / Weak	Low / Strong
Old part of city	Less number of youth and less member of youth union, thus less youth activities, no dynamics of youth. Large areas are abandoned and poor settlements are growing.	Low	Low / Strong	Low / Strong	Low / Weak	Low / Weak	Low / Strong
Valley	Less youth population and less member of youth union, thus less youth activities. Remote areas. Less access to city services.	Medium	Medium / Weak	Medium / Strong	Medium / Strong	Medium / Weak	Medium / Weak
Mountainous	Less number of youth population and less member of youth union, thus less youth activities. Remote areas and dominated by rich citizens. Less tight connection between neighbors.	Medium	Medium / Weak	Medium / Weak	Medium / Weak	Medium / Strong	Medium / Strong
Residential areas	More youth populations compared to other areas, more members and actively conduct youth activities. Close and tight- knit relationship between neighbors and between different age ranges. Involvement of TAGANA members. Easy access to city services	High	High / Weak	High / Weak	High / Strong	High / Weak	High / Strong
Newly developed areas	More youth populations compared to other areas, more members and actively conduct youth activities. Close and tight- knit relationship between neighbors and between different age ranges. Involvement of TAGANA members. Recently joined the city and majority of the community are young couples.	High	High / Weak	High / Weak	High / Weak	High / Weak	High / Strong
Outer fringes of city	More youth population compared to other areas, more members and actively conducts youth activities. Involvement of TAGANA members. Close and tight- knit relationship between neighbors and between different age ranges. Large amount of interest and motivation in improving living conditions.	High	High / Strong	High / Strong	High / Strong	High / Weak	High / Strong

To ensure the implementation and involvement of youth in risk communication actions (RC SIERA) in these areas, the leaders of YUs and TAGANA at wards and sub-districts can appoint/select one of their members to be a neighborhood coordinator in facilitating the process. This will address the inequality in youth participation in the risk communication process. Thus, risk communication is ensured through solid networks among the YUs and TAGANA as well as between the YUs and TAGANA with the local government. Another option on how to involve more YUs is through other forms of networking besides social media. A live interaction platform, such as setting up a peer-supported youth forum on a regular basis that aims to create an inter-active forum, will give the YUs and TAGANA an opportunity to familiarize themselves with local government agencies and other stakeholders related to disaster management including city, sub-district, and ward governments, Social Service, Red Cross, volunteer-based

organizations like BDSG, Local Disaster Management Agency, and other CBSOs (WWAs and FBOs). The peer-supported youth forum will not only create a strong relationship among each stakeholder and ensure the involvement of YUs in DRR and RC activities but also create collaborative solutions.

Lastly, the YUs in sub-districts located in the residential, newly developed residential areas, and outer fringes of the city have high participation levels of RC SIERA. This is shown by the strong involvement of TAGANA, who mostly reside and are active in these areas. However, challenges such as monitoring and evaluation to maintain the level of activeness has to be addressed. Therefore, such a system should be developed not only by the YUs, but also with related stakeholders. Sharing their implementation and best practices on DRR and RC experiences with other sub-districts, which have a low level of participation, may support and inspire them. The weak degree of relationship of establishing early warning system with the local government in these three areas has the implication of low support from the local government despite the fact that most of TAGANA members are connected to government agencies. Better coordination and communication between the two parties (YUs/TAGANA and local government) needs to be strengthened. Consequently, a two-way risk communication has to be actualized.

Therefore in summary, both analysis of YUs participation and degree of relationship between YUs RC SIERA in different types of areas in Bandung show that it is not only help the YUs in overcoming barriers in DRR participation but also it helps in identifying micro risk communication types that work within the community in enhancing the resilience.

5.5.3 YUs Risk Communication Interface

Previous sections have mentioned about YUs' SIERA perceptions, on going SIERA, and the correlations of YUs risk communication SIERA. This section aims to investigate more on the risk and communication background of YUs, prior drawing the conclusion on how the role of YUs as risk communicators would be. The background of risk communication is as follow: knowledge on disaster and its impacts, source of information, risk communication responses, and partnership in risk communication. These are illustrated in the following sections.

1. Knowledge

The first to investigate is the disaster knowledge part of the youth, represented by the heads of the YU at wards. Figure 5.28 shows the results of the knowledge part. The YUs at wards inhibit a profound of knowledge on hazards and disaster impacts, with the later one is slightly above the knowledge on the hazard phenomenon itself. This might be due to some of the members of YUs are also members of TAGANA and are acquiring much knowledge from trainings and drills.

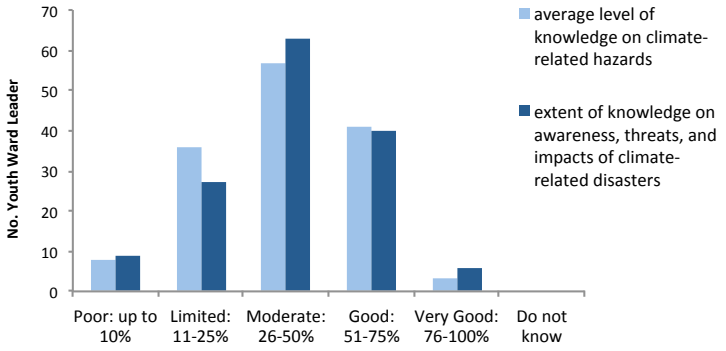


Figure 5.28: The disaster knowledge of YUs

This also implies that youth are aware about the disaster; hence risk reduction actions have to be accelerated in all areas of Bandung. Below figure shows the interest level of YUs in learning disaster and DRR and to what extent the YUs are embedding the DRR in their activities (Figure 5.29).

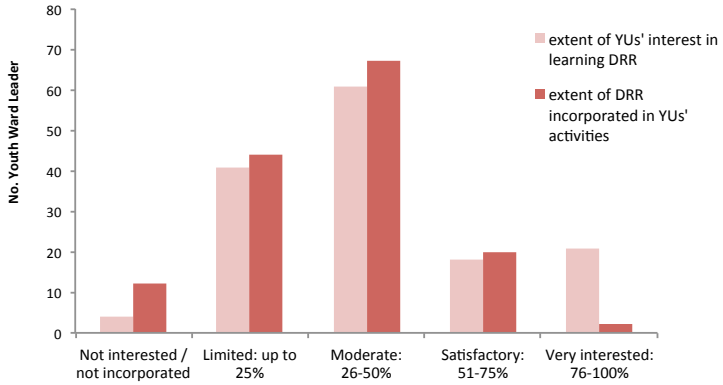


Figure 5.29: The extent of YUs' interest and incorporation of DRR in their activities

The YUs are very much interested in learning DRR and have embedded the DRR element in their activities. This can be seen in their ongoing activities, coupled with SIERA approach (Figure 5.22). The variation of level of incorporation (limited, moderate, satisfactory, etc.) means that the DRR activities are carrying out differently in YUs at wards. This might relates on the needs, concerns, interest, and participation of the youth in neighborhoods. Consequently, less interest and participation might affect and eventually cause the barriers for risk communication.

Moreover the knowledge part, the YUs were rated on their frequency in supporting the local government in disaster awareness campaigns at wards in Bandung and how often DRR trainings are given to youth in YUs (and community) (Figure 5.30).

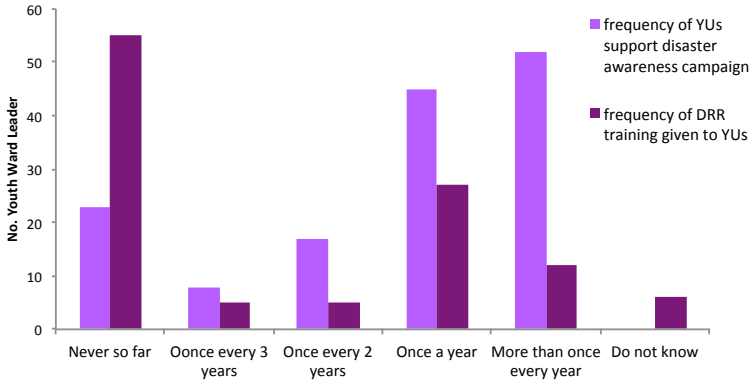


Figure 5.30: The frequency of disaster awareness campaign supported by YUs and DRR training

The finding shows that first, YUs highly support the disaster awareness campaigns, originated from the government. Secondly, on the contrary, the amount of DRR trainings received by the YUs at wards is minimum. This contradiction is due to the participation of TAGANA members in YUs in Bandung. TAGANA, as elaborated previously are young people (youth) recruited by the Social Service voluntarily and are focusing on disaster preparedness and response (Section 5.5). Therefore, it is their nature of organization in supporting any governmental activities related to disasters. Moreover, fewer amounts of DRR trainings received by YUs might also due to unequal distribution of TAGANA members within YUs reside in wards. TAGANA members inhibit skill and knowledge in disaster, which they might infuse in YUs. TAGANA's activation in YUs influences the level of participation of YUs in disaster issues. Thus, the TAGANA plays a crucial factor in risk communication process.

2. Source of Information

The YUs obtain disaster information from various sources (Figure 5.31).

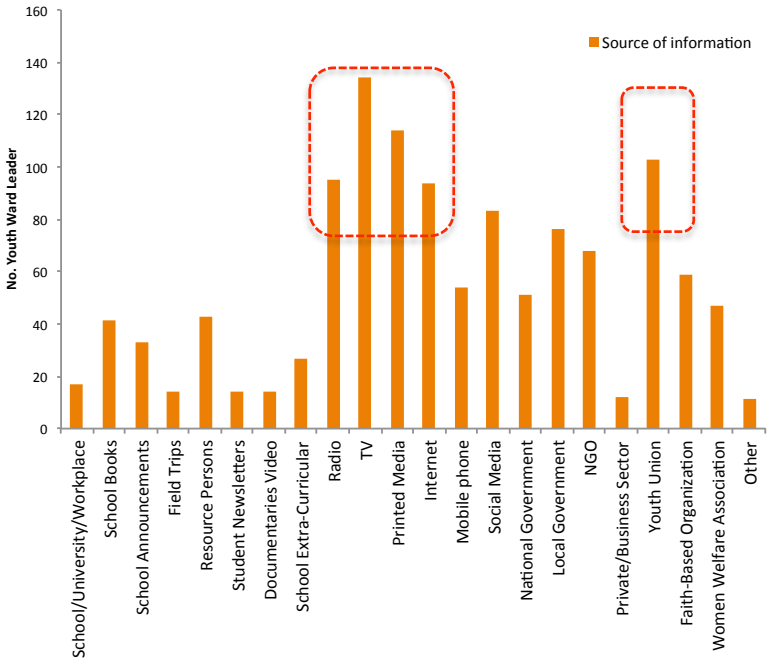


Figure 5.31: The source of information for YUs

The findings in Figure 5.31 show that the trivial media group, such as electronic media (television and radio) and printed media (mostly newspaper) are their main source of information, following information from their own organization (YUs) and local government. On the contrary, information from the social media (Facebook, Twitter, etc.), which is most utilized tool of communication by the youth, had not significantly rated as their most prioritized source of information. This might due to the variety usage of the social media among the youth in Bandung. Since the age range of the members of YUs and TAGANA is wide (13 until 45 years), the social media might not be favored among those members. Based on above circumstance, the use of media for YUs is essential and will be elaborated in the following Chapter (Chapter 6).

Moreover the source of disaster risk information, those sources are further analyzed on how the YUs prioritize them, according to the credibility and trustworthiness of the information that are provided. Figure 5.32 illustrates the results of the rating/priority of the YUs. Repeatedly, the YUs rated that electronic media such as television and radio as their most credible and trustworthy source of information, compared to other source providers (Figure 5.32).

Subsequently, local government and printed media (newspaper) were prioritized second credible and trustworthy source of information after the television. This is due to the close relationship and collaboration of YUs with the Government of Bandung, as well as TAGANA with the Social Service Agency. Thereupon, disaster risk information availability, trustworthiness and network with local government influence the risk communication process done by the YUs, not only the content, but its mechanism as well.

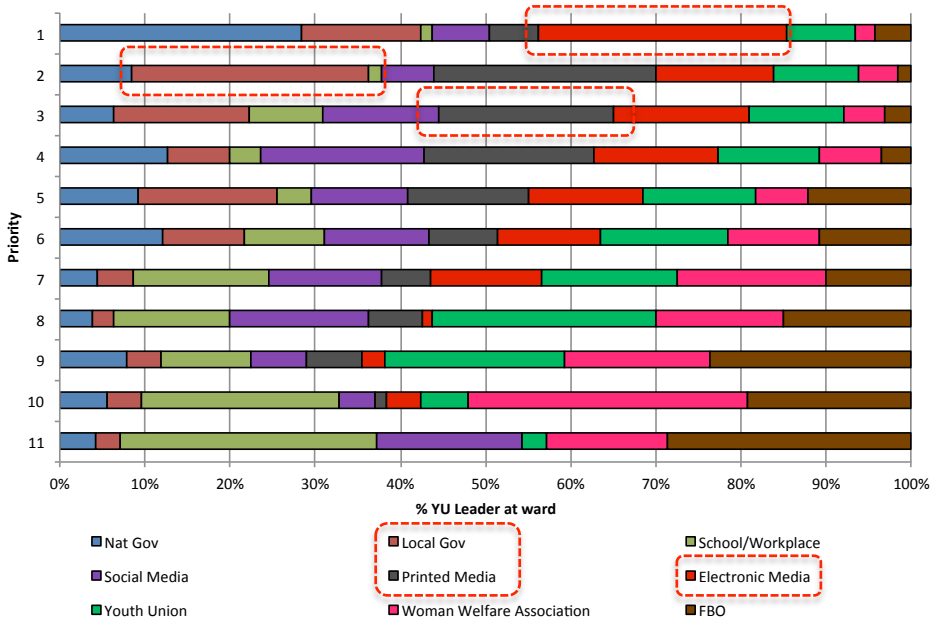


Figure 5.32: YUs prioritization of source of information

Therefore, based on the results in Figure 5.31 and Figure 5.32, an overview Table of YUs risk communication source and mechanism is presented below in Table 5.25.

Table 5.25: YUs risk communication source and mechanism

Youth Unions (YUs)	Priority		
	1	2	3
Source of disaster risk information	Media (Television and Newspaper)	YUs SIERA (youth and community activities)	Electronic Media (Radio and Internet)
Risk communication mechanism	YUs SIERA (youth and community activities)	Media (Television, Radio, and Newspaper)	Social Media (Facebook and Twitter)

3. YUs Risk Communication Responses

Moreover risk communication process, the YUs raised in the survey that they would like to convey the risk information to other youth and community, using all the available media equally. Figure 5.33 shows that the YUs have advancing the youth-based DRR activities embedded in SIERA (YUs SIERA), electronic-, printed-, and social media in equal proportion. This shows that YUs would like to reach out all type and different range-age group of community; presumably one does not utilizing sophisticated media, such as computer (Internet). The type of YUs SIERA (see Table 5.25 on risk communication mechanism) that they would like to conduct is disaster trainings and youth-based activities towards socio-economical aspect. These imply that these are the entry points for the YUs in communicating risk information to community. Through these risk communication mechanisms, it highlights that not only the YUs support the government and act as intermediaries between government and community, but risk communication process done by the youth will enhance the resilience of community in Bandung as well.

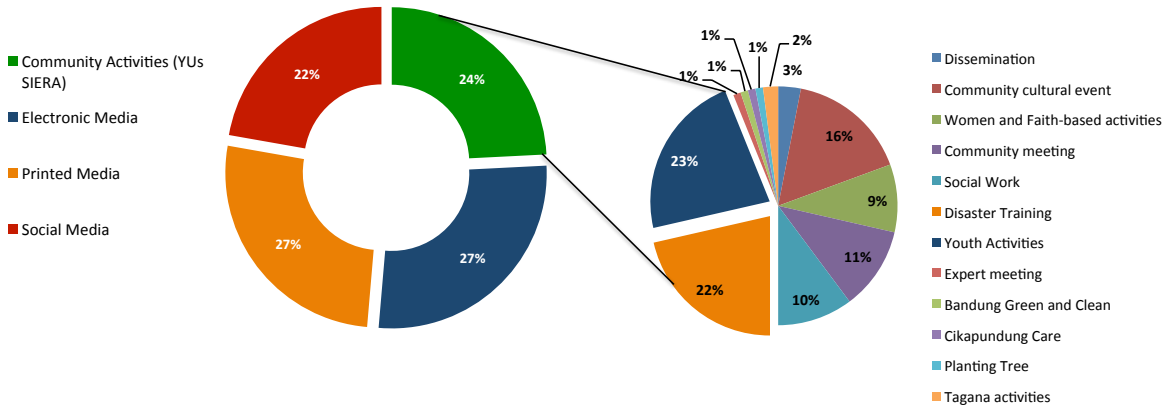


Figure 5.33: The composition of preferred risk communication media (left) and type of activity by the YUs to community (right)

More to the YUs' response, almost all the YUs are acting upon receiving disaster risk information (Figure 5.34). Their responses dominated mainly in the social work, such as helping other community in restoring back to initial condition (houses reconstruction,

clearing the debris, etc.) after a disaster. Thus, it is mainly dominated in emergency response. Aside from the social works, the YUs are also supporting the evacuation works and recording disaster losses data (disaster affected and casualties). This has stressed once again that the YUs are most active during the disaster and conducting emergency response actions.

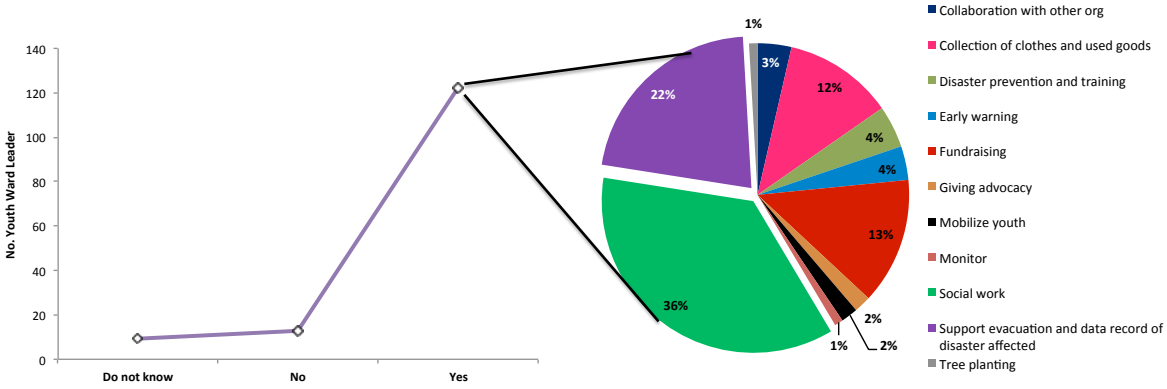


Figure 5.34: YUs' responses when receiving disaster risk information

4. Partnership of YUs Risk Communication

The YUs would like to implement risk communication the most with other CBSOs, such as Faith-Based Organizations and local government (Figure 5.35).

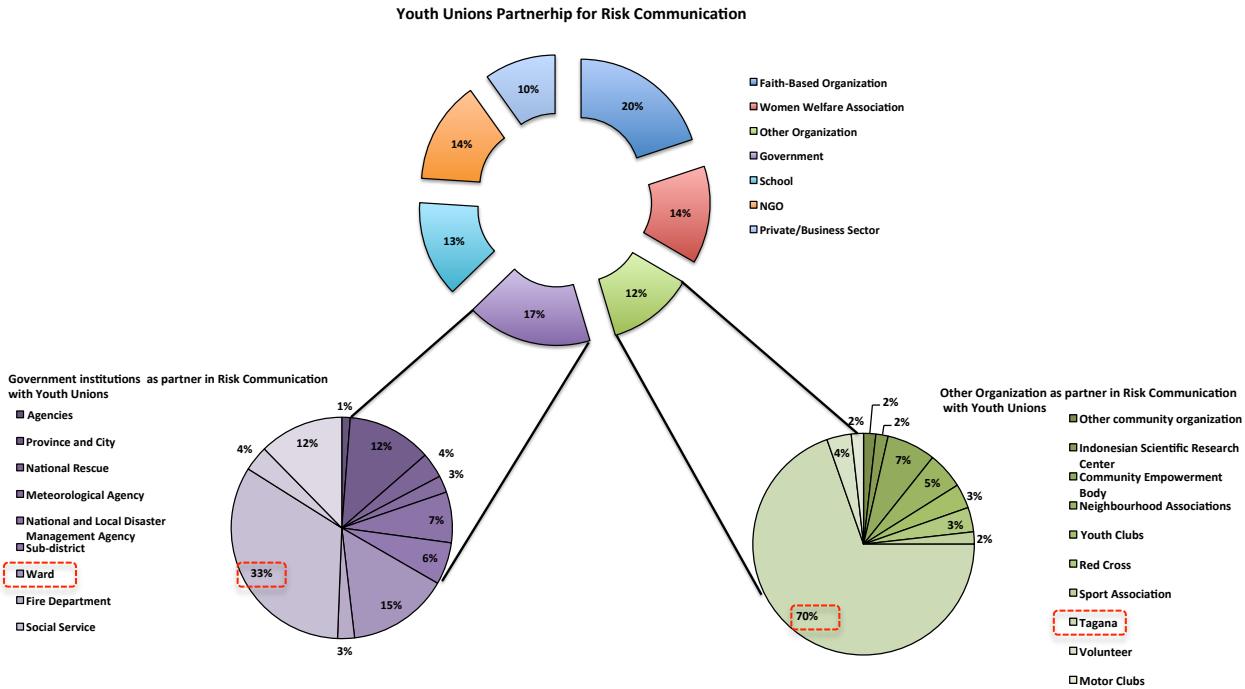


Figure 5.35: YUs' partnership for risk communication

The rationale of the selection of partnership with the FBOs is based on the practical background. Mosques inhibit crucial roles in disasters, not only based on the basic pre-requisites for temporary shelter (sanitation and hygiene, water and space availability), but its role in social-religious aspect. In addition, mosques have outward speakers, which would be very useful for transmitting early warning messages to communities.

Keeping this in mind, the YUs are partnering with the FBOs, is strategic for a comprehensive risk communication in Bandung. More to FBOs risk communication will be illustrated in Section 5.6. Moreover, partnering with the local government, such as Social Service Agency to conduct risk communication will bring additional benefit to YUs. Social Service Agency is the umbrella organization of TAGANA. Partnering with Social Service Agency of Bandung means securing TAGANA's interventions (contribution of disaster skill and knowledge, human resources and manpower, and equipment). Thus, risk communication process and actions in Bandung for youth and communities will be optimized.

5.5.4 Implications to YUs Risk Communication Approach

This study argued that certain key individuals or groups such as the youth groups can be mobilized as DRR agents and "transmitters" of information in risk communication process. The research has shown that youth group's activities within a community (city and its micro-city level/sub-districts and wards) contribute to DRR and provide the platform for interaction in communicating the disaster risks and build community resilience. The study emphasized that the adopted community resilience where the youth group is being the center of community-based society organization's (CBSO's) DRR is effective for organizational behavior and disaster management.

The case study of Bandung City provides some evidences, that informed youth group, such as Youth Unions (YUs) can network among the community as trusted and politically neutral resource, dispelling competing beliefs, convincing adults of new risks, and instilling more balanced view. As the case study has demonstrated, risk communication should be more than a conversation about the risk itself. Rather it forms part of wider process of community development and social engagement, and covers risks beyond those normally considered within the disasters literature. Reflecting the YUs' DRR activities, these risks are part of everyday life and form an intrinsic part of their behavior and attitude. Therefore, addressing these risks, it also increases the resilience through their corresponding actions in the domain of social, institutional, economic resilience activities (SIERA), as inline with the (CDRI) local level resilience assessment for the whole disaster management cycle (before, during, and after a disaster).

Specific results from the case study show two main findings; first, the YUs (youth groups and youth disaster preparedness unit/TAGANA at sub-districts and wards) are most active during a disaster. This was shown by the high of relationship between their perceptions and undertaken DRR actions in during disaster time frame. In addressing other disaster time frame, the YUs and TAGANA could engage the youth-led volunteer group such as BDSG and strengthening the YU's Productive Business Sector in pre-and

post-disaster. For example, creating and maintaining the collaboration and partnership before a disaster, YUs and TAGANA will make a great investment in terms of shaping culture of safety in conducting disaster drills and trainings. Since BDSG has many experiences and developed skills, techniques and methods in this field; it will not only make a positive impact to YUs' and TAGANA's members but the whole communities. And vice versa, BDSG may have an additional value in partnering with the YUs for the success of their DRR Homestay program, since the YUs have a strong tie of network with the community, not only the YUs in Bandung City, but the YUs at other cities and regions as well. Moreover, by strengthening the YU's Productive Economic Business Sector, especially after a disaster, the YUs could contribute economically to the community, providing the youths the access to economic resources, thus increasing households' incomes and economic resilience.

The second main findings illustrated that YUs risk communication are most active in the institutional domain, such as during the crisis management at their sub-districts and wards (losses data collection and communication to the officials) and good governance (establishing the early warning system with local government and inform, update the officials the disaster status), especially in hazardous areas (mountainous and riverside, etc.). To ensure that risk communication reach to the end users (communities at large) and not only limiting to local government; the collected risk information needs the media for the dissemination. Apart of the utilization of mobile devices (short message service), Peary (2012) found out the power of social media throughout the disaster cycle. Envisage the idea of using social media, Facebook is existed and commonly used by the YUs and TAGANA to inform and remind their members about their non-DRR activities. What needs to be emphasized is in channeling the wider options of usage, such as updating the risk information along with recommended countermeasure/DRR actions. To ensure the implementation of DRR actions in the community and involvement of youth in DRR, the leaders of YUs and TAGANA at wards can appoint/select one of their members to be a neighborhood coordinator in facilitating the process. Thus, risk communication is ensured through solid networks among the YUs and TAGANA as well as between the YUs and TAGANA with the local government.

Further idea on how to address barriers of youth participation in DRR is to involve more YUs in other form of networking than advancing the social media. A live interaction platform, such as setting up a peer-supporting youth forum of quarterly basis that aims to create an inter-active forum, will give the YUs and TAGANA the opportunity to familiarize themselves with local government agencies and other stakeholders related to disaster management, such as city, sub-district, and ward governments, Social Service, Red Cross, volunteer-based organization like BDSG, Local Disaster Management Agency, and other CBSOs (Women Welfare Associations and Faith-Based Organizations). The peer supporting youth-forum will not only create a strong relationship among each other and ensure the involvement of YUs in DRR activities, but creating collaborative solutions as well.

All in all, the YUs SIERA (including YUs RC SIERA) provides the window of opportunity and communication platform in the initiation of youth involvement in DRR. The next step would be the implementation of DRR that would trigger actions in and for the youth

and community in enhancing the resilience in the above-mentioned three domains (social, institutional, and economic). Although key barriers of youth involvement in DRR are identified, however, the example of YUs and TAGANA in Bandung, Indonesia gave an insight on how the youth groups such as Youth Unions can be mobilized for youth involvement in DRR and participating in overall community resilience building. Thus, the DRR and risk communication led by the youth groups for building a strong and resilient community lies not in whether it can be easily captured and quantified, but in whether it triggers novel actions. To make youth-centered DRR by YUs of Bandung a holistic approach, strengthening networking with local government and other stakeholders dealt with disasters (engaging BDSG in pre-disaster, setting-up peer-supporting youth forum) as well as using interactive social media such as Facebook with each appointed neighborhood facilitator, for further wider outreach of their DRR activities will create benefit for the whole community.

Although this section focuses on the risk communication abilities of the youth groups, the findings of YUs in Bandung, Indonesia also demonstrate the importance of the informal two-way risk communication between local government and the youth groups as well as between the youth groups and community. This highlight the notion that the youth groups through their DRR activities could interpret and take responsibility and actions on salient issues such as risk communication and building the overall community resilience.

5.6 Risk Communication through Faith-Based Organizations

In Indonesia, the mosque, part of FBOs has historically been a focal point where political, social, and religious activities are blended together. Mosques allow Muslims to perform their personal, social and cultural responsibilities, and provide a scope to perform their solidarity duties to society (IRI et al., 2011). During natural disasters mosques play an important role in collecting *sadaqat* (charity in the form of money and goods), organizing the community or as a place of refugee. According the data in IRI report, as Indonesia with the highest Muslim population in the world, it is the world's largest in the terms of the number of mosques (630,000) and *mushalla* (500,000 small Islamic prayer house). Learning from major disasters in Indonesia in the past five years, mosques have been playing important roles, especially during an emergency phase. With stronger construction, many mosques adequately withstood the destruction and damages, while other buildings and houses collapsed. Thus mosques have been provisionally accommodating vulnerable communities seeking temporary shelter and transformed into centers of aid coordination and distribution. Additionally, during the disaster, people also tend to turn to mosques to find spiritual and psychological composure, adding to its already eminent position in the community affected by disasters. The selection of the mosque as an alternative, informal center for disaster management has strategic considerations since the mosque has been considered as a house of God, which is safe for anyone. Moreover, the mosque is usually accessible and is located inside the residential areas, thus it provides a sense of security and safety. Although the role of the mosque in disaster situations is evident, there has been no proper study yet to explore fully the potential of mosque, especially in risk communication and disaster resilience.

Bandung City has 2,282 mosque family councils as of 2011, widely spread in 30 sub-districts and 151 wards. These mosque family councils, known as *DKM (Dewan Keluarga Masjid)* are under the Religion Department of Bandung City. DKMs are informal FBOs, self-empowered (depend heavily on charity and funds from the community), with limited and unregularly budget/incentive from the local government. In DKM Bandung, the mosques are also being as education centers for adults as well children in learning the religion deeper. Figure 5.36 shows some activities conducted by FBOs in Bandung.



Figure 5.36: FBOs Activities in Bandung. Clockwise: Mosque in a neighborhood organized cheap bazar for women in a neighborhood, Men participated in religious and community meeting, Mosque is the religious education center for youths and children.

Every afternoon and evening after the school and office hours, children and adults are coming to the mosques and get together to discuss about religious and social issues. Men head the *DKMs* and mosques, when Islam told the Muslims that men are meant to be leaders in favor of women. However, this leadership's rank is not diminishing the role of women; women play also major role in *DKMs*, particularly for women's Muslim issues. Thus, the *DKMs* accommodate the needs of many age's section population.

The IRI report (2011) mentioned that the coordination of mosques' activities in Indonesia, including Bandung, is concentrated on social collective group who has the power, authority, and being leaders in communities. These are first, social-religious group of actor, such as *ustadz* (Islamic spiritual leader), mosque council leader, and other organization leaders. The second group is the formal-structured community leader, such as neighborhood leaders, ward leader, sub-district leader, etc. In disaster situation, mosques inhibit the social-religious leadership roles as part of mosque's mechanism framework. Those roles are such as:

- Provision and arrangement of accommodation and place to sleep for evacuation purposes (as men and women are separate according to Islam religion), including food consumption, sanitation and personal hygiene
- Storage and aids distribution
- Coordination of aids involving the council and members from all group of ages and areas
- Collaboration with authorities, experts, and disaster management practitioner
- Mobilization of FBO members' participation in physical and non-physical aids
- Psychosocial therapy/support for communities through praying sessions and religious lessons

Mosques in Indonesia, including Bandung are divided into several categories. Previously mentioned, aside from *mushalla* (small Islamic prayer house) and communal mosque, there are governmental mosque, and organizational mosque (IRI, et al., 2011). The above roles of mosque in disaster are being optimized and work for communal mosque only. A mosque is classified as being a communal mosque if the mosque has more than 40 members (quantified in Friday's praying session for men). Figure 5.37 illustrates the tactical roles of communal mosque in disaster. For example, the communal mosque collaborates with government in directly distributing aids to the needed ones, without involving directly the local leaders. It has the fully right and mandated by the government to implement those six tactical steps in optimizing the role of mosque in disaster.

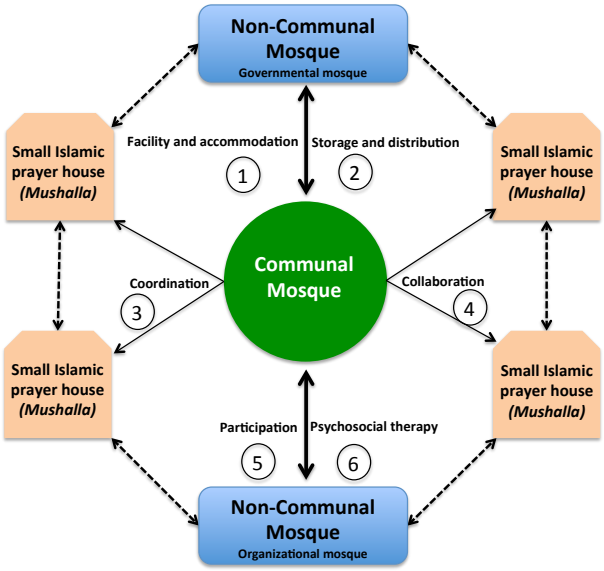


Figure 5.37: The communal mosque and its role in disaster (adapted from IRI et al., 2011)

Consequently, if such mosque, which is common and majority in Bandung, has the mechanism in disaster management in place, presumably mosque has conducted certain level of DRR as part of disaster management. Thus risk communication process needs to be explored in optimizing the role of mosque in disaster. The section below describes the approach of exploring the role of Bandung's FBOs in risk communication.

5.6.1 FBOs Risk Communication through SIERA

The perceptions of the FBOs, represented by the leaders of *DKM*s at ward level are collected to analyze the role of FBOs in perceiving the disaster risk in their community and their role in DRR by implementing their activities, which can eventually enhance the community resilience. Utilizing the same SIERA approach of risk communication as women and youth group, it also aims to analyze the role of FBOs as potential informants within informal risk communication networks. Table 5.26 pinpoints the common Faith-Based Organizations Social, Institutional, and Economic Resilience Activities drawing from the aforementioned roles of the communal mosque in disaster situation.

Likewise the Women Welfare Associations and Youth Unions, the Faith-Based Organizations was analyzed quantitatively and qualitatively. The quantitative approach is used in measuring the SIERA perceptions of *DKM* leaders of mosques in Bandung City. Hence, spatial focus is considered to assess the close relationship between mosque and community in every ward. Hence, a two-stage random sampling was conducted for data collection. Firstly, it should represent one FBO per ward and secondly, mosque that were selected has to be located within a large-size community. Thus, 151 wards equals to 151 FBOs samples. Qualitatively, the results are manifested in form of informal and un-structured interviews with the *DKM* leaders. It is used to capture the insights into shaping the risk communication process through the proposed FBOs SIERA (Table 5.26). To acquire their perceptions, a FBOs SIERA questionnaire was utilized. Firstly, their perceptions on the proposed SIERA based on immediate, or sometimes, or postponed are captured, followed by their undertaken SIERA in their respective wards. Secondly, these *DKM* leaders were asked about theirs and their members' disaster and risk knowledge, disaster risk information source, media to convey the risk information, and partnership.



Figure 5.38: Pictures during FBOs questionnaire survey in August-September 2012. Clockwise: Surveys with FBOs' leaders in residential areas, A FBO leader in newly developed areas showed children education materials goods as income for mosque, Mosques within communities are selected.

Table 5.26: FBOs SIERA

Dimension	Primary Indicators	FBOs DRR Activities					
		BEFORE Disaster	SIERA Code	DURING Disaster	SIERA Code	AFTER Disaster	SIERA Code
Social	Population	• List most vulnerable households	S1. B	• Collection of used clothes and goods for donation	S1. D	• Coordination with other CBSOs (WWAs and YUs) in collecting data of disaster's affected	S1. A
	Health	• Organization of health information sessions for the community	S2. B	• Link the disaster's affected community for medical treatment	S2. D	• Clean the debris waste after floods and/or waste after fires	S2. A
	Education and Awareness	• Disaster awareness campaign after praying sessions	S3. B	• Emergency and early warnings	S3. D	• Link disaster management institutions for enhanced disaster awareness campaign materials for the community	S3. A
	Social Capital	• Discussion disaster issues among the community leaders	S4. B	• Mobilization the community in hosting the evacuation place	S4. D	• Organize and engage community in cultural events	S4. A
	Community Preparedness	• Assign roles and responsibility in the event of disaster with community leaders	S5. B	• Mobilization the community in supporting evacuation process for vulnerable groups	S5. D	• Mobilization, organization the community for large aids distribution	S5. A
Institutional	Mainstreaming	• Inform community about disaster management plan after praying sessions	I1. B	• Confirm local government in disaster management utilization	I1. D	• Engage the community to participate in disaster management plan review	I1. A
	Crisis Management	• Mobilization the community in volunteering trainings and first aid	I2. B	• Mobilization of men's community members in neighborhood watching	I2. D	• Coordination, gather, and communication data of vulnerable groups to authority	I2. A
	Knowledge Dissemination and Management	• Dissemination of printed safety materials after praying sessions	I3. B	• Collaboration with community leaders in early warning	I3. D	• Enhance disaster awareness materials	I3. A
	Institutional Collaboration	• Networking	I4. B	• Collaboration with other stakeholders in taking care refugees	I4. D	• Engage disaster experts for community forums/meetings	I4. A
	Good Governance	• Participation in early warning system development	I5. B	• Gather information of disaster loss for authority	I5. D	• Engage community leaders in the development of rehabilitation and reconstruction process plan	I5. A
Economic	Income	• Facilitation the community's in business network	E1. B	N.A	E1. D	• Invite and involve outside experts in providing community's skills in setting-up home industries	E1. A
	Employment	• Invite business sector for business training for the community	E2. B	N.A	E2. D	• Facilitation business sector in building community capacity in generating income	E2. A
	Household Assets	• Inform in securing household assets in case of a disaster	E3. B	• Inventory of non-and destroyed household assets	E3. D	• Mobilization the community in restoring and cleaning the household assets	E3. A
	Finance and Savings	• Link households to religious-based bank institution for saving practice	E4. B	• Support local government in financial aids distribution	E4. D	• Cooperative unit campaign	E4. A
	Budget and Subsidy	• Sensitization of disaster risk management budget allocation	E5. B	• Fundraising during/after praying sessions and distribution	E5. D	• Link local government in rehabilitation of mosques, community halls, and schools	E5. A

Once the data are collected, following sections illustrate the analysis and finding form the FBOs survey. It investigates FBOs as local potentials in enhancing community resilience through their local risk communication approaches that are inhibited in their activities within the three domains (FBOs SIERA, Table 5.26). The coding of S1.B and etc., to simplify the reading, was also the same that are applied for WWAs' and YUs'.

5.6.2 Data Analysis and Findings of FBOs Risk Communication

1. Perceptions of the FBOs

The *DKM* leaders hereafter named, as FBO leaders, at wards have perceived their SIERA different than WWAs and YUs. They perceived their SIERA in terms of urgency. For example, almost for all activities within the 15 primary indicators in the FBO SIERA, the FBO leaders perceived those as immediate actions (Figure 5.39 until Figure 5.41). There are no variations in their perceptions for before-during- and after a disaster time frame.

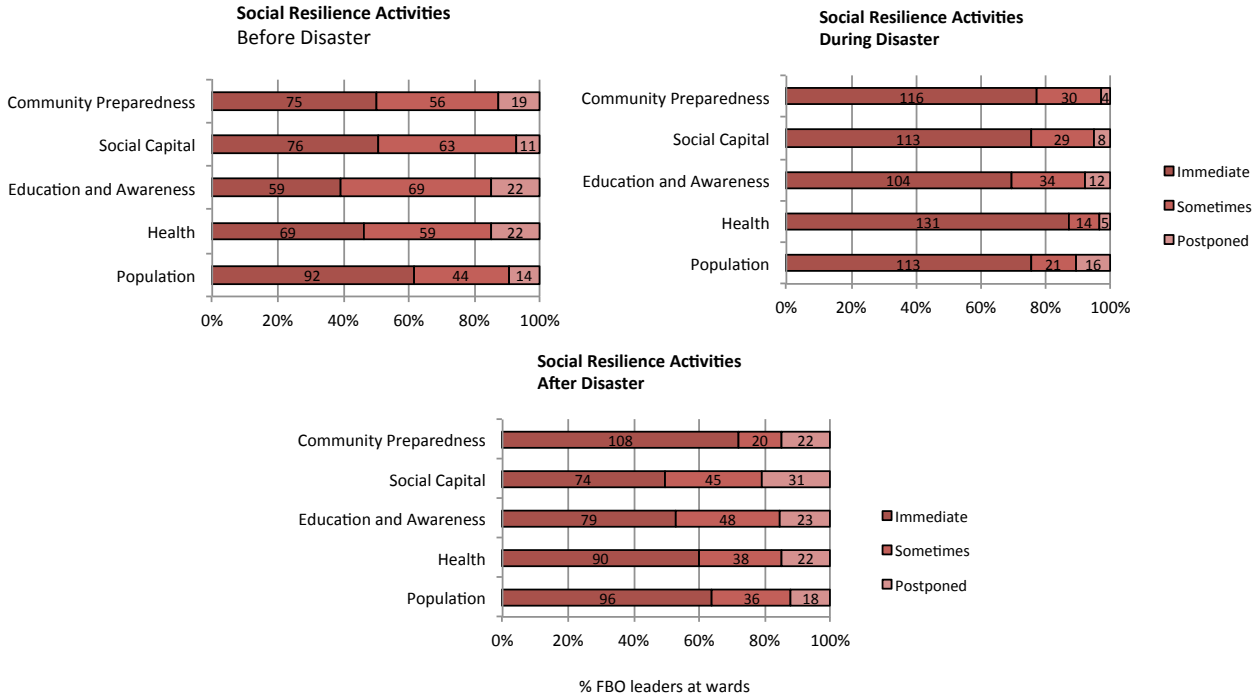


Figure 5.39: FBO leaders perception for social resilience activities

Figure 5.40 and 5.41 illustrate the perceptions of FBO leaders for institutional and economic resilience activities. These are presented in the following page.

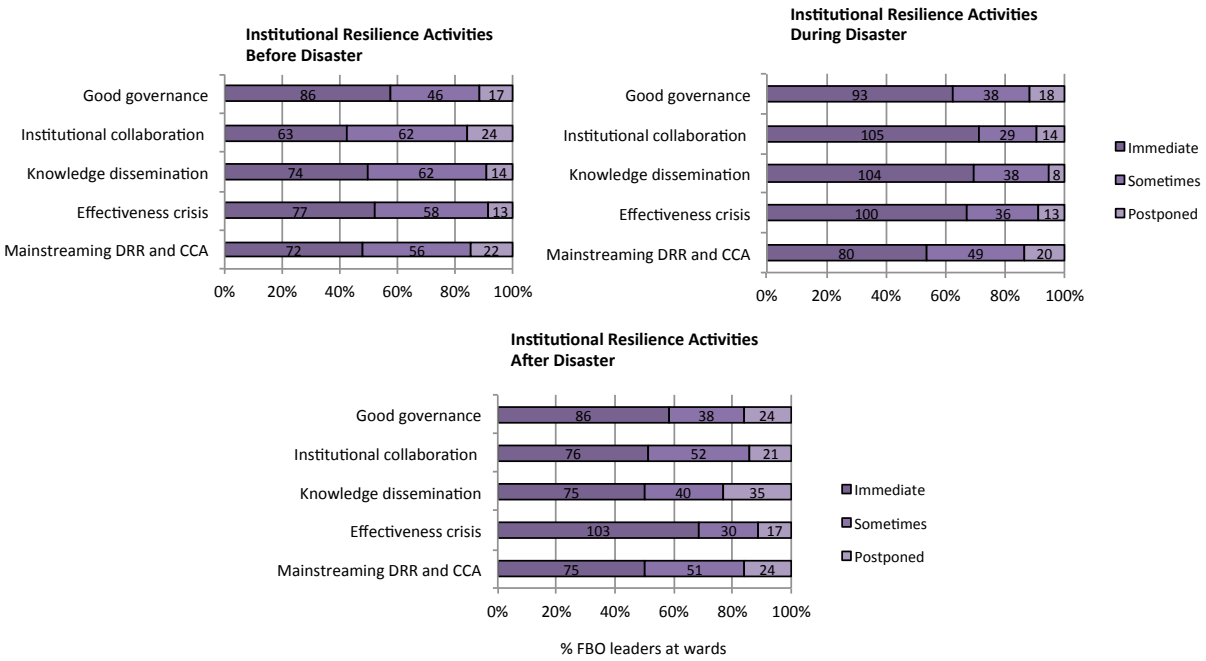


Figure 5.40: FBO leaders perception for institutional resilience activities

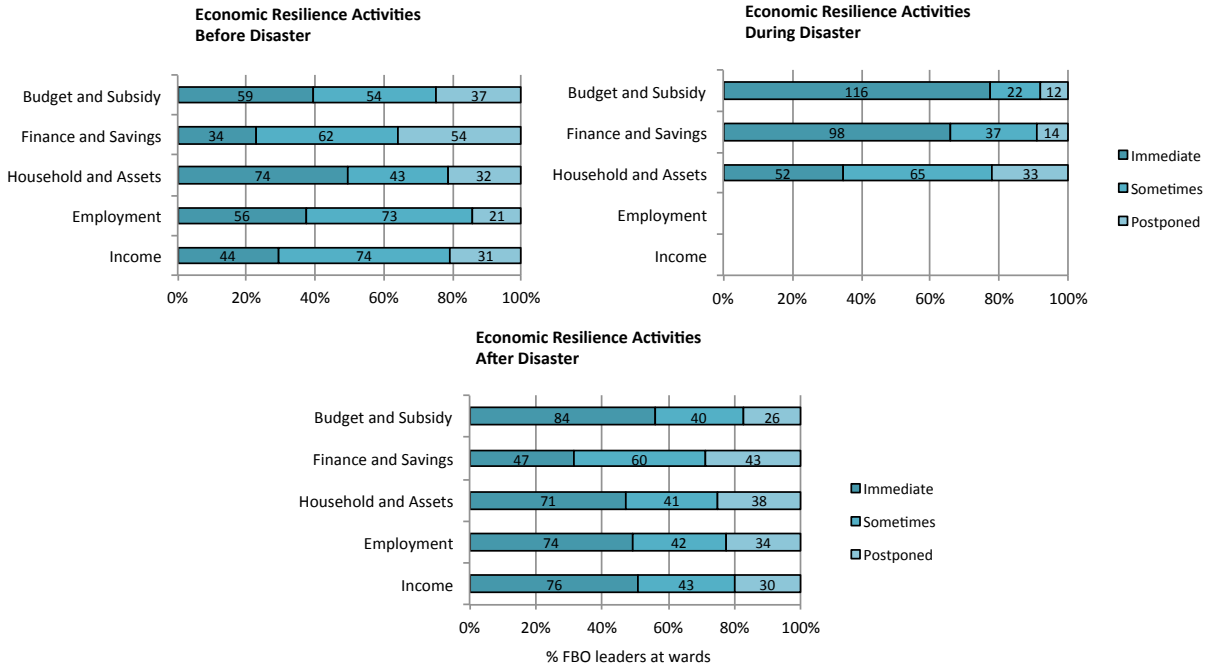


Figure 5.41: FBO leaders perception for institutional resilience activities

However, if one looks further into details, in terms of social resilience, the activity that is focused on the health issue for during the disaster is perceived as the highest, but is not the weighted as the most. Instead, the activities that are concerned with the primary indicator of population are weighted as the most important, such as listing the most vulnerable households (Figure 5.42[a]).

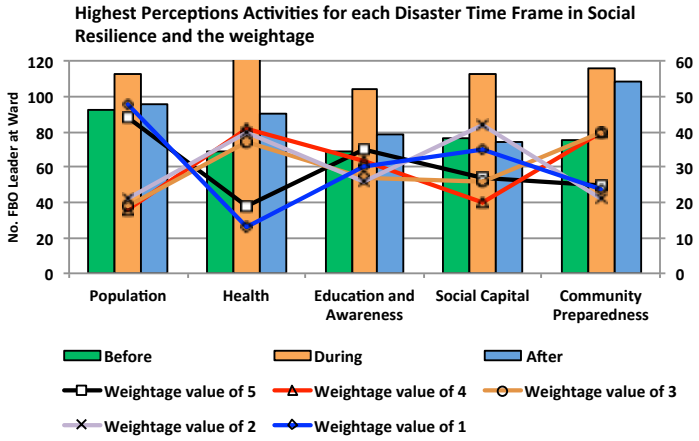


Figure 5.42(a): FBOs SIERA highest perception for social resilience in different disaster time frame and the weightage

In terms of institutional resilience, the activities that are perceived the highest are on institutional collaboration, knowledge and dissemination, and effectiveness of crisis, but are not weighted the most. Instead, the FBOs leaders at wards are weighted more the activities on the good governance issues than others (Figure 5.42[b]).

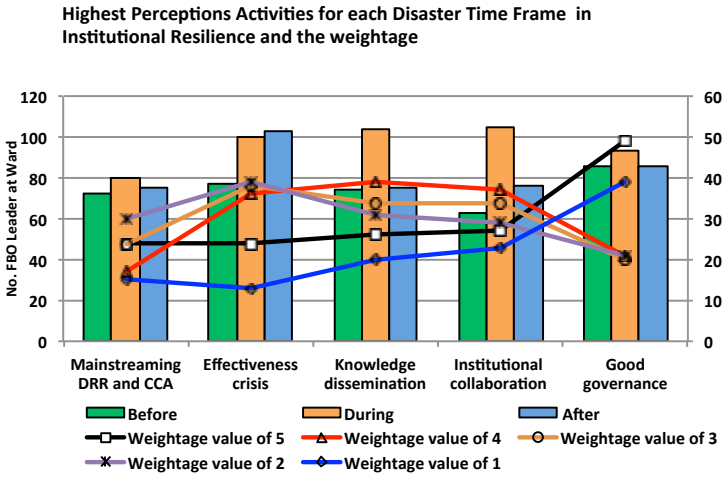


Figure 5.42(b): FBOs SIERA highest perception for institutional resilience in different disaster time frame and the weightage

In terms of economic resilience, the activity that is focused on the budget and subsidy issue for during the disaster is perceived as the highest, but is not the weighted as the most. Instead, the activities that are concerned with the primary indicator of employment are weighted as the most important (Figure 5.42[c]). For example, employment issues are weightage the most important, although FBOs at wards have not been involved directly in its resilience activities. FBOs at wards so far have not been involved in the communities/households' economic and livelihood issues. Planning to be involved in the economic resilience activities have been raised by most of FBOs during the survey.

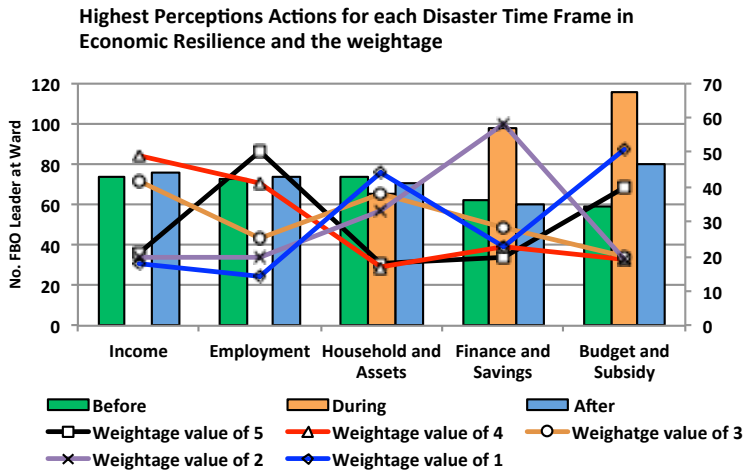


Figure 5.42(c): FBOs SIERA highest perception for economic resilience in different disaster time frame and the weightage

The next analysis of the FBOs' perceptions is described in Table 5.27. This table shows the finer details of the urgency of the highest perceptions, derived from Figure 5.42(a), (b), and (c). In terms of social resilience, almost all social resilience activities are perceived immediate, except for education and awareness before the disaster (conducting awareness campaign after praying sessions). This shows that FBOs are not familiar with this activity, which it was endorsed by the responses that are given by the majority of the FBOs leaders at wards.

In terms of institutional resilience, all institutional resilience activities are perceived immediate. This might have shows that the FBOs at wards have a clear organizational structure and might work during emergency such as disaster. Previously mentioned in that FBOs in Indonesia, including in Bandung have a clear distinct tactical role in social-religious leadership during disaster. The division of role for different mosque category enables the FBOs locate themselves in institutional issues in disaster situation.

Table 5.27: The urgency level for the highest perceptions in every primary indicator

Dimension	Primary Indicator	Disaster Time Frame		
		Before	During	After
Social	Population	Immediate	Immediate	Immediate
	Health	Immediate	Immediate	Immediate
	Education and Awareness	**Sometimes**	Immediate	Immediate
	Social Capital	Immediate	Immediate	Immediate
	Community Preparedness	Immediate	Immediate	Immediate
Institutional	Mainstreaming DRR and CCA	Immediate	Immediate	Immediate
	Effectiveness crisis management	Immediate	Immediate	Immediate
	Knowledge dissemination	Immediate	Immediate	Immediate
	Institutional Collaboration	Immediate	Immediate	Immediate
	Good Governance	Immediate	Immediate	Immediate
Economic	Income	**Sometimes**	NA	Immediate
	Employment	**Sometimes**	NA	Immediate
	Household and Assets	Immediate	**Sometimes**	Immediate
	Finance and Savings	**Sometimes**	Immediate	**Sometimes**
	Budget and Subsidy	Immediate	**Sometimes**	Immediate

And lastly, in terms of economic resilience, the urgency of activities in income, employment, household and assets, finance and savings, and budget and subsidy are varied one to another. These might that first; FBOs have not been involved in these activities for the communities. And second, the variations of the urgency for these activities are varied, depending on the implementation/participation level, concern and needs of each ward.

Furthermore, the FBOs leaders at wards have prioritized the economic resilience activities as the number one, following the social and institutional ones. This anomaly has been in their weightage of employment as the most important (Figure 5.43).

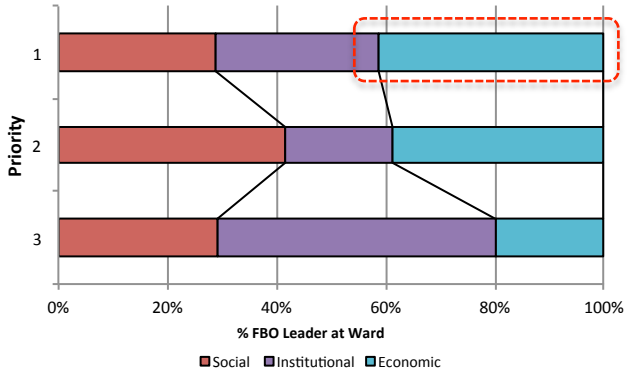


Figure 5.43: Prioritization of SIERA by FBOs leaders at wards

All above mentioned are the findings for the FBOs leaders' perception, which shows the trends and tendency towards their potential activities provided for risk communication platform with communities. This is also in line with their ongoing activities that are illustrated in the next section.

2. The ongoing activities of FBOs

The FBOs at wards in Bandung are conducting their frequent activities also likewise the WWAs and YUs, in monthly, quarterly, and annually. Although the FBOs conduct few religious activities that involve community daily and weekly; however, these were accounted as their routine meetings and served as their strength for risk communication process and platform. Figure 5.44(a), (b), and (c) summarizes the FBOs ongoing activities. In terms of social resilience (Figure 5.44 [a]), activities such as organizing and engaging all community groups in participating in religious and cultural events, and cleaning the debris/waste from rivers in setting up a healthy environment for the community are conducted monthly, even weekly. For example, cleaning activity is done regularly every Friday in every neighborhood in Bandung. CBSOs, such as FBOs, WWAs, and YUs are the usual pioneer and motivator for this type of activity. Furthermore on social resilience activity, FBOs are identifying and listing the most vulnerable households in the community once a year. In fact, the ward government requests the FBOs in assisting them to list the vulnerable groups. This shows that FBOs are very close to communities and trusted by the government in conducting such support.

In terms of institutional resilience activities (Figure 5.44[b]), since the FBOs have a knit-tight relationship with neighborhoods and households, mobilizing the male community members in taking part of neighboring watching is frequently done, whether a disaster occurs or not. Often, this activity is always been a part of community empowerment that is endorsed by the government. This has highlighted how the FBOs could mobilize community in taking any positive action. More or less, the FBOs have influenced the community in their daily lives and therefore this huge potential has to be channeled properly, particularly on crucial issue such as disaster.

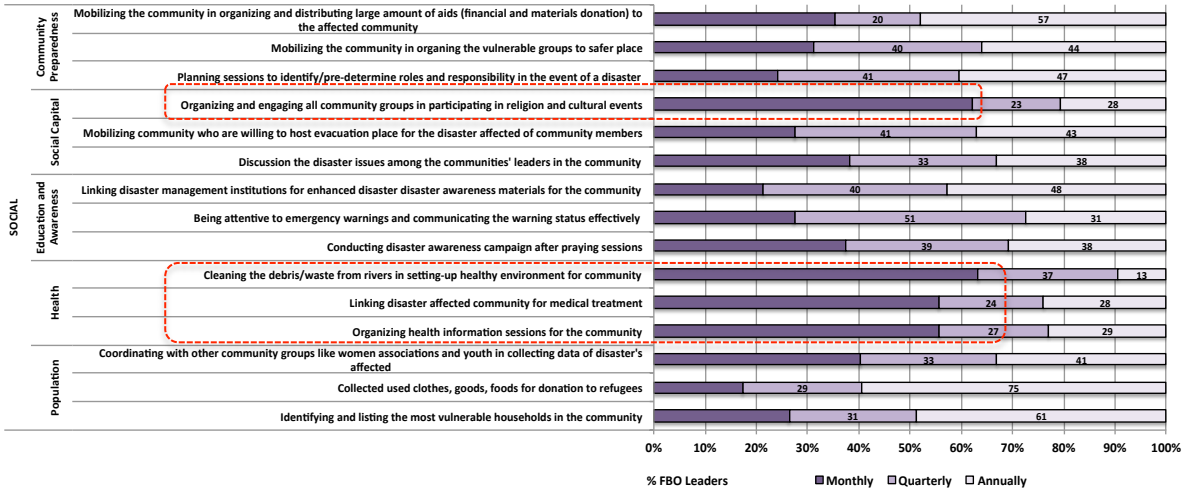


Figure 5.44(a): Frequency of current Faith-Based Organizations activities in Bandung - Social

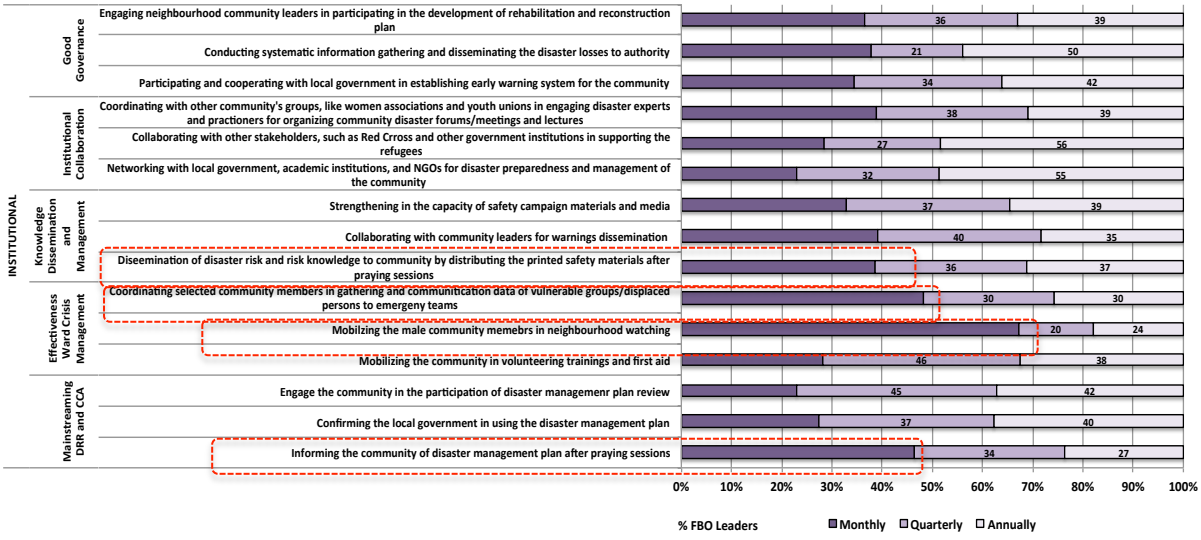


Figure 5.44(b): Frequency of current Faith-Based Organizations activities in Bandung - Institutional

In terms of economic resilience activities (Figure 5.44[c]), previously mentioned, the FBOs do not conduct any economic activities or business. Fund raising and charity are

their strength in financial issues of activity. FBOs activities are dependent on the donation from communities or from sponsors such as *Islamic Sya'riah Banking and Cooperative units* in neighborhoods. Mosques are not supposed conducting economic activities within the compound itself. However, during the survey, most of the FBOs raised their wish in taking more part to the improvement of community's economic condition. These have to be accommodated without compromising the sacred place in conducting business issues, since these may provide entry points for risk communication process. Figure 5.44(c) shows no economic resilience activities for income and employment. So far, the FBOs has no role in that particular issues. On the contrary, since FBOs are listing down the vulnerable groups, automatically, FBOs also are supporting government in gathering data for aid recipients within community

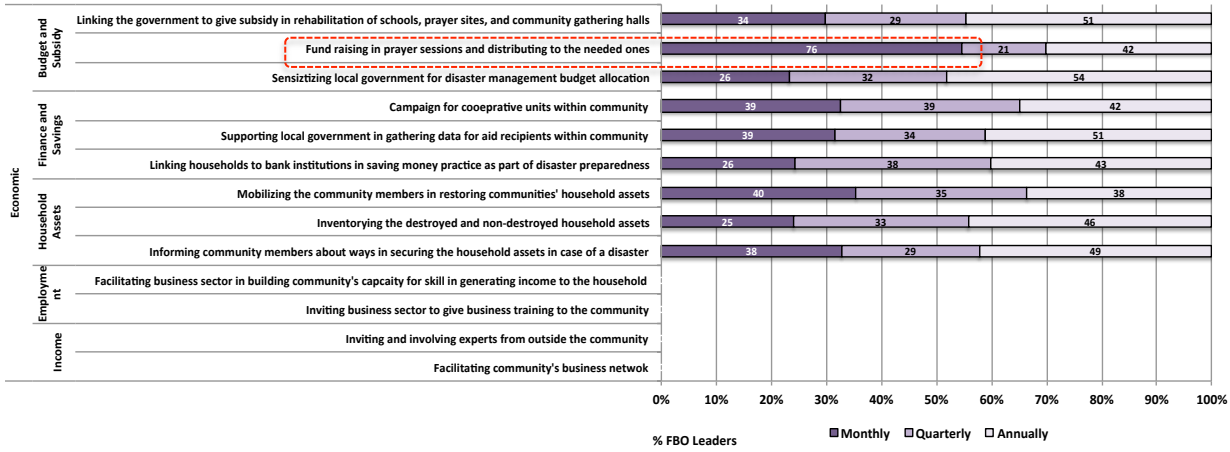


Figure 5.44(c): Frequency of current Faith-Based Organizations activities in Bandung - Economic

All in all, above FBOs' ongoing activities provided entry points for risk communication to take place in communities. The next section illustrates the correlation and kinds of risk communication actions that may function for communities, by placing the FBOs as risk communicators.

3. Relationship of FBOs SIERA for risk communication

Further analysis for the FBOs was done in the same approach as WWAs and YUs. The data was quantitatively analyzed using a statistical method and linier regression analysis to reveal the strength of relationship between two variables. Again, a benchmark score that is used based on the r^2 value of coefficient of determination of higher than 0.7. It investigates the relationship between two variables of the scores between 0 and 1. The higher the score of the r^2 towards the maximum (1) shows the high the degree of relationship between those two variables. This positive method helps to identify the positive high degree of relationship between two variables (perceptions vs. ongoing). The data for this analysis was taken for only the highest prioritization among the primary indicators for the social, institutional, and economic dimension. The degree of relationship results in Table 5.28 between the FBOs' perceptions and ongoing activities in different disaster timeframes significantly show a high degree of relationship for all the disaster phases. This implies that the ongoing FBOs' activities

regardless the disaster time frames has a high degree of relationship with the perceived actions of during disaster and shows as well that FBOs are mostly only capable of implementing actions during disaster only. This may inline with the six tactical role of mosque in disaster as illustrated in Figure 5.37.

Table 5.28: Degree of relationship of FBOs SIERA between perceptions and ongoing activities

Correlation (N= 150 FBOs)	Ongoing Activities		
Perceptions	Before	During	After
Before	0.27	0.18	0.22
During	**0.82**	**0.85**	**0.85**
After	0.05	0.04	0.03

On the contrary with YUs' degree of relationship results, no high degree of relationship can be found between the FBOs' perceptions and the frequency of the FBOs' ongoing activities.

3.a Relationship between FBOs RC SIERA

As already pre-determined in the earlier section, the FBOs RC SIERA approach is similar to WWAs and YUs. Only the for effectiveness crisis management in institutional dimension after a disaster, the activity is adjusted to what FBOs are conducting (I2.A) in community. The FBOs RC SIERA can be seen in Table 5.29.

Table 5.29: FBO's Risk communications SIERA (FBOs RC SIERA) depicted from the FBOs SIERA approach

Dimension	Primary Indicator	Disaster Phase	RC SIERA	SIERA code
Social	Education and Awareness	Before	***Awareness and drills*** (Disseminating climate-related disaster awareness and conducting disaster drill at ward level for youth and communities)	S3. B
		During	***Emergency and early warnings*** (Being attentive to emergency warnings and preparedness and communicating the information status effectively)	S3. D
Institutional	Effectiveness Crisis Management	After	***Data collection and communication to officials*** (Coordination with other community members in collecting issues, needs of disaster affected)	I2. A
	Good Governance	Before	***Establishing early warning system with the local government*** (Advocating and cooperating with the ward and sub-district government in establishing early warnings systems)	I5. B
		During	***Informs and updates officials*** (Conducting systematic information gathering and dissemination of disaster losses to be shared with officials)	I5. D

The data was collected at ward level, as mentioned previously, however for this statistical analysis purpose, the data was aggregated into sub-district to match with the climate-related disaster resilience assessment conducted for each sub-district, described in Chapter 4. This will provide strategies in future by combining the CDRI and SIERA approach for a comprehensive integrated approach of risk communication for Bandung, advancing the (local) government and CBSOs as the sender of risk information and communities/general public as the receiver of information. Table 5.30 shows the results of the degree relationship between the FBOs RC SIERA.

Table 5.30: Degree of relationship between FBOs RC SIERA

FBOs RC SIERA	(Sub-district Sample = 30)	Coefficient of determination (r^2)				
	RC SIERA	S3. B	S3. D	I2. A	I5. B	I5. D
Awareness and drills	S3. B		0.17	0.20	0.27	0.21
Emergency and early warnings	S3. D			0.60	0.40	**0.71**
Data collection and communication to officials	I2. A				0.54	**0.86**
Establishing early warning system with local government	I5. B					0.58
Informs and updates officials	I5. D					

Based on the analysis results, emergency and early warnings has a high degree of relationship with informing and updating the officials of the disaster situation. This means that FBOs are being attentive to emergency warnings and preparedness in their wards and communicating the information status effectively. Simultaneously, FBOs are gathering information and disseminating disaster losses to officials during disaster. This underlines the result from Table 5.28 that FBOs are mostly active during disaster. It is early to state that FBOs likewise the YUs are still in the conventional paradigm of disaster management.

Other degree of relationship results that can be observed from Table 5.30 is that data collection and communication of those data to officials is highly related with informing and updating officials. This describes that coordination with other community members in collecting issues and needs of disaster-affected community after a disaster is highly depending of their data gathering during disaster. When FBOs are gathering information and disseminating disaster losses, they have taken into consideration the needs of impacted communities to be later shared with the government. Hence, the needs of the disaster-affected community can be accommodated. This accentuates that FBOs are taking its role as the intermediaries between communities and government, linking the two parties together and can act thus as risk communicators.

3.b Relationship between FBOs RC SIERA and attributing factors

The analysis between FBOs RC SIERA and its attributing factors such as different geographical locations, population (total population and density), and education institutions (total schools) are similar like the WWAs'. The results are elaborated below and summarized in Table 5.31 and Table 5.32.

3.b1 Relationship between WWAs RC SIERA and geographical locations

Aside from the correlation analysis between the FBOs RC SIERA, likewise the WWAs, the correlation of RC SIERA was also analyzed for the FBOs according to the geographical locations their wards reside. The results of this correlation analysis are showed in Table 5.31.

In the mountainous areas of Bandung, FBOs SIERA has a positive high degree relationship between awareness and drills before disaster and informing and updating the officials during disaster (Table 5.30). The FBOs at wards, which reside in the mountainous areas, might consider these activities as the utmost important, since they are located in the landslides prone areas. During the rainy season awareness and preparedness that they should inhibit, supposedly they obtain from disaster drills, might support them and community in taking decisive actions. This may relate with their

information gathering on disaster loss data, if they might learn on small-scale economic assessment during the drills.

The next high degree of relationship of RC SIEARA for the mountainous areas is showed between emergency and early warnings and data collection and communication to officials (Table 5.31). These activities might strongly influence each other. For example, FBOs that are being attentive to emergency warnings and preparedness and communicating the information of disaster status effectively to officials would prevent that they have to generate coordination with other community members in collecting issues and needs of disaster affected community. Subsequently, emergency and early warnings has also a high degree of relationship with informing and updating the officials (Table 5.31). Both RC SIERA are conducted during disaster and particularly for FBOs that are located on disaster prone areas, these two types of risk communication actions are supported each other. The earlier and better early warnings are conducted, the lesser these FBOs are conducting systematic information gathering and dissemination of disaster losses to be shared with officials.

Table 5.31: Degree of relationship between FBOs RC SIERA with geographical locations

FBOs RC SIERA	Geographical Location	Coefficient of determination (r^2)				
	Mountainous N = 4	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		0.61	0.22	0.10	**0.80**
Emergency and early warnings	**S3. D**			**0.84**	0.24	**0.96**
Data collection and communication to officials	**I2. A**				0.24	0.67
Establishing early warning system with local government	**I5. B**					0.21
Informs and updates officials	**I5. D**					
	River N = 27	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		0.15	0.21	0.27	0.19
Emergency and early warnings	**S3. D**			0.64	0.40	**0.71**
Data collection and communication to officials	**I2. A**				0.52	**0.88**
Establishing early warning system with local government	**I5. B**					0.57
Informs and updates officials	**I5. D**					
	Plain N = 26	**S3. B**	**S3. D**	**I2. A**	**I5. B**	**I5. D**
Awareness and drills	**S3. B**		0.15	0.17	0.28	0.15
Emergency and early warnings	**S3. D**			0.58	0.41	**0.70**
Data collection and communication to officials	**I2. A**				0.59	**0.87**
Establishing early warning system with local government	**I5. B**					0.62
Informs and updates officials	**I5. D**					

In the riverside areas, the correlation analysis results show the same pattern as in the mountainous areas (Table 5.31). FBOs that are located on the riverside or has rivers flowing through their wards inhibit a high degree of RC SIERA correlation between emergency and early warnings, data collection and communication to officials and informing and updating the officials of a disaster status. These imply that for FBOs in the flood prone areas, risk communication processes of being attentive to emergency warnings and preparedness and communicating the information status effectively, coordination with other community members in collecting issues and needs of disaster affected community, and conducting information gathering and dissemination of disaster losses to be shared with officials have to be instrumented for appropriate flood risk reduction.

In the plain areas, where local inundations are most located, a positive high degree of relationship can be manifested for RC SIERA between emergency and early warnings

and informing and updating the situation to officials are extremely important, as well as between data collection and communication to officials and informing and updating the officials of a disaster status. The fact, that FBOs' activity in coordinating with other community members in collecting issues and needs of disaster affected community, are strongly influenced their information gathering and dissemination of disaster losses to be shared with officials or vice versa. These are confirming mosque's tactical role in disaster as described in Section 5.6 of coordinating and mobilizing community members in taking part of action. Moreover, above circumstances are also similar with the YUs' paradox of conventional paradigm of disaster management (mostly taking part in risk communication during disaster actions).

However, it is worth to note that in all types of geographical areas, high degree of relationship emerge for FBOs RC SIERA of data collection and communication to officials (coordination with other community members in collecting issues and needs of disaster affected) and FBOs RC SIERA of informing and updating the officials of a disaster status (conducting information gathering and dissemination of disaster losses to be shared with officials). These may underline that these risk communication actions are disjointed with the character of communal mosque's tactical role in disaster as they inhibit social-religious leadership in the community.

3.b2 Relationship between FBOs RC SIERA and other attributing factors (total population and population density

Table 5.32 shows the results of the degree of relationship of all surveyed FBOs between the RC SIERA and total population. The size of the population has influenced the conduction of the RC SIERA, irrespective the geographical locations of mosques. The category of high amount population has a high degree of relationship with risk communication actions of emergency and early warnings, data collection and communication to officials, and informing and updating the status of a disaster to officials. This is coherent with the type of risk communication action, which requires much people to function. Especially when the risk communication process requires a high sum of manpower to conduct coordination and data gathering.

Table 5.32: Degree of relationship of FBOs RC SIERA with total population and population density

FBOs RC SIERA	Total Population	Coefficient of determination (r^2)				
		Very Low	Low	Medium	High	Very High
Awareness and drills	**S3. B**	0.0034	0.12	0.21	0.17	0.002
Emergency and early warnings	**S3. D**	0.06	0.002	0.53	**0.95**	0.10
Data collection and communication to officials	**I2. A**	0.27	0.03	0.09	**0.77**	0.02
Establishing early warning system with local government	**I5. B**	0.18	0.005	0.03	0.57	0.09
Informs and updates officials	**I5. D**	0.18	NA	0.06	**0.95**	0.18

FBOs RC SIERA	Population Density	Coefficient of determination (r^2)		
		Low	Medium	High
Awareness and drills	**S3. B**	0.52	0.006	0.18
Emergency and early warnings	**S3. D**	0.46	0.22	0.64
Data collection and communication to officials	**I2. A**	0.59	0.002	**0.85**
Establishing early warning system with local government	**I5. B**	0.65	0.03	0.61
Informs and updates officials	**I5. D**	0.60	0.02	**0.72**

Similarly, a high degree of relationship is identified between the aforementioned RC SIERA and high population density. This may reveals that the closer community lives in a neighborhood; the tighter the social relationship is constructed. Therefore, most likely

mosques that are located within a knit-tight community are procuring a solid network to perform risk communication actions. In understanding more about FBOs as risk communicators, likewise the Youth Unions, FBOs leaders at wards were further evaluated on risk and communication issues in the next section.

5.6.3 FBOs Risk Communication Interface

Previous sections mentioned about FBOs' SIERA perceptions, on going SIERA, and the correlations of FBOs risk communication SIERA. This section aims to investigate more on the risk and communication background of FBOs, prior drawing the conclusion on how the role of FBOs as risk communicators would be. The background of risk communication is as follow: knowledge on disaster and its impacts, source of information, risk communication responses, and partnership in risk communication. These are illustrated in the following sections.

1. Knowledge

The first to investigate is the disaster knowledge part of the FBOs, represented by the FBOs leaders. Figure 5.45 shows the results of the knowledge part. FBOs at wards in Bandung acquire a balanced of knowledge on hazards and impacts of climate-related disasters. This implies that they have a profound of knowledge on the consequences of disasters, thus preparedness and risk reduction measures ought to be in placed.

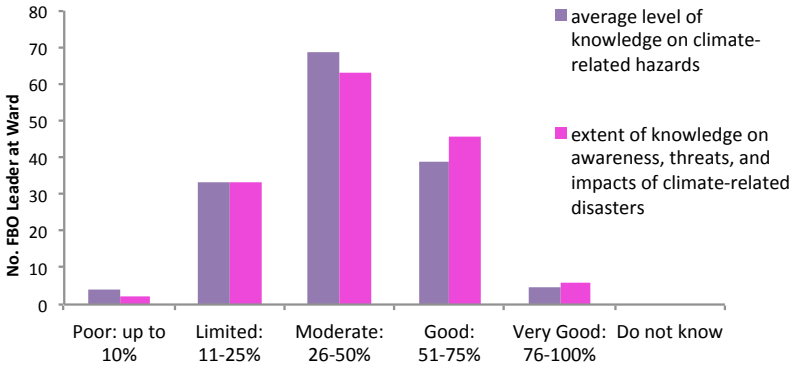


Figure 5.45: The disaster knowledge of FBOs

Following, Figure 5.46 illustrates their interest in learning disaster and DRR and to what extent do they have incorporated the DRR in their activities.

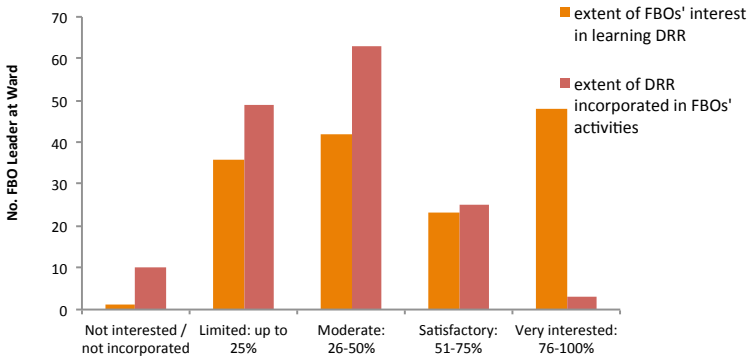


Figure 5.46: The extent of FBOs' interest and incorporation of DRR in their activities

FBOs are in general interested in learning the DRR, although some of the FBOs have incorporated DRR in their activities, but the incorporation is varied among FBOs at wards in Bandung. This highlights the importance of SIERA to pinpoint and categorize FBOs activities on risk reduction and communication. These will enable later to assess their performance and capability as risk communicators for communities.

Lastly, on the knowledge part, FBOs were evaluated on their frequency in supporting local government in disaster awareness campaigns at wards and how often DRR trainings are given to FBOs (Figure 5.47). The results show that majority of FBOs in Bandung have not been participated in awareness campaigns nor risk reduction trainings. Thus, they are lacking in before disaster activities.

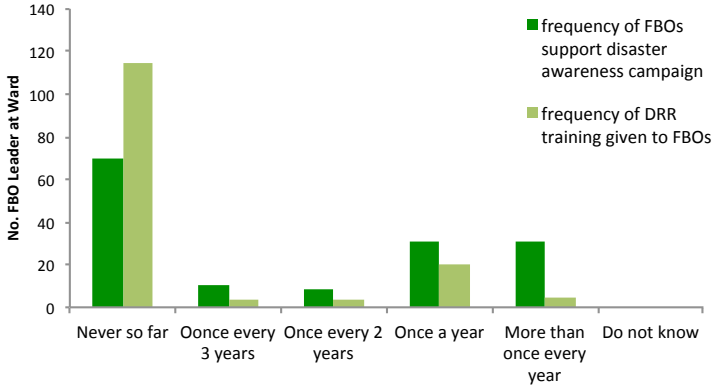


Figure 5.47: The frequency of disaster awareness campaign supported by FBOs and DRR training

2. Source of Information

FBOs obtain information on disaster from various sources. The result shows that television, printed media (newspaper), radio, other FBOs, and local government are listed as the top five source of information (Figure 5.48). The television as their number one for source of information is coherent with the resilience assessment result (CDRI assessment in Chapter 4). All population of Bandung has a television at home, thus strengthening individual/household information flow. Television as one of the mass

media plays certain important role in risk communication of Bandung. The role of mass media will be illustrated in the following Chapter (Chapter 6).

The result is further analyzed on how the FBOs prioritize the source of information according to the credibility and trustworthiness of the information that are provided by those sources. It is clear from Figure 5.49 that FBOs rated television as their number one source of information as well as their number one credible and trustworthy information provider (Figure 5.48). This provides the entry point for media in taking role in the overall framework for risk communication of Bandung (Chapter 6). The fact from resilience assessment results (Chapter 4) that people in Bandung have a television in each household does not reflect different economical status among community. This in turn, may support people in ensuring the risk communication flow from authorities to communities. However, whether people are taking sub sequential actions, this where the CBSOs such as FBOs, also YUs and WWAs and their approaches to communities are the core of the whole risk communication process (Figure 5.4).

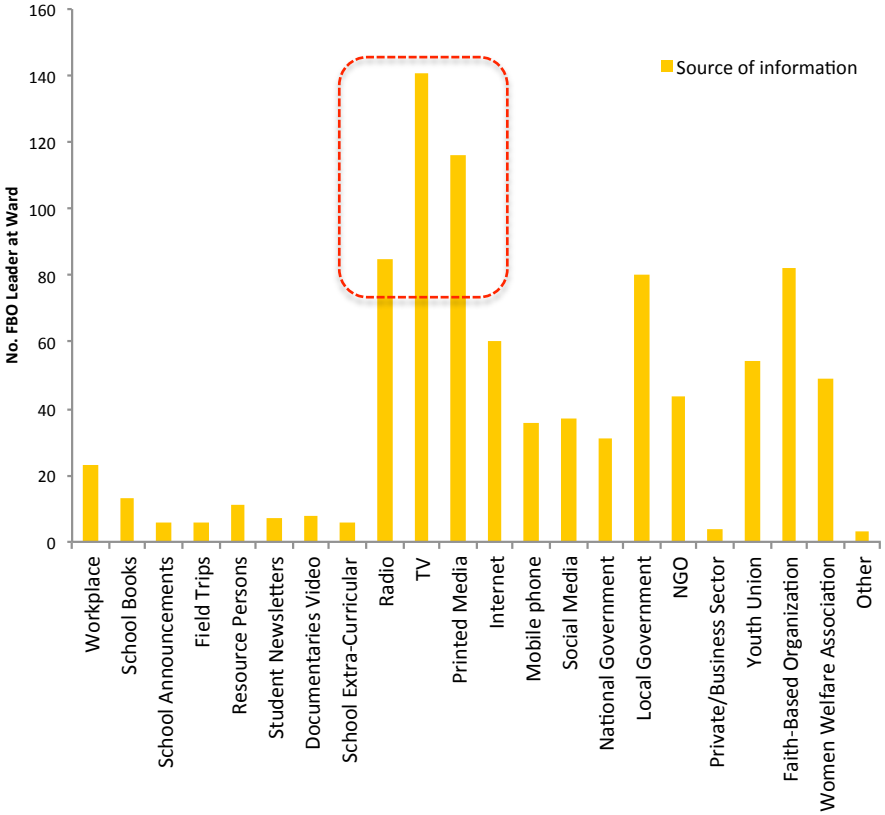


Figure 5.48: The source of information for FBOs

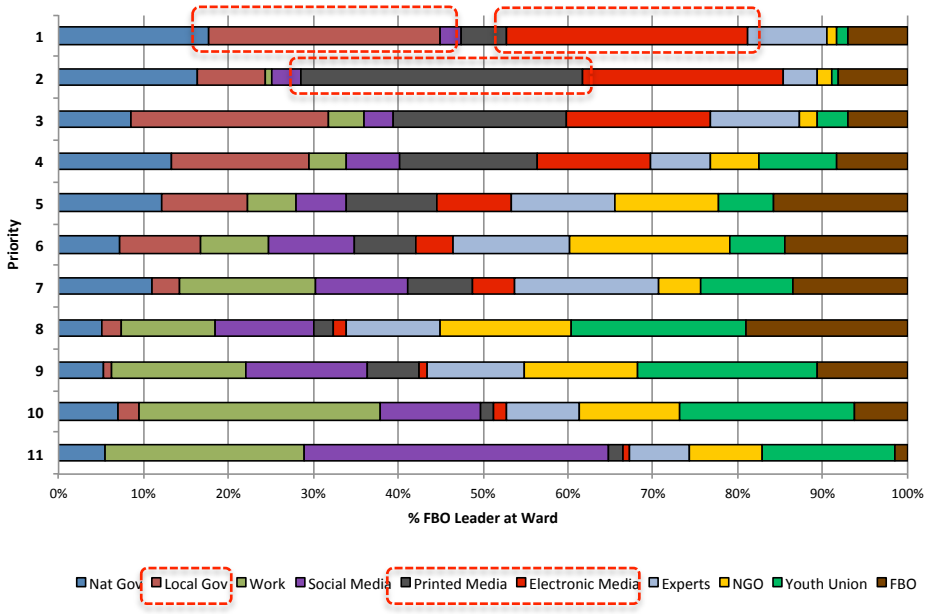


Figure 5.49: FBOs prioritization of source of information

The local government is being the second trusted source of information for FBOs in Bandung. It shows that FBOs not only inhibit a strong relationship with communities but with their wards or sub-district government. More to the connection and risk communication network between CBSOs and government and vice versa will be elaborated later on.

Thus, based on the result of Figure 5.48 and Figure 5.49, an overview of FBOs risk communication source and mechanism can be seen in Table 5.33.

Table 5.33: FBOs risk communication source and mechanism

Faith-Based Organizations (FBOs)	**Priority**		
	1	**2**	**3**
Source of disaster risk information	Media (Television, Newspaper, Radio)	Local Government	FBOs SIERA (religious and community activities)
Risk communication mechanism	FBOs SIERA (religious and community activities)	Media (Radio, Television) Internet, Mobile phone, Short Message Service (SMS)	Printed Media (Newspaper, Leaflets, Posters, Banners, Notice boards in community house/mosque/ward office

3. FBOs Risk Communication Responses

Further analysis on the risk communication process, presumably FBOs obtain appropriate information to be conveyed to the community is showed in Figure 5.50. The result shows the type of risk communication medium FBOs have been advancing. Clearly FBOs SIERA stands out compare to other categories (social-, printed-, and electronic media/mass media). This highlights the notion that conducting communities' activities

is the entry points of risk communication platform among larger communities (CBSOs are part of larger community/citizen of Bandung).

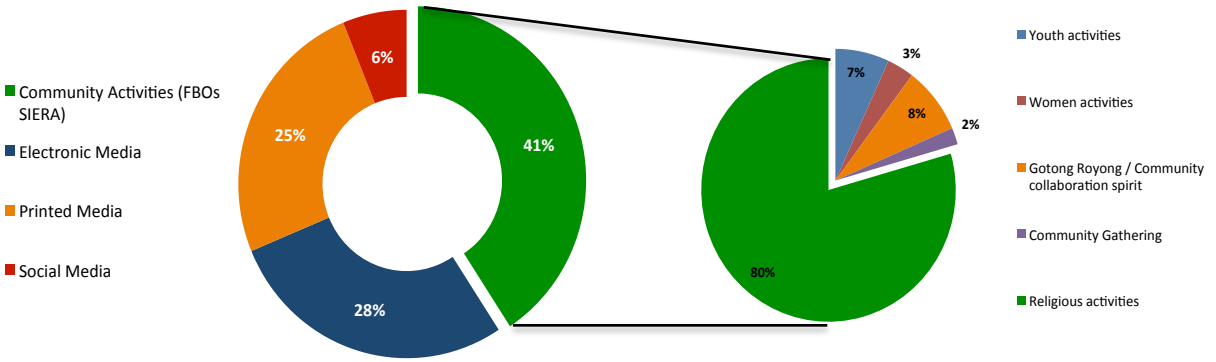


Figure 5.50: The composition of preferred risk communication and type of activity by the FBOs to community

Furthermore, whether FBOs act upon when receiving disaster risk information is showed in Figure 5.51. The majority of the FBOs act upon through the mosque speakers to inform the community (awareness and preparedness). Mosques are equipped with communication tools at present, thereupon mosques have played significant part in disasters as illustrated in Section 5.6. Thus, their experiences may elevate their potential as risk communicators.

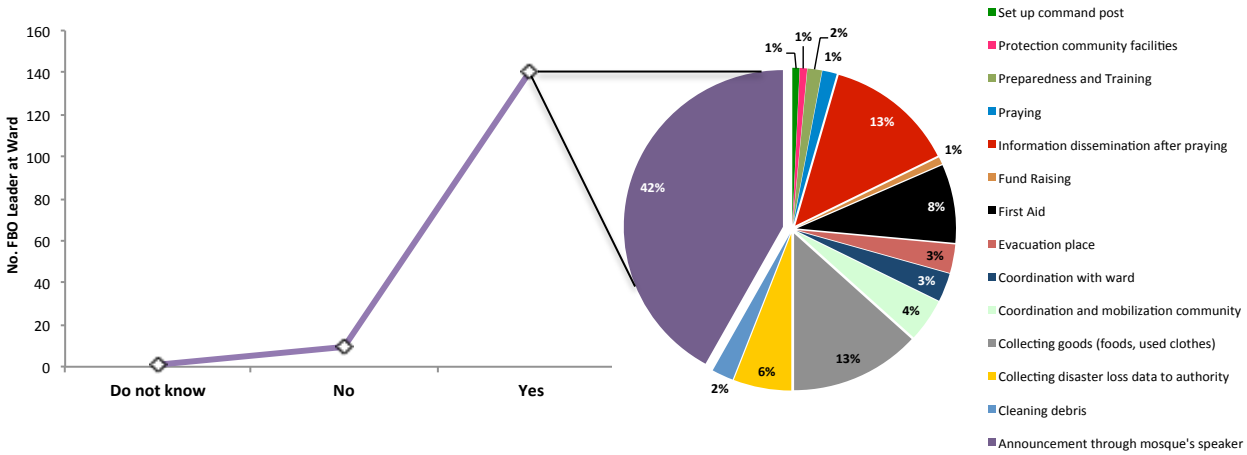


Figure 5.51: FBOs' response when receiving disaster risk information

4. Partnership of FBOs Risk Communication

To conduct risk communication, the majority of FBOs at wards in Bandung would like to be partnered with Non-Governmental Organization (NGO) (Figure 5.52). The rationale that NGO could intervene actions on areas where government and academic are unable, bring a plus point for NGO to be favored by FBOs. However, this preference is not

limiting the relationship/network with other CBSOs (WWAs and YUs), since there are overlapping members between the three CBSOs.

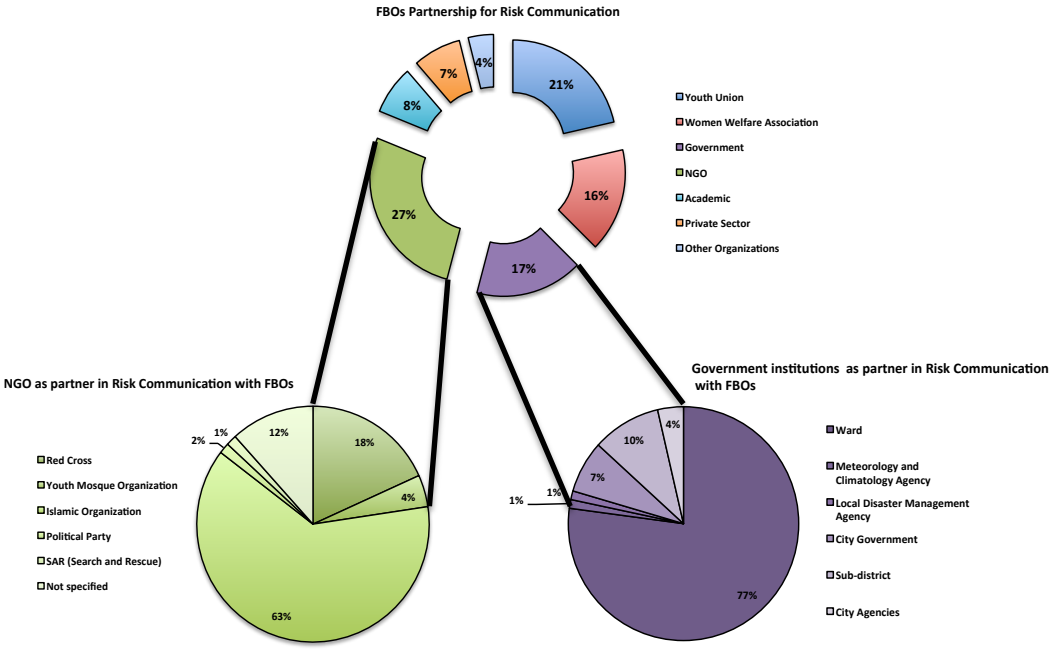


Figure 5.52: FBOs' partnership for risk communication

5.6.4 Implications to FBOs Risk Communication Approach

Based on the findings from previous section, FBOs in Bandung provide risk communication platform through their SIERA by direct interaction, face-to-face when they meet during religious activities in the mosque. Moreover, FBOs could provide economic perspective to the community. Being a center of community activities, FBOs can enhance the economic resilience of the surrounding neighborhood. Undoubtedly, FBOs are implementing wide varieties of SIERA (Figure 5.44(a) to (c)). However, based on the correlation results between the perceptions and undertaken for the disaster time frame of during and after disaster, FBOs should engage and invest in preparedness activities (before the disaster). All in all, there are three main key words that may explain the nexus of FBOs as risk communicators, keeping in mind the role of mosque in disaster situation.

The first keyword is resilience. There are various definitions given by many scholars. However, the understanding of resilience that is closest to FBOs is defined as a capacity of a system, community, or people who have potential exposure to danger, to reach or maintain an acceptable level of function and structure. Highlighting the understanding resilience from UNISDR (2009), it is to determine of how far that social system is capable to organize itself in order to improve its capacity to learn from previous disasters for better protection in the future, and to improve risk reduction actions. That definition refers to the strengthening of social system that is capable to dynamically adapt in preventing and handling disaster. Sociologically, resilience can be defined as a

process of strengthening integration, latency, and communication, which exist in community (Parson, 1997, p19-21 in IRI et al., 2011). In this definition, According to IRI et al. (2011), resilience is very different from the meaning as in resistant. The latter word is not dynamic, and it does not give an opportunity for an occurrence of a process to adopt *"new things"* from the previous social system.

Community is the second keyword in this regard about the FBOs as risk communicators. Community in FBOs means a group of individuals who gather based on the common interests and goals, and they have social bond. They are the creator and executor of emergency response in that social system. With the system in their unconsciousness, the members try to reach the common goal within their own ways. Similar to the definition of resilience, the community here in FBOs means a group of individuals with its unique social system with operational strategies; they are susceptible to disasters, being living in disaster prone areas.

The third keyword is disaster management. This covers activities of before, during, and after the disaster. Muhtadi (2011) in IRI document (IRI et al., 2011) developed a chart of disaster management cycle, which explains Islamic perspective of disaster management that can be traced to *Al Qur'an* (Holy Book of Islam) and *hadits* (guidance from the Prophet Muhammad SAW). There are 4 phases in which Al Qur'an defines sustainable disaster management. Those are the following: (1) prevention and mitigation; (2) awareness and preparedness; (3) emergency response; and (4) rehabilitation and reconstruction. The aim of comparative study of the disaster management between what is written in Al Qur'an and reality serves as a foundation for the FBOs and its members in manifesting and justifying disaster management (including risk reduction) activities, shifting from fatalistic paradigm. IRI et al. (2011) illustrated the comparison as follows:

In terms of prevention, *Surah Al A'raf [7] verse 56-58* explains that human are not allowed to make damage on earth. This prohibition covers all areas including *muamalah* aspects, such as intruding the source of living and other people's subsistence. *(Quran Surah Al Qasas [28]: 4).* Based on the lesson learnt and best practices from the history of prophets, it is revealed that there were mitigation and awareness-preparedness as explained in *Surah Yusuf [12]: 47-49*. Efforts that were made by *Prophet Yusuf* were about saving his people and citizens from surrounding countries whenever there was a severe draught that lasted for seven years. This was given as an example of mitigation.

Furthermore, *Surah Al Maidah [5]:* 2 explains about helping each other in emergency situation, and Prophet Muhammad SAW uttered a *hadit* (*hadits* narrated by Muslim), which states the importance of human to help each other. In terms of rehabilitation and reconstruction, *Surah Ar-ra'd [13]: 11* explains that humans are given the capability to interact socially and coordinate programs or activities with multi-stakeholders in multi sectors; hence disaster management can be done comprehensively.

Al Qur'an also states that efforts of rehabilitation and reconstruction must obey three principles. First, is about increasing public awareness about the cause, evidences, and approach, to prevent repetition of risks. Secondly, is about acknowledging traditional,

local wisdom, *(al-'adah muhakkamah),* culture and local indigenous; hence there would not be any friction in the society. And thirdly, is about cultivating patience, preventing despair, and the will to survive *(Al Qur'an Surah Yusuf [12]: 87)*.

Drawing lessons from above facts, operational actions in disaster management cycle will succeed if the resilience mechanism in the community, for example, role of a mosque is functioned. The social mechanism of the mosque occurs, if the community has parallel worldview with the significance of disaster management in the Holy Book of Islam (Al Qur'an). Through that common view, FBOs and its members are being able to relate, *"what is the best thing to do"* when the disaster strikes. As mentioned by Abdullah (2008), disaster management and relief require speed and approaches based on the particular situation in the field, including operational mechanism that involves mosque. Therefore, actions in disaster take place, if there is high participation from the community. FBOs and its members can give support in the form of information to emergency authorities (government or other organizations). They are even willing to let the places of worship (mosque) and educational places (school, religious center) be used for emergency shelters. Mosque, which is a sacred place and a place of worship for Moslems, is then becomes public, providing an opportunity for outside party to enter it. Behavior and appreciation among inter-faith is seen natural in the mosque 's social mechanism during disaster.

Above arguments giving the rationale for a mosque to take part in risk reduction and risk communication that are part of larger disaster management concept. According to the IRI report (2011), it is not considered as *bid'ah* or forbidden. On the contrary, it revitalizes the initial role of mosque. Mosque, as mentioned before, is not only a place to do *mahdhah* (worshipping). In the time of Prophet Muhammad SAW, a mosque had multi-functions, such as a madrasah (place of education), art show center, hospital, court for prisoners, and information center. To underline mosque's role, mosque was also valued to monitor people's welfare (Department of Religious Affairs, 2009). According to *KH. Miftah Farid*, leader of MUI (Indonesian Muslim Council) of West Java Province a mosque's function is not only for praying to Allah, but also for social, economic, and cultural activities (*Pikiran Rakyat* 2008, in IRI et al., 2011). Moreover, a survey result of *Republika Research and Development* in 2009 (IRI et al., 2011) gave similar view about the role of a mosque as the *Department* aforementioned. The results showed that 83.5% out of 1,307 respondents stated that a mosque should not only be a place of worship. The majority of the respondents (84.2%) also encourage that a mosque should be accounted for non-religious activities as well, such as the center of culture, economy, social, and education. Thus, the provision of risk communication platform with larger communities (local community, government, etc.) is wide open.

In conclusion, the findings of FBOs study (analysis of the survey with the mosque leaders) and background information of mosques as part of FBOs provide immense evidences on the potentials and crucial roles of mosque within community in disaster and entry points for risk communication process in enhancing community resilience, especially in social and economic aspects. This has to be taken up, geared, and accommodated by the government as vehicle to communicate risks to wider public in

Bandung, right after the conduction of local level resilience assessment (CDRI Bandung at sub-districts) in Chapter 4.

5.7 Risk Communication Approach for Individuals

Aside from CBSOs at wards, the individual members of communities were also brief surveyed on their perceptions of risk communication by the three CBSOs. Individual survey in every wards of Bandung was conducted to collect data on their perceptions of risks and risk communication process (activities and media) targeting those three CBSOs (Women's Association, Youth Unions, and FBOs). Individuals ranked the CBSOs for effective risk communicators with their specific/signature SIERA that serves as risk communication platform between CBSOs and community and vice versa.

Moreover, individuals were surveyed also on their risk communication media, aside from CBSOs SIERA. Prior to disclose those individuals risk communication preference, individuals details on: gender, age, duration of stay in Bandung, frequency of participation in community activities, and their perceptions about major disaster risks in Bandung is showed in Table 5.34.

Table 5.34: The details of individual respondents

Individuals	Details
Total Sample	150 wards 1,500 persons (10 persons/ward)
Gender	**Male (61%)** Female (39%)
Age	15 – 25 (17.75%) 26 – 35 (23.67%) **36 – 45 (26.06%)** 46 – 55 (18.75%) 55 + (13.76%)
Duration of stay in Bandung	< 5 years (8.24%) 5 – 15 years (17.48%) **> 15 years (74.29%)**
Frequency of participation in community activities	**Once/month (49.60%)** 3 – 4 times/year (20.73%) Once/year (17.53%) *Special event only (12.13%) *Religious events (Islamic religious event), community activities (*gotong royong*/community collaboration work, funerals management, cleaning rivers), national event celebration (Independence day)
Major disaster risks in Bandung	Landslide (49%) **Flood (63.60%)** Earthquake (6.87%)

Based on the results in Table 5.34, the surveyed individuals were randomly chosen in each ward (10 persons/ward), however, the majority were men adults (age group of 26 until 45 years old). Most of them are living long enough in Bandung (more than 15 years), thus were originated from the city. The majority of the respondents are participating in community activities once a month, not only in religious but also in social issues as well, such as coordination meetings with other CBSOs such as WWAs and YUs, "Friday Cleaning" (cleaning the debris and waste in the neighborhoods), and fund raising. These activities thus provide entry points for risk communication. Moreover, people in Bandung do perceive that flood is the most threatened hazard and

the highest risk for a disaster. As described in Chapter 4, Government of Bandung has identified more than 60 spots of inundation within city, which disrupt daily lives when rainy season starts. This will eventually lead to a disaster, when nothing is undertaken soon. Therefore, risk communication should be at hand to minimize and prevent flood disaster risk.

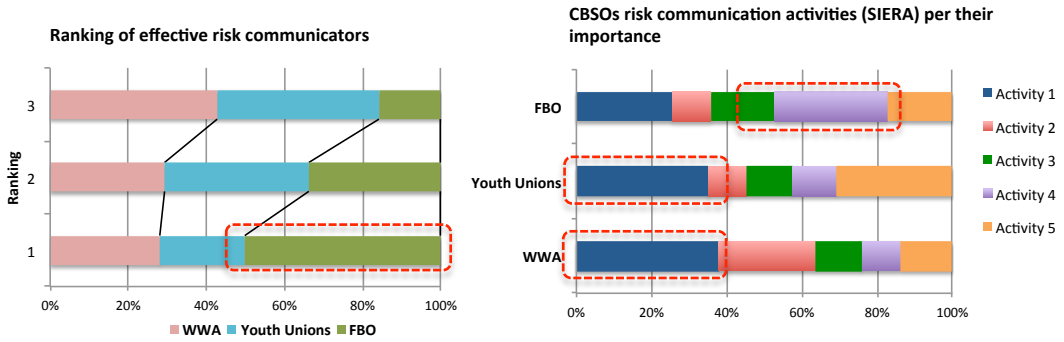


Figure 5.53: Pictures during Individual questionnaire survey in August-September 2012

Following, Figure 5.54(left) shows the ranking of effective risk communicators and their signature of risk communication activities (CBSOs SIERA) rated by the respondents. It can be seen that respondents have rated FBOs as the most effective risk communicators. It has two implications, whether respondents recognize FBOs as the most effective based on their signature activities (FBOs SIERA) or that most of the respondents are members of FBOs. Following effective risk communicators are Youth Unions and finally Women Welfare Associations.

Subsequently, Figure 5.54(right) also shows that respondents marked FBOs high in their activities on collecting goods, used clothes, foods for donation for poor and refuges. Funds raising during/after prayer sessions and distributing to the needed ones was rated second. Thus, FBOs are important for their charity activities (activity 1 and 4) and inline with mosque tactical role (social-religious) description in Section 5.6. The Youth Unions are marked by their activities in cleaning debris/waste from rivers in their neighborhoods and mobilizing other youth and community members in actively participating in neighborhood watching (activity 1 and 5). As for the Women Welfare Associations, respondents marked their activities on health issues high (activity 1 and 2). This was described as their strength of their organizational activities, which benefit community and are the backbone of government, in terms of health improvement issues. Consequently, social resilience activities of the three CBSOs dominate the risk

communication platform between CBSOs and community. Therefore, it calls for sustainable social resilience activities and enhancement for the institutional and economic resilience ones.



Activity	Women Welfare Association	Youth Union	Faith-Based Organization
1	Conducting health concerns campaign at the community leve	Cleaning the debris/waste from rivers in setting-up healthy environment for community	Collecting used clothes, goods, foods for donation to refugees
2	Conducting campaign on family planning	Being attentive to emergency warnings and communicating the status effectively	Conducting disaster awareness campaign after praying sessions
3	Conducting courses and trainings for women and community to have skills and ability in generating income to the family	Disseminating disaster and risk awareness and conducting drills for youth and community	Organizing and engaging all community groups in participating in religion and cultural events
4	Conducting systematic information gathering and dissemination of disaster losses to be shared with officials	Engaging outside experts in providing youth skills in setting-up home industries	Fund raising in prayer sessions and distributing to the needed ones
5	Organizing the meetings and forums within ward and inviting outside stakeholders for effective disaster management	Mobilizing the youth and communities for neighboring watching	Mobilizing the male community members in neighborhood watching

Figure 5.54: The ranking of effective risk communicators (left) and their signature activities (right and below)

Lastly, the respondents have chosen media such as television, radio, and newspaper as their preferred medium in obtaining risk information, aside from community activities (CBSOs SIERA) (Figure 5.54). This is a similar paradox to what CBSOs opined (Section 5.4 – 5.6). This calls for another rationale on why these media should be included and act as essential medium as well as risk communicators in the overall risk communication framework for Bandung (Figure 5.55).

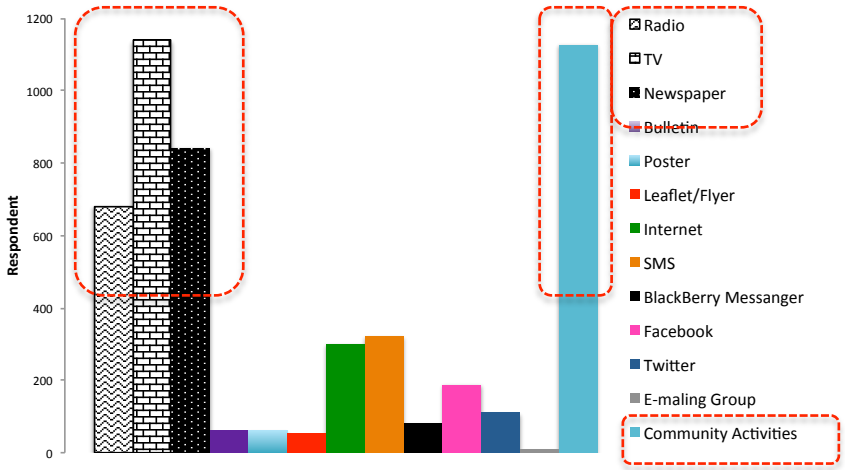


Figure 5.55: The preferred media of risk communication by individuals

5.7.1 Implications to Risk Communication Approach for Individuals

It is apparent that new approaches are needed in risk communication to create desirable behavioral changes. The focus in the above methodology on individual behavioral change through conveying information needs to be broadened. Individual risk communication approach is equally important as collective, community-based approach. A research mentioned by NSW State Emergency in Kempsey in Pfister (2001) have demonstrated that hazard and risk information, when distributed in isolation from the social setting, will have little significant impact on awareness or behavioral change. Therefore risk perception at individual basis will determine each (people's) behavioral change towards risks.

According to O'Neill (2004), integral to the community safety approach is the belief that people do not categorize all risks as the same. This implies that they will underestimate or overestimate the risk according to their perception or understanding of the impact of the risk on their own lives. In situations such as an infrequent but severe hazard, or frequent but non-severe hazard, the decision-making process is made harder by the complex variables that influence an individual's perception of the risk. Research suggests that when people feel threatened when confronted with health and safety messages, they become defensive and believe that it will not affect them. Sandman (1994) found that people were often hostile to the idea that they are at risk. People judged themselves less at risk than the *'average'* person to a variety of natural and technological hazards. In essence, people usually underestimate risks because they would rather believe they are safe, free to live their lives without the responsibility of feeling vulnerable and obliged to make difficult or unpopular decisions that would affect their lifestyle. For example, people who are confronted with the devastating news of a future severe flood may deny that this level of flooding could occur and reject the information as well as assistance to reduce the risk. This is because they may consider there is a low risk from a severe flood, coupled with low benefits from becoming flood prepared and a high cost in terms of their time and effort. Thus, they would consider their vulnerability as being low and would make a decision not to become involved in any risk-management programs. When a severe flood occurs, these people would be ill prepared and require the assistance of emergency agencies to evacuate.

Thus the individual risk communication approach is also equally important to the overall risk communication framework in city in creating resilient community; because a perennial challenge in risk communication is how to target the right safety message to the right audience (O'Neill, 2004). Therefore, highlighting this issue, audience segmentation is therefore an important issue in designing risk communication program. Therefore, the individual survey has focused and adopted on three main segmentation criteria that have been identified by various scholars (O'Neill, 2004; Goulter and Myska (1987; Millar et al., 1999; Esmund et al., 2000; Granger, 1996; AC Neilsen, 2003; Kunreuther, 2001; Penning- Rowsell and Fordham, 1994; Berry and King, 1998; AEMC, 2002), such as demographic factors, psychological traits and degree of personal experience of the hazard (see Table 5.34 and Appendix 6). The audience segmentation based on the individual approach is important, for example in the course of risk communication campaign targeted by media, as direct communicators to wider public.

For example, in terms of demographic factor, a research that has been carried out does support some generally held beliefs – namely that women are more responsive to safety issues and that men tend to be more risk-deniers or risk-seekers (WWAs, see Section 5.5). Goulter and Myska (1987) noted that women are more risk averse than men are. And Millar et al. (1999) noted that vulnerability is commonly considered to increase with age; however, in his study of volcanic risks in New Zealand, the group above 50 years old appeared less vulnerable. It was presumed that this group was having greater financial security than younger groups. This argument, might applied to Bandung, since some of the respondents are above 55 and have their monthly pension from the government. Although the sum is less, but having regular money income has secured their household's financial security.

In terms of psychological traits, Esmund et al. (2000) and Granger (1999) opined that people's reactions to hazards are to be mediated by their perceptions, particularly their perception of the risks generated by a particular hazard and their belief in their ability to deal with those risks. They have also mentioned in their research that psychologists have tried to explain predispositions to act based on psychological traits such as perceived self-efficacy, anxiety, and independence. Thus, people who are confident and want to be independent are more likely to be risk managers. Because of the importance of the audience segmentation, it is worth to note that the effect of most segmentation approaches (O'Neill, 2004) is the division of audience into: (1) risk averse [people who are sufficiently concerned, and have sufficient self- efficacy, to take personal action to reduce their risk], (2) risk tolerant [people who are ambivalent about the risk, depending on their personal experience of the hazard], (3) risk deniers [people who are unlikely to take any form of action until an emergency occurs], and (4) risk seekers [people who have an unfounded belief in their ability to manage risk and will often seek out risks for a personal challenge or a sense of adventure]. More on this category is explained in the following chapter (Chapter 6). This argument on the aspect of psychological traits, is immature at this stage in determining the individual risk communication approach based on survey results in Bandung. However, since they are members of the three CBSOs (WWAs, YUs, and FBOs) and based on their evaluation of the CBSOs DRR activities, they can be regarded as risk averse and risk tolerant. Further investigation is needed, whether they can be classified as risk deniers and/or seekers.

In terms of the degree of personal experience of the hazard, for example studies by Kunreuther (2001); Penning- Rowsell and Fordham (1994); Berry and King (1998); Goulter and Myska (1987); and AEMC (2002) have highlighted the role of personal experience of disasters as a driver of heightened risk perception. According to a research by AC Neilsen (2003), people who have experienced a disaster are more likely to have things in place in case a disaster happens because they may have experienced a disaster before, have lived in the same area for a long period and are familiar with what to expect, have experienced 'severe' damage either personally or to property (especially if the disaster has been recent), and have more to lose (i.e. their own house and furnishings). It also concluded that personal experience was a decisive factor in shaping both people's perception of risk and the likelihood of preparations. Moreover, although personal experience is likely to be the best teacher, people may also have alternate exposures of hazards in a number of ways, such as through indirect experience. These

include (1) through social norms of the region (power 'normative social pressure', where the whole community is taken the warnings seriously), (2) through indirect experiences (i.e. flood commemorations, including viewing historic flood pictures) that may help build increased risk awareness, and (3) through personal connections, such as family stories, and the experiences of other family members in disasters. All these may work best in raising awareness of the hazard and the associated risks. In relation to the individuals' results in Bandung, this argument might in conform, since most of the respondents are living more than 15 years in Bandung. Thus, some of them may experience floods/inundations frequently and their family members might learn from them. Therefore, the risk communication approach to individuals is apt in accentuating individual behavioral changes towards risks and shed the light towards their perceptions on CBSOs as risk communicators and their media preference as medium in receiving risk information.

The following section illustrates further the identification of risk communication patterns/networks of CBSOs and individuals in different types of areas of Bandung through the method of Focus Group Discussion.

5.8 Risk Communication Interfaces in Communities in Bandung

To identify further risk communication approaches at community level, certain risk communication interfaces need to be explored. Thus, after the risk communication approaches for CBSOs (through SIERA) and individuals are completed, a Focus Group Discussion was held in different type areas of the city to explore and identify more of these communication patterns/networks. The process and findings from the Focus Group Discussion are discussed in the following sections.

5.8.1 Identification of Risk Communication Interface in Communities

The method of Focus Group Discussion (FGD) was utilized to identify further risk communication patterns at communities in Bandung City. The theme of the FGD is Disaster Risk Communication in Bandung City. The aims of the FGD is to reveal inter- and intra communication process/pattern between the three CBSOs, local government, and community; as well as among the three CBSOs itself, including communication player(s)/actor(s) in the inter-networks outside the three CBSOs. A brief SWOT analysis of disaster risk communication was also conducted in the discussion and through a problem tree analysis, it identified as well the root causes/problems and proposed solutions of disaster risk communication. Consequently, the expected results of the FGD are the formulation of the communication networks (connectivity) among the nodes of community structure and communication networks between the nodes of community structure and local government. A problem tree analysis of disaster risk communication in Bandung was also implemented during the FGD to disentangle the risk communication problems in Bandung and propose ways and solutions to the issues.

The participants of the FGD are local government of Bandung City, the three CBSOs (WWAs, YUs, and FBOs), and other stakeholders, such as related governmental agencies, and communication organizations of Bandung. The FGD is conducted for three large

groups, divided into three major areas in Bandung, namely (1) Mountain, (2) Center and Residential areas, and (3) Newly developed areas and Out fringes of city. These areas that was chosen for the FGD, are the area division of the conducted resilience assessment (CDRI, see Chapter 4) as well as the types of the areas in Bandung when conducting the risk communication surveys of the three CBSOs through SIERA Approach (see Chapter 5). The division of these three major groups that were participated in the FGD due to several factors, such as different hazard prone areas (flood/inundation prone, landslide susceptibility, and fire threats), different demographic characteristics (sum of population, variety of age across population group), and different nature of CBSOs (in the newly developed areas and out fringes of city are dominated by the Youth Unions and Faith-Based Organizations). All these factors are taken into account, which may generate positive implications to risk communication process in the city. Therefore, the CBSOs' participants from these areas, represented in the FGD may accentuate the risk communication networks/patterns, problems and root causes and proposed solutions of disaster risk communication in city.

Bandung Development and Planning Agency *(Bappeda Kota Bandung)* is the venue and host of the FGD. The agency has close collaboration with Kyoto University, initiating from the resilience assessment of CDRI (see Chapter 4) in 2010. Following table (Table 5.35) is the details of the FGD on Disaster Risk Communication in Bandung City. Figure 5.56 below shows the team of Bandung Development Agency and Kyoto University (author) for the FGD.



Figure 5.56: Bandung Development Agency and Kyoto University team for the FGD

Table 5.35: The details of the FGD

Topic	Details of FGD
Participant	▪ CBSOs at the ward level: • Women Welfare Associations • Youth Unions • Faith-Based Organizations ▪ Community Information Groups ▪ Sub-districts governments from the related ward ▪ Communication and Service Agency *(Diskominfo)* ▪ Fire Department ▪ Bandung Development and Planning Agency *(Bappeda Kota Bandung)*
Facilitators of the FGD	▪ Kyoto University ▪ Institut Teknologi Bandung (ITB)
Duration	Half-day discussion
Method	Focus discussion, SWOT Analysis, Problem Tree
Agenda	▪ Opening by the head of *Bappeda Kota Bandung* ▪ Introduction remarks by Communication and Information Service Agency *(Diskominfo)* ▪ Introduction and explanation of FGD by Kyoto University (author) ▪ Discussion among the three groups ▪ Presentation of findings of the discussion by each group ▪ Closing remarks by *Bappeda Kota Bandung*
Key Questions of the FGD	▪ Communication between the three CBSOs and Local Government of Bandung What kinds of communication action? How is the communication process? ▪ Communication among the three CBSOs What kinds of communication action? How is the communication process? ▪ Involvement of other stakeholder(s) outside the 3 CBSOs What kinds of communication action? How is the communication process? ▪ SWOT Analysis on Disaster Risk Communication of the 3 CBSOs ▪ Problem Tree of Disaster Risk Communication

The FGD was thus conducted in three groups and below sections describe the results of the discussion. Figure 5.57 shows the FGD participants of Disaster Risk Communication in Bandung.



Figure 5.57: Participants of FGD for Disaster Risk Communication

5.8.2 Risk Communications Interfaces

Previously mentioned, the FGD was divided into three groups, namely (1) Mountain, (2) Center and Residential areas, and (3) Newly developed areas and Out fringes of city. The discussion was focusing on identifying the risk communication interfaces of local government, CBSOs, and people, where the participants were asked the key questions. The SWOT and Problem Tree Analysis were utilized to discuss the root causes of disaster risk communication problem, focusing on the socio-economic, institutional, and technical (sender-receiver of information) aspects. It also asked participants to suggest solutions to overcome barriers or challenges in those three aspects.

1. Mountain

The FGD for the mountainous areas of Bandung was participated by eight people that are coming from three CBSOs (WWAs, YUs, and FBOs), CIG, sub-district government of Sukajadi and Coblong, and Sukabungah and Sadang Serang Wards. The participants highlighted the kinds of disaster events in the areas and responses (Table 5.36), prior discussing the communication networks. It is worth to mention that these areas have a disaster management plan available.

The items that are included in their disaster management plan are as follow:

- Formation of disaster management team at ward and neighborhood level (internal organization)
- Disaster management training
- Developing commando post station for disaster at wards
- Development of communication facilities for disasters
- Suggestions by community are subject to be included into *MUSRENBANG (Musyawarah Rencana Pembangunan*/Development Planning Discussion) at wards
- Socialization and dissemination of disaster management at schools, neighborhoods, malls, mosques, and other public facilities
- Preparation of evacuation routes and shelters
- Hazard prone areas mapping

Table 5.36 and Table 5.37 summarize the results of the discussion on kinds of disaster events in the areas and their responses. Figure 5.58 shows the destroyed levee due to riverine flood in one of wards of Bandung.

Table 5.36: Summary of kinds of disaster events in the mountain areas

Kinds of disaster events in the areas		
Disaster	**Period**	**Damages**
Annual Flood/Inundation	Rainy season	Houses, roads destroyed. Public facilities, such as *Puskesmas* (*Pusat layanan kesehatan masyarakat*/Community health service center) mosques, and governmental offices are disturbed. Unhealthy environment. Economic and traffic condition is disturbed. Loss of household assets.
Big Flood	1983	Two neighborhoods were inundated and four casualties.
Landslides	Rainy season	Houses were destroyed. Disruption of economic and daily life. Loss of household assets.
Fire	Past, year unknown	Loss of household assets.
Storm	2008	200 households were damaged.
Hagel storm	2005	Roofs were damaged.
Floods	2009, 2010, 2011, 2012, 2013	Trees and houses damaged, human loss.
Earthquake	2009	Houses and constructions light damaged and cracks.



Figure 5.58: Man-made levee (from construction material) is destroyed due to riverine flood at Citepus River in Inhoftank area, Nyengseret Ward, Astaanyar Sub-district, Bandung

Table 5.37: Summary of kinds of disaster responses in the mountain areas

Kinds of disaster responses			
Disaster	**Actor of Response**	**Other Stakeholder**	**Time of Response**
Flood	**WWA:** ▪ Disaster response towards more preventive, focusing on environment and community health issues **YU:** ▪ Instruction to community to protect and preserve the environment through proper waste management ▪ Supporting and helping the affected people and coordinate with local authority and Red Cross and TAGANA **FBO:** ▪ Preventive announcement through praying sessions *(Majlis Taklim, pengajian)* about the importance of preserving environment and nature in minimizing disaster risks. **Community Information Group (CIG):** ▪ Friday Cleaning ▪ Repairing drainage and sewer ▪ Collective waste disposal management ▪ Management of river catchment area (city government and community) ▪ Hygiene promotion ▪ Disaster management training ▪ Coordination with related agencies ▪ Inform the community about the activities by community radio *(Rakita FM Sadang Serang)*	Water and Irrigation Agency Development and Planning Agency	▪ During the event ▪ Regular activity (Friday Cleaning)
Landslides	**Sub-district government:** ▪ Evacuation of victims ▪ Data recording and updating the victims and the needs of the affected community ▪ Temporary shelters ▪ Community kitchen ▪ Coordination with related agencies and organization (TAGANA, Red Cross) ▪ Dredging the sewer system ▪ Construct landslides reinforcement ▪ Coordination with related technical agencies **CIG:**	WWA, YU, FBO, CIG, Social Service, City government, Public Works, Dinas Bina Marga dan Pengairan (DBMP), TAGANA, Red Cross	During the event

Kinds of disaster responses			
Disaster	**Actor of Response**	**Other Stakeholder**	**Time of Response**
	▪ Preserving the *levee* and water catchment areas ▪ Control, evaluate, and informed housing construction in landslide prone areas ▪ Giving advices during *MUSRENBANG* ▪ Engage community in environmental protection (waste management) **YU:** ▪ Participation in environmental protection trainings (by related agencies/organization) ▪ Emergency response (physical and mental support)		
Fire	**Sub-district government:** ▪ Data collection and record of economic, household asset and casualties ▪ Evacuation process ▪ Food and clothes supply ▪ Coordination with related agencies/organization **CIG:** ▪ Fire drill with small industries in neighborhoods ▪ Information and dissemination about fire risks and safety **YU:** ▪ Training of fire fighter volunteers with Fire Department ▪ Information dissemination about the fire risks and its countermeasures	WWA, YU, FBO, CIG, Fire Department, City Water Company	Before the event

Disaster risk communication interfaces in the mountain areas are varied among the CBSOs. The mountain group highlighted that a special occasion or event in their neighborhoods is the entry point of gathering the community, including the CBSOs. Thus a particular event is the glue for communities to conduct communication with all. As the communication between Local Government and CBSOs and inter-and intra CBSOs are different between neighborhoods and wards. Table 5.38 summarizes the results of the discussion in the mountain group, and Figure 5.65 (page 305) illustrates the current risk communication interfaces compiled for CBSOs in Bandung.



Figure 5.59: The participants of FGD for the mountain areas group

Table 5.38: Disaster risk communication interfaces in the mountain areas group

Network	Communication pattern in informing risks
Intra-CBSOs	
Among the WWAs members	▪ During the WWAs' regular meetings (monthly) ▪ Direct interaction (talking when meet, by phone, by SMS)
Among the YUs members	▪ Direct interaction (talking when meet, by phone, by SMS) ▪ Discussion during plenary meetings (unregularly, held when it is necessary)
Among the FBOs members	▪ Inserted disaster knowledge/disaster education into praying materials during the praying session
Inter-CBSOs	
Between WWAs and YUs and vice versa	▪ During coordination meeting/gathering of WWAs. The YUs are invited by the WWAs to attend the meeting in planning activities ▪ YUs are usually the implementer and support the WWAs' activities (i.e. integrated community health service)
Between WWAs and FBOs and vice versa	▪ Communication through the *Majlis Taklim and pengajian* (women or family praying sessions) ▪ Members of WWAs are also members of FBOs
Between YUs and FBOs and vice versa	▪ Communication through *IRM (Ikatan Remaja Mesjid*/Youth Mosque Councils) during the praying sessions and mosque social activities
Among the CBOSs	
Between WWAs, YUs, and FBO in the community	▪ Routine/regular meetings ▪ Communication through integrated community health service *(Posyandu)* activities, led by WWAs ▪ Inauguration of WWAs at neighborhoods ▪ Communication during the commemoration of WWAs and Community Service Day *(Peringatan Hari Kesatuan Gerak PKK dan Bulan Bakti Gotong Royong Masyarakat)*
Between authority and CBSOs	
Between the Local Government of Bandung and three CBSOs	▪ Communication during coordination meetings with each CBSOs ▪ Communication during coordination meetings with all CBSOs (Government of Bandung invites the CBSOs and vice versa, if they have a proposed program of activities) ▪ Communication during awards presentation ▪ Communication through brochures, leaflets, and posters ▪ Communication though appeals, requests, persuasive activities
Involvement of other stakeholders in the community in risk communication	
Community Information Group (CIG)	▪ Community media: information through printed media (newsletter, flyer, notice board) ▪ Internet/Wi-Fi: some of neighborhoods at some wards have access to internet and access the information in CIG's website

The SWOT analysis was also conducted in the group. The participants mentioned few analysis of disaster risk communication by the CBSOs. One interesting finding of the SWOT for this group, is that the participants mentioned monitoring and evaluation of their activities as threats. This needs to be followed up by the local government in near future, in obtaining optimum impacts and benefits for communities from these CBSOs. It is previously stated that these CBSOs are the partners of government of Bandung in executing its development programs. A monitoring and an evaluation method/framework or approach for CBOSs activities and its SIERA is thus required. What, who, and how this should be conducted needs to be further discussed with the Government of Bandung. A regular evaluation, followed by an award presentation and incentives might in need in triggering the CBSOs perform and deliver better service to communities. This could mean win-win solution as the programs of government of Bandung is ensured to have the support, the CBSOs are obtaining recognition, and communities receive benefits. The summary of their analysis can be seen in Table 5.39.

Table 5.39: The SWOT for disaster risk communication by the CBSOs (WWAs, YUs, and FBOs) in the mountain areas group

Strength	Weakness
▪ High level of trust and concern from each stakeholder ▪ Existence of governmental support in communication infrastructure and facilities until the ward level (Wi-Fi/internet access in neighborhood)	▪ Less funding for community's activities ▪ Less prepared human resources and skills in communication ▪ Constant changing of risk communication pattern
Opportunity	**Threats**
▪ Government obtain support from the community through CBSOs ▪ Possibility in creating/generating income for households in neighborhoods through house/small industries (i.e. handicrafts, community service, et.)	▪ No/less monitoring and evaluation of CBSOs' risk communication activities (i.e. CBSOs' SIERA) ▪ Risk communication activities might be sometimes not right to the target

Moreover, the problem tree analysis was conducted as well in identifying the root causes and possible solutions for disaster risk communication problem in Bandung. The mountain areas group was discussing the institutional /policy aspect. According to Vaughan (1995), communication and participatory strategies will be considered successful only if diverse communities can be engaged as partners in the policy process. This group highlighted the unsynchronized activities of related agencies in disaster management. Many activities are taken double in form and overlapped to one another. This classical issue needs to be responded soon, if Bandung City wants to serve better its communities. Otherwise, the socialization, awareness, and dissemination have not touched communities' need. These were raised during the discussion and the participants proposed a solution in engaging closely the community, represented by these CBSOs at the sub-district level. This will endorse the policy at the more local level, thus wards are the implementers with better coordination line than before. The results of this institutional/policy aspect are summarized in a consolidated problem tree with other aspects in Figure 5.67, page 308.

2. Center and Residential Areas

The FGD for the center and residential areas of Bandung was participated by seven people that are coming from three CBSOs (WWAs, YUs, and FBOs), CIG, sub-district government of *Antapani* and *Batununggal*, *Antapani Kidul* and *Cibangkong* Wards, and Communication and Service Agency officer. The participants highlighted that inundation during the rainy season is the regular disaster event in the central part of the city and their common disaster responses in the areas are as follow: cleaning sewages and drainage from sediment and waste disposal, and *Gotong royong* (common spirit of helping each other) in Friday Cleaning, which are done by CBSOs, local governmental officers, and communities in neighborhoods (Figure 5.61).

Disaster risk communication interfaces in the center and residential areas are varied. The center and residential group highlighted that coordination meetings among the CBSOs and between local government and CBSOs are crucial in maintaining the flow of information. They also highlighted that revitalize the "Friday Cleaning" activity is important to ensure community participation in preserving and protection of their neighborhoods. Therefore, promoting collaborative actions across/inter CBSOs is the essence of community participation. It is worth to note that in the center and residential

group, a community radio is functioning, as part of Community Information Group (CIG) activity.



Figure 5.60: The participants of FGD for the center and residential areas group



Figure 5.61: A main road in residential areas inundated during rainy season (left) (Photo courtesy: Pikiran Rakyat, 2013) and an example of gotong royong/kerja bakti (Friday cleaning) of clearing the ditches to prevent street inundation in one neighborhood in residential areas (right) (Photo courtesy: RW-net, 2013)

This community radio will be illustrated in later chapter (Chapter 6). This community radio is named *Radio Suara Cibangkong 107,7 FM,* and the leader of CIG is managing this community radio. Its activities are spanning from environmental protection until socio-economic livelihood, which provides the entry points/platform for risk communication in neighborhoods.

In addition, since this group includes the local government officers (sub-district government and Communication Service Agency), they have conveyed that there are direct communication processes between government of Bandung and its communities. This was taken in the form of group counseling, through mass media (radio and newspaper), and circular letter to sub-districts *(kecamatan)*. This is then descended to wards *(kelurahan),* neighborhoods *(RW/RT)* and finally it reaches the households *(rumah tangga).* Table 5.40 summarizes the results of the discussion of the communication patterns between local government and CBSOs as well as inter-and intra CBSOs in neighborhoods and wards at the center and residential areas, and Figure 5.65 (page 305) illustrates the current risk communication interfaces compiled for CBSOs in Bandung.

Table 5.40: Disaster risk communication patterns in the center and residential areas group

Network	Communication pattern in informing risks
Intra-CBSOs	
Among the WWAs members	▪ Information dissemination through community radio ▪ Direct interaction (face to face when we meet, house visit)
Among the YUs members	▪ Direct interaction (talking when meet, by phone, by SMS, house visit) ▪ Art and culture gathering ▪ Communication when organizing cultural and national event (i.e. Independence Day)
Among the FBOs members	▪ Communication through mosque's speakers ▪ Communication through the *Majlis Taklim and pengajian (praying sessions)* ▪ Communication process through *kentongan* (community tradition bamboo alert system) ▪ Direct interaction (face to face when meet, house visit)
Inter-CBSOs	
Between WWAs and YUs and vice versa	▪ Coordination between WWA and YU during meeting/gathering, organized by local government (usually sub-district government) ▪ Monthly meeting of WWA, the YU are invited and involved in WWA activities
Between WWAs and FBOs and vice versa	▪ Communications through *Majlis Taklim,/Pengajian* (praying sessions), as the WWA members are also FBO members
Between YUs and FBOs and vice versa	▪ Communication through *IRM (Ikatan Remaja Masjid)* or Youth Mosque Council during the prayer session and mosque social activities
Among the CBSOs	
Between WWAs, YUs, and FBO in the community	▪ Routine/regular meetings ▪ Communication through integrated community health service (Posyandu) activities, led by WWAs ▪ Inauguration of WWAs at neighborhoods ▪ Communication during the commemoration of WWAs and Community Service Day *(Peringatan Hari Kesatuan Gerak PKK dan Bulan Bakti Gotong Royong Masyarakat)*
Between authority and CBSOs	
Between the Local Government of Bandung and three CBSOs	▪ Communication during coordination meetings of WWA, YU, and FBO (government invite the CBSOs and vice versa if they have a proposed programs for activities) ▪ Coordination meeting on Sundays ▪ Local government has call center (if possible, connect to sub-district leader), the number is updated during the coordination meeting ▪ Direct communication (community can walk in to sub-district office during office hours)
Involvement of other stakeholders in the community in risk communication	
Community Information Group (CIG)	▪ Community radio (*RSC: Radio Suara Cibangkong, 107,7 FM* (4pm - 12am) ▪ Community Protection Group, such as *LINMAS (Perlindungan Masyarakat*/Community Protection)/*SATPAM (Satuan Pengaman Masyarakat*/Community Protection Unit) ▪ Other community organization, such as CIG (Community Information Group), IRM (Youth Mosque Council), Cooperative Unit, and *Arisan* Group (Women Informal Cooperative Unit meeting)

The SWOT analysis for disaster risk communication by the CBSOs is also conducted in this group. The participants mentioned each SWOT for each of the CBSOs, which was responded slightly different than in the mountain areas group (specific for each CBSO). The results of the SWOT can be seen in Table 5.41.

Table 5.41: The SWOT for disaster risk communication by the CBSOs (WWAs, YUs, and FBOs) in the center and residential areas group

Strength	Weakness
WWAs ▪ Flexible, motherly, high mobility, voluntary spirit **YUs** ▪ Energetic, innovative, creative, voluntary spirit **FBOs** ▪ Religious act and verses (from the holy Qur'an) as the legal argument for disaster management and community activities that are accepted by the community	**WWAs** ▪ Sometimes gossiping/talk active in negative sense, overlapping working programs **YUs** ▪ Not all members active participate/active, less funds, too much profession (overlapping work), sometimes not discipline with time **FBOs** ▪ Underrated facilities, high level of fanatic and diversion of ranges to certain religion that might threat the peaceful and harmonic community
Opportunity	**Threats**
WWAs ▪ Political participation **YUs** ▪ Youth Union as stepping stone of early career in an organization **FBOs** ▪ High mobility, many members, positive fanatics and spirit	**WWAs** ▪ Irregularity of participation, not following leader's order **YUs** ▪ Too obsessed in implementing activities **FBOs:** ▪ High level of fanatic and diversion of ranges to certain religion that might threat the peaceful and harmonic community

Furthermore, the problem tree analysis in this group was identifying the root causes and possible solutions for disaster risk communication problem in Bandung for the socio-economic aspect. Because responses to risks are embedded and evolve within broader social environments, achieving the promise of risk communication across a diverse economic condition of society (Vaughan, 1995; Grothmann and Reusswig, 2006). This group highlighted the lack of trust that community inhibits in government and the low economic condition of some communities that may hamper their participation in community activities, due to busy in working and earning money for their households. This shall be responded by each neighborhood in enhancing the livelihoods of its households. One possible solution was proposed by the participants such as creating a stimulate aid in giving modality to neighborhoods in developing home industries that are managed by neighborhoods and households. Thus, it will bring additional income to families, without spending time outside their neighborhoods and at the same time providing sufficient time to participate in community activities. The results of the socio-economic aspect are summarized in a consolidated problem tree with other aspects in Figure 5.67 page 308.

3. Newly developed areas and Out fringes of city

Eight people participated in this group that are coming from three CBSOs (WWAs, YUs, and FBOs), CIG, sub-district government of *Cibiru* and *Babakan Ciparay*, *Pasirbiru* and *Babakan Ciparay* Wards, and Fire Department officer. The participants highlighted that inundation during the rainy season, landslides and fire are frequent disaster events in these region. Dense populated areas are dominated these regions that might cause electrical short circuits and eventually causing fire. Some of these areas are lying in lowland and thus prone to floods and inundations. Table 5.42 summarizes the different responses by CBSOs and government to disaster event, such as flood/inundation.



Figure 5.62: The participants of FGD for the newly developed areas and out fringes of the city group

Table 5.42: Summary of kinds of disaster responses in the newly developed areas and out fringes of city

Kinds of disaster responses			
Disaster	**Actor of Response**	**Other Stakeholder**	**Time of Response**
Flood	**WWA:** ▪ Coordination with related agencies and government, mobilization the community in taking part of countermeasures action **YU:** ▪ Responsive to disaster events (spontaneous support/aids/volunteering, fund rasing) and collaboration with TAGANA (Youth Disaster Response) and Red Cross in emergency response activities and distribution of aids ▪ Supporting and helping the affected people and coordinate with local authority, Red Cross, and TAGANA **FBO:** ▪ Coordination with the local market *Caringin* in managing wastewater and sewage system ▪ Mobilization of the community in repairing and maintaining wastewater and sewage system ▪ Solid waste management with local market and supported military force ▪ Construction of water pump with neighboring wards **Sub-district government:** ▪ Collaboration/coordination with *Muspika* (*Musyawarah Pimpinan Kecamatan*/Sub-district Forum) ▪ Mobilization of community ▪ Reporting disaster events to government/related agencies ▪ Initiating *RTH* (*Ruang Terbuka Hijau*/ Green Open Spaces Plan) and *PHMB* (*Pengelola Hutan Bersama Masyarakat*/Community Forest Collaborative Management) for flood and landslide risk reduction **Government of Bandung (Fire Department):** ▪ Development of plans related to disaster prevention and mitigation (road planning system and spatial planning) ▪ Dissemination of disaster awareness and preparedness ▪ Emergency response to disaster affected area ▪ Aids (foods, goods, clothes, etc.) supply and distribution to disaster affected community ▪ Recovery and reconstruction plan	Military Forces	▪ During and after a disaster

Figure 5.63 illustrates a collaborative activity that was described by the FBO in cleaning the solid waste management with the military force and governmental officers in a local market in Bandung. This was implemented to prevent clogging of the drainages for flood risk reduction in the neighborhood.




Figure 5.63: 150 ton/day waste generation from the local market "Caringin" (left) (Photo courtesy: Pikiran Rakyat, 2010, and collaborative action of military forces "Kodam III Siliwangi" Bandung with community and governmental officers in clearing the waste from the local market "Caringin" (right) (Photo courtesy: Detik, 2011)

The current risk communication interfaces in this group are not deviated from other two previous groups (mountain and center-residential areas). The communication inter-intra and between the CBSOs and local government and other stakeholders are similar throughout Bandung. Coordination meetings, community actions packed in SIERA, direct interactions are the common risk communication process. However, this group highlighted the importance of Friday Cleaning *(Jumsih)* activity. Collaborative action coupled with environmental protection is the backbone of risk communication process in these neighborhoods. Table 5.43 summarizes the results of the discussion on communication patterns in these regions. Subsequently, Figure 5.65 (page 305) illustrates the current risk communication interfaces for CBSOs in Bandung, compiled from the three FGDs.

Table 5.43: Disaster risk communication patterns in the newly developed areas and out fringes of the city group

Network	Communication pattern in informing risks
Intra-CBSOs	
Among the WWAs members	▪ Flood prevention/mitigation: At wards, every Friday organize Friday Cleaning, together with ward officials, community leaders, and communities in cleaning the neighborhoods
Among the YUs members	▪ Information and dissemination of hazard and disaster ▪ Importance of preserving natural environment with engaging the member in *gotong royong* and Friday Cleaning (drainage, water, and sanitation system), especially in disaster prone area ▪ Creating healthy lifestyle slogans
Among the FBOs members	▪ Organizing small meetings before and after a disaster under the members of FBO ▪ Conduct coordination meeting with community member and representatives until neighborhood level ▪ Direct observation and countermeasures in disaster affected area ▪ Verbal communication (mobile phone), SMS, conventional mail, community programs
Inter-CBSOs	
Between WWAs and YUs and vice versa	▪ Verbal communication, coordination meetings, technical guidance, volunteer units (CIG, FBO, TAGANA) ▪ Communication process is relatively occurred, depending the situation (during emergency only)
Between WWAs and FBOs and vice versa	▪ Communications through *Majlis Taklim, Pengajian* (praying sessions), as the WWA members are also FBO members
Between YUs and FBOs and vice versa	▪ Communication through *IRM (Ikatan Remaja Masjid)* or Youth Mosque Councils during the prayer session and mosque social activities

Network	Communication pattern in informing risks
Among the CBSOs	
Between WWAs, YUs, and FBO in the community	▪ Routine/regular meetings ▪ Communication through integrated community health service *(Posyandu)* activities, led by WWAs ▪ Inauguration of WWAs at neighborhoods ▪ Communication during the commemoration of WWAs and Community Service Day *(Peringatan Hari Kesatuan Gerak PKK dan Bulan Bakti Gotong Royong Masyarakat)*
Between authority and CBSOs	
Between the Local Government of Bandung and three CBSOs	▪ Communication during coordination meetings of WWA, YU, and FBO (government invite the CBSOs and vice versa if they have a proposed programs for activities) ▪ Local government has call center (if possible, connect to sub-district leader), the number is updated during the coordination meeting ▪ Direct communication (community walk in to office)
Involvement of other stakeholders in the community in risk communication	
Community Information Group (CIG)	▪ Socialization about bio pores through informal meetings with communities and community group discussion. ▪ Information about PHBS (*Perilaku Hidup Bersih dan Sehat*/Healthy lifestyle), *KB* (*Keluarga Berencana*/Family Planning) ▪ Printed media information dissemination to community (flyers, notice board, etc.)

Aware of its disaster prone areas, these communities have made effort in promoting a slogan campaign of "Healthy Lifestyle". For example, one neighborhood (*RW 09 Cigending*) has made a pamphlet for *gotong royong*, a regular *Friday Cleaning (collaborative neighborhood cleaning action)* of the neighborhoods in Bandung. This implies that printed media is used to communicate actions to communities. In this regard, when communication process takes place, risks are informed. Figure 5.64 is the example of this *collaborative neighborhood cleaning action* promotion pamphlet.



Figure 5.64: A pamphlet of environmental protection campaign, a printed media in engaging the community in a neighborhood to act (left) (Photo courtesy: rwnet, 2013) and a bulletin/regular newsletter to inform the community of various (SIERA) actions of various CBSOs in a neighborhood (right) (Photo courtesy: RW-net, 2013). Pictures clock-wise in the right pamphlet: religious event by the FBO, health service and medicine knowledge by WWA, handicraft activity by WWA, youth mosque activity by YU and FB, mosque rehabilitation by FBO, clean water pipe construction by communities, cooking class by WWA, and neighborhood coordination meeting.

The SWOT analysis for disaster risk communication by the CBSOs is also conducted in this group. The participants responded similarly with the other two groups and highlighted as well the SWOT of local government and CIG, based on their experiences. The results of the SWOT can be seen in Table 5.44.

Table 5.44: The SWOT for disaster risk communication by the CBSOs (WWAs, YUs, and FBOs) in the newly developed areas and out fringes of the city group

Strength	Weakness
WWAs ▪ "Top of the sphere" of the community **YUs** ▪ Many members, community trust, strong communication network **FBOs** ▪ Many members, strong local/traditional root **Local Government** ▪ Clear and structured organization, policy as legal basis, access to communication **CIG** ▪ Community-based organization, legal aspect from government (Communication and Information Agency as the founder of CIG)	**WWAs** ▪ Sometimes gossiping/talk active in negative sense, overlapping working programs **YUs** ▪ Sometimes less organized, aggressive **FBOs** ▪ Less united with other different community members **Local Government** ▪ Less personnel and funds **CIG** ▪ Unclear communication system, less disaster risk communication knowledge, less communication facilities and infrastructure, less governmental support
Opportunity	**Threats**
WWAs ▪ Political participation **YUs** ▪ Youth Union as stepping stone of early career in an organization **FBOs** ▪ Community trust, economical value **Local Government** ▪ Inhibits legal instrument, access to community and mass media **CIG** ▪ Optimizing neighborhood meetings as the media to interact	**WWAs** ▪ Irregularity of participation, sometimes not following leader's order **YUs** ▪ Too obsessed in implementing activities **FBOs** ▪ Decreasing communication ability **Local Government** ▪ Overconfident in disaster management **CIG** ▪ Less community participation (do not know how to engage community) in risk reduction actions

Figure 5.65 in the following page illustrates the current risk communication interfaces, compiled from the three FGDs that represent the risk communication interfaces of CBSOs with local government and community members in neighborhoods. There are four types of current status of risk communication within CBSOs in neighborhoods of Bandung:

- The first (1st) Risk Communication Interface is the Intra-Communication among the member of CBSOs self: For WWAs, regular meetings and direct interaction are the major communication mode. While for YUs, they communicate through art and cultural gathering, texting message, and through healthy lifestyle campaign. The FBOs are communicating through praying sessions, mosque speakers, and Friday Cleaning.
- The second (2nd) Risk Communication Interface is the Inter-Communication (bilateral communication) between two CBSOs: WWAs and YUs and vice versa are communicating through coordination meetings where Youth Unions are supporting in some of WWAs activities. WWAs and FBOs and vice versa are communicating through religious events, where there are religious activities that targeted women

only. While Youth Unions and FBOs and vice versa are communicating through youth mosque council forums.

- The third (3rd) Risk Communication Interface is the Inter-Communication between all three CBSOs (Trilateral): Aside from their own activities compiled in SIERA, the three CBSOs are communicating through routine meetings, Integrated health service, and common neighborhood activity such as Friday Cleaning.
- The fourth (4th) Risk Communication Interface is the communication between CBSOs and Government (Multilateral communication): Through City Forum where representatives of each of CBSOs are invited to attend the meeting with City Government. In addition, there are local annual and weekly coordination meeting between government and CBSOs and community members in discussing development plan and seeking collaborative actions.

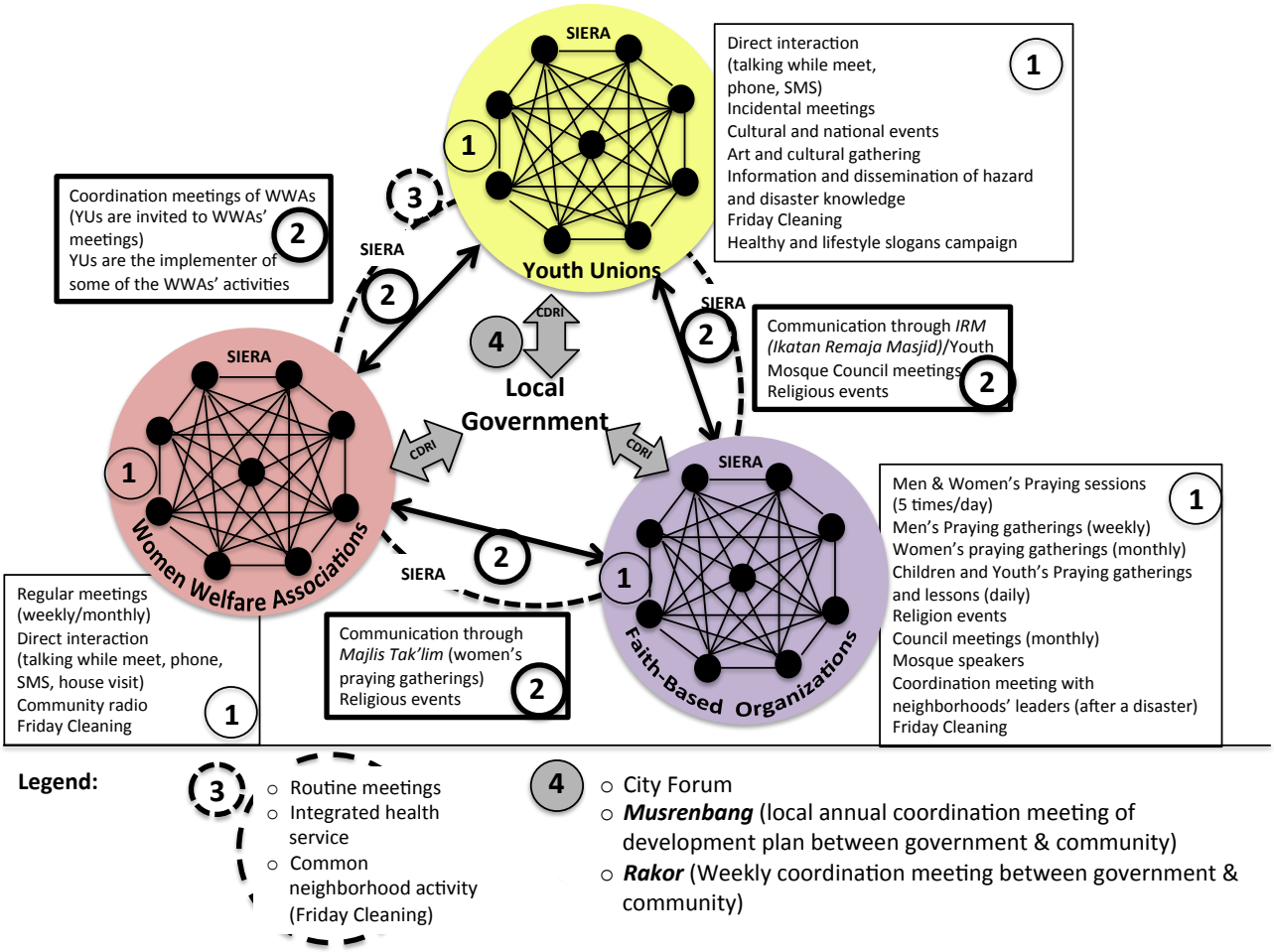


Figure 5.65: Current risk communication interfaces of CBSOs in Bandung

Finally, the problem tree analysis in this group was identifying the root causes and possible solutions in technical matter, such as sender-receiver information aspect of disaster risk communication problem in Bandung for the technical aspect. This group highlighted the passive participation of community and/or community groups in DRR. The lack of disaster risk reduction concern may hamper the availability of risk information and consequently impede the ability of sender to convey the risk message and receiver to draw the information and to act upon it. One possible solution that the

participants proposed is to trigger activities that will gather the communities altogether, to conduct common activities, such as revitalization of neighborhood watching. As the consequent, men communities gather frequently and while watching their neighborhoods, they can discuss disaster and risk reduction issue. This information will be passed at the later stage, at homes, to their family members. In the early 80s until late 90s, almost all neighborhoods in Bandung conduct the neighborhood watching, when all men 17 years old and above were participating to take turn in guarding their neighborhoods. This community protection activity may serve as a communication platform, where possibly the members of YUs and FBOs can met and mingle outside their internal activities, thus risk information exchange is ensured. Figure 5.66 shows a typical venue of community watching *(pos sistim keamanan linkungan/pos siskamling)* and traditional warning instrument made from wood/bamboo *(kentongan),* which can be used as an early warning tool.



Figure 5.66: A typical venue for community watching in West Java Province with a warning instrument, made out of wood (Photo courtesy: Kabar Priangan, 2013)

Following this, Figure 5.67 (page 308) illustrates the consolidated results of the problem tree analysis in disaster risk communication problem of Bandung, in terms of technical aspect along with the aforementioned two aspects such as institutional/policy and socio-economic. The raw data for the problem tree analysis purpose was obtained during the FGD from the three groups. The problem tree analysis in the FGD was thus conducted to assess the disaster risk communication problems and issues in city in both components; local government as well as public (communities/citizen of Bandung City) and to reveal and identify possible solutions to those issues.

To highlight the root causes and possible solutions to risk communication problems in Bandung, in terms of socio-economic aspect, the participants of FGD raised three fundamental issues, such as lack of funds and budget within the government and communities in neighborhood to implement risk communication (RC) activities in overall disaster management. This is also evident from the low resilience value of city's assessment (CDRI assessment in Chapter 4). A possible solution that was proposed by participants is that governmental agencies should program their annual budget strategically, placing the priorities of actions in appropriate manner. Hence it allows some space for cross-actions subsidies. A trust fund, which can be used during emergencies have to be endorsed until the lowest administrative unit (ward level) that

includes RC process to function properly (message arrives on time to the target). Second issue is that some low-level income community may not participate in DRR in their communities; hence risk communication may not be optimally functioned.

The low economic condition forces them to have multiple source of income, hence no or less time is provided for participation in community meetings and discussion. One way to address this issue is that local government should create a local community empowerment programs in neighborhoods that shall not only bring the community closer to homes but these programs shall bring additional income as well. Hence, this segment of community will have more time to participate in CBDRR and thus ensure the functionality of RC. The third issue is the absence of linkages between socio-cultural features and risk responses. Certain group of people in multi-cultural neighborhood may have responded differently to risk, which may affect the RC process. To address this issue, when designing RC process, emphasis must be placed on understanding different patterns of responding risk situations. Hence a leader that may regarded as inhibiting respected and neutral position in multi-ethnic and cultural communities in Bandung, must have profound understanding of the folk, wisdom, religion, and tradition in his/her neighborhood. In addition, RC process is not designed only for community response/collective response, but it has to foster personal risk reduction adaption as well.

In terms of institutional and policy aspect, much of the root caused were addressed to governmental perspective. Previously mentioned the unsynchronized, redundant, and inconsistency of governmental programs on disaster issues may affect the risk communication process from government to public. Thus the socialization, awareness raising, and risk information dissemination are not conveyed properly and grasped communities' needs, especially at the lowest administrative unit (ward level). Hence, community in neighborhoods will not be informed and hamper the collective and/or personal risk responses and RC actions. To address the issue, city government has not only to encourage but also to endorse public service or agency managers to be transparent to each other agencies and public. Frequent coordination meetings that should lead to implementation have to be accommodated by the city government and ensure that CBSOs as representatives of communities are participated in these meetings and discussions. Therefore, through routine meetings with relevant stakeholders (service agencies and public), institutional and policy components, such as development, programs, services, and initiatives in RC process can be designed and identified collaboratively. Thus, these assemblies ensure that good governance in RC process is advanced.

In terms of technical aspect, the root causes of sender-receiver relationships and linkages in RC process are explored and previously discussed (See the FGD results for the group of newly developed areas and out fringes of city). To add, issue such as the lack capability of sender of information to covey the message to the receiver is put at the forefront, disregard whether the sender of information are governmental institutions or community groups. This may affect the risk communication process and eventually affect the end goal of risk communication (to undertake appropriate risk reduction actions in timely manner).

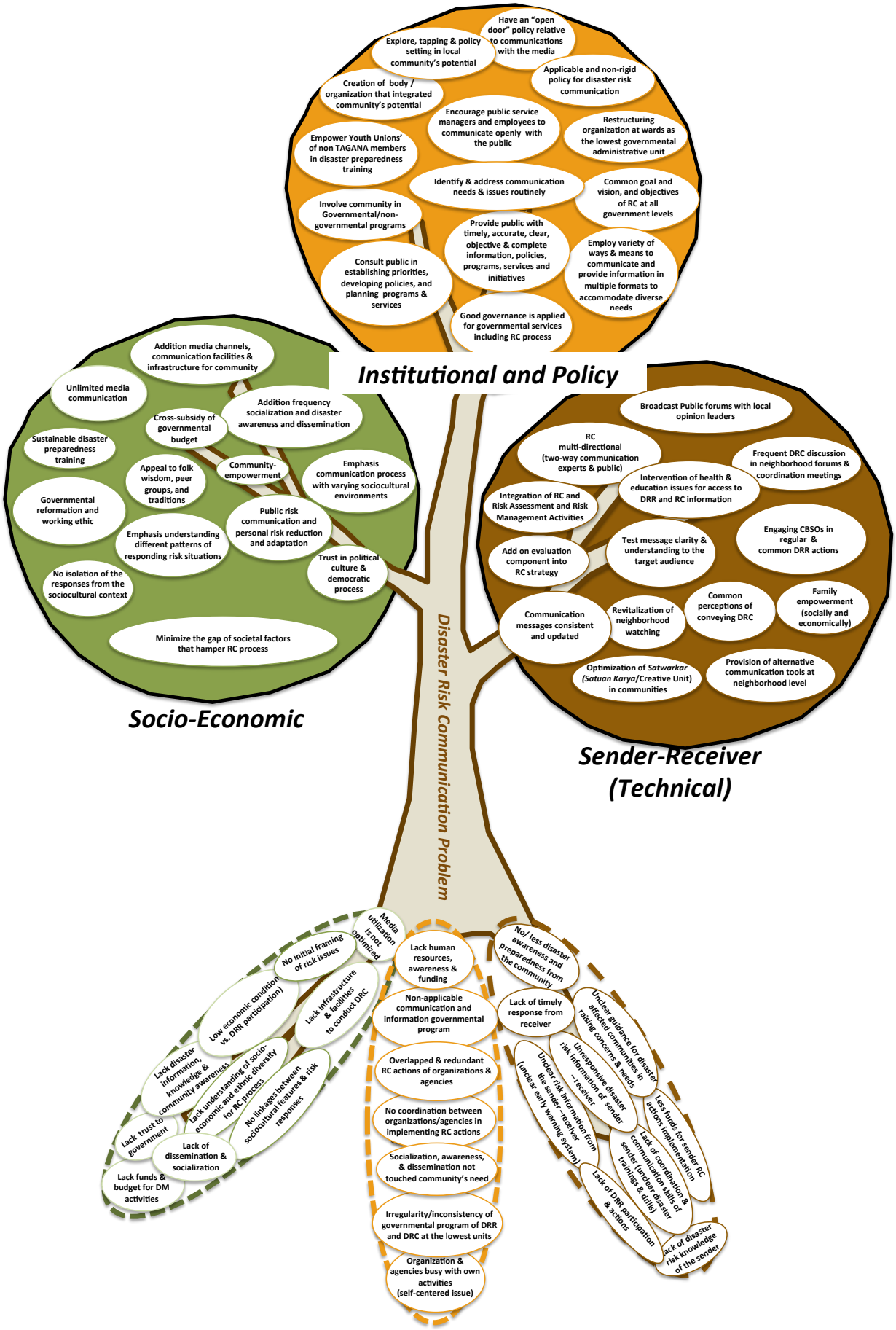


Figure 5.67: The Problem Tree for Disaster Risk Communication in Bandung

5.9 Implications to CBSOs Risk Communication Approach

This chapter has illustrated the CBSOs and the linkages of their activities for the adoption of DRR and risk communication process. Based on these, a risk communication framework and SIERA approach to enhance the climate-related disaster resilience in Bandung are formulated. Subsequently, the findings and results from each of the CBSO's SIERA approach in delineating the risk communication process in communities are presented. It discussed on what, which and how are the risk communication process can be implemented that may function to trigger the community to act in enhancing their disaster resilience.

This chapter has also delineated the risk communication processes of each of the three CBSOs in communities. Based on the results and findings of CBSOs risk communication, signature activities (SIERA) of each of these CBSOs can be marked as the type of risk communication that may function to bridge the communication gap between government and communities. CBSOs SIERA is not only accounted as risk communication platform, but it provides the opportunity of enhancing community resilience. Moreover, individual perceptions of risk communication implementation by the CBSOs are congregated to highlight the impact of CBSOs risk communication process as risk communicators and also to pave the way for triggering personal risk reduction actions and adaptations.

And lastly, the revelation of disaster risk communication patterns and consolidated problem tree analysis of disaster risk communication provide first-hand basis of risk communication assessment for Bandung City and its communities, which may to be taken up by Government of Bandung in addressing risk communication problems and seek respected solutions in enhancing community resilience to climate-related disasters.

Drawing upon the results, the following chapter (Chapter 6) will elaborate the media such as television, radio, and newspaper in the context of risk communication and enhancement of resilience. Those media are the desired risk communication media, apart from the SIERA, that are resulted from the CBSOs' and individual's surveys, in molding the risk communication model for enhancing climate-related disaster in Bandung. The findings from this chapter (Chapter 5) and the following chapter (Chapter 6) will serve as crucial input to the comprehensive model of risk communication for climate-related disaster resilience in Bandung, by integrating the three components of risk communication processes in the city (government, community-based and media).

5.10 Key Findings of Chapter 5

Key findings are arisen from risk communication at the community level in Bandung. This is highlighted in the table below.

Table 5.45: Key findings of CBSOs risk communication approaches

Characteristics	Women Groups (Women Welfare Associations)	Youth Groups (Youth Unions)	Faith-Based Organizations (Mosque Councils)
Type of organization	Semi-formal. Headed by the wives of appointed administrative leaders.	Volunteer. Headed by appointed youth role model at city level and selected at lower level administrative units (sub-districts, ward, neighborhoods).	Volunteer. Headed by a community elder/community leader.
Timing of actions	Mostly before a disaster	Mostly during a disaster	Mostly after a disaster
Nature of actions (SIERA Approach)	▪ Social-based ▪ Actions planned in working period (short – and long term). Primarily active in social aspect, especially, in health issue. ▪ Utilizing strong networking among the women and community members. ▪ Having the advantage of direct relationship with the local government (at city, sub-district, and ward level) risk communication actions as local responses to disasters are better rooted in the community	▪ Institutional-based ▪ Actions mostly ad-hoc type. ▪ Due to TAGANA, youth unions have close networking with inter-department agencies in city. ▪ Mobilizing TAGANA (youth disaster response) unit have influenced the youth in taking risk communication action in emergency response.	▪ Economic-based ▪ Actions dominated in humanitarian aspects, such as collecting goods, used clothes, foods for donation to the poor and refugees. Fund rising during the prayer sessions and distributing the collected funds to the needed ones. ▪ Utilizing the media of face-to-face interaction with the community in the prayer sessions (5 times/daily and once a week) allowing mosque councils to have direct communication contact and frequent access to community for inquire the needs and concerns after the disaster and commit collaborative responses.
Localized communication (RC SIERA)	▪ Mountain areas Awareness and drill and Emergency warning ▪ River Establishing EWS with government and Informing and updating disaster status	▪ Residential, Newly developed areas, and Out fringes Awareness and drill, Emergency warnings, Data collection and communication to officials, Informing and updating disaster status	▪ Plain areas Data collection and communication to officials and Informing and updating disaster status
Media for wider outreach communications	▪ Electronic Media (Commercial Radio) ▪ Printed Media (Local Newspaper)	▪ Electronic Media (Television and Community Radio) ▪ Printed Media (community newsletter, pamphlet)	▪ Electronic Media (Community Radio, Mobile devices Short Message Service) ▪ Printed Media (community newsletter, pamphlet)

Box 5.1: Key findings of Chapter 5 and link to the current study

Highlight and link to current study

- The strength of the three community organizations (Women Welfare Associations, Youth Unions, and Faith-Based Organizations) is showcasing local practices in risk reduction within community and thereby enhances the resilience
- Their activities are recognized as interaction and communication platform of concerns and risks to community, thereby regarded as risk communicators, which was also confirmed by individuals' survey (local risk communication approaches):
  - WWAs effective in pre-disaster RC, strengthening the social sector
  - YUs strong during disaster RC, enhancing institutional sector
  - FBOs major contribution post-disaster RC, strong in socio-economic sector
  - Individual survey shows that people in neighborhoods trust in FBOs as effective risk communicators and conventional media (radio, newspaper, and television)
- Utilizing these local potentials; institutionalization of local initiatives to enhance the resilience can be framed.
- Media and local media are the crucial tools for CBSOs risk communication to convey trusted messages to wider communities and shared their lessons learned to other areas

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Chapter 6
Role of Media in Risk Communication in Bandung

"Holding people accountable for their areas of responsibility is one of the basic purposes of a properly functioning media"
~Jonathan Baker

Chapter 6
Role of Media in Risk Communication in Bandung

This chapter provides the illustration of the involvement of media as the wider publication communication mechanism that highlights the overall risk communication framework of Bandung. It will contribute to model of risk communication framework for climate-related disaster resilience in Bandung, Indonesia

6.1 The Role of Media in Disaster and Risk Communication in Bandung

Media (radio, television, and newspaper) are one of the main risk information sources and the preferred medium for CBSOs (WWAs, YUs, and FBOs) as their risk communication tool to wider communities in Bandung CIty. Since 1970s, media has strong, long-term effects on audiences, based on the omnipresent and consonant stream of messages they presented to audiences (Noelle-Neumann, 1970; Gerbner and Gross, 1974). It has cognitive effect and therefore audiences process the information provided and store it in memory (Scheufele and Tewskburry, 2007).

To date, there are 37 local commercial radio, seven local television, five local/regional newspapers and less than 100 community radio in Bandung *(Yandy Supsiandhy, General Manager of Plus GM Radio, Personal Communication, July 2013).* Nine media in Bandung were interviewed, utilizing semi-structured type of interview. Prior conducting the interviews, key questions were prepared and formulated based on the DRR issues and media's involvement. Moreover, these media are representatives of different types media, such as radio, newspaper, and television. These nine media were selected because of their wide coverage of network in and around Bandung City, their concern in disaster issues, and their potentials as vehicle of risk communication process in Bandung. Thus, two media for each category were chosen that might represent their media group in risk communication. The target of the interviews was ranged from journalists, program directors, to general managers of the media that they are represented. The aim of media interview is similar to CBSOs and individual questionnaire surveys, FGD, and Problem Tree Analysis; it is to explore the risk communication approaches, roles, and possible interventions for risk reduction in city and foremost, in bridging the information gap between government and communities. Likewise the results of CBSOs and individual surveys, FGD and Problem Tree Analysis; the outcomes of the media interviews will be integrated in the risk communication model of Bandung. It is expected that linkages to risk communication process will be revealed and laid out; hence a practical, applicable, and comprehensive risk communication framework can be constructed.

These nine selected media (except campus-based radio) have a working collaboration with the provincial and city government. The Communication and Information Service Agency of Bandung *(Diskominfo Bandung)* is the main source of information for the media in extracting governmental information. The Communication and Information Service Agency is the public relations office of the city. A pressroom in the Communication and Information Service Agency office is dedicated to media as their working venue while obtaining news and information from the government. This implies that these media will likely convey up to date information, including disaster and disaster risk information to the public. Thus the risk communication flow is

ensured. Table 6.1 shows kinds of disaster information coverage that these nine media in Bandung have performed. The purpose to identify their coverage of news of disaster events that occurred in and outside Bandung area, is to confirm the information that they convey will likely trigger people to be more aware and prepared to disasters.

Table 6.1: The coverage of disaster news of interviewed media

Type of media	Recent Disaster Coverage	
	IN Bandung	**OUTSIDE Bandung**
CR 1 **Community Radio 1**	▪ Floods/inundation in November-December 2012 in southern part of Bandung ▪ *Bandung Tenggelam/"*Bandung is Sinking"	▪ Earthquake risk in Bandung and *Tasikmalaya Earthquake* (southern part of Bandung City) ▪ Volcanic eruption risk of *Tangkuban Perahu Volcano* (northern part of Bandung City) ▪ Jakarta 2013 Floods → To raise community awareness and consequences of floods (health issues)
CR 2 **Community Radio 2**	▪ Regular floods due to spilling out of the 2 major rivers in Bandung (*Citarum* and *Cikapundung*) and one small river in this sub-district (*Coblong* Sub-district). ▪ The causes and consequences/impacts are discussed (interview the affected communities, the chronology of the breakdown of levees, etc.)	▪ *Pangandaran* Tsunami and Earthquake in *Tasikmalaya* in 2006 → Informed and share the lessons learned of disasters in neighboring cities that affected indirectly Bandung City.
CPR **Campus-Based Radio**	NA	NA
R 1 **Commercial Radio 1**	▪ Floods in *Pasteur* road 2011 and Floods in *Pagarsih* ward in 2013 ▪ Issue that is highlighted is the city planning, why and how it happened ▪ Diminishing of green spaces turned into construction (residential areas), land use change and alteration in its function ▪ Mountainous areas were transformed in high-rise construction buildings	▪ Earthquakes in nearby city, such as *Tasikmalaya* Earthquake: → To raise people awareness about earthquake risk in Bandung and what needs to be prepared and also many relatives of Bandung citizen live in the nearby affected area (keeping them informed about the condition) → To educate people on how was the strength and magnitude of the earthquake and compared the impacts to Bandung city (in future) ▪ Jakarta 2013 Flood → inform the people about the huge economic loss and disruption of the economic activities that might occur in Bandung as well
R 2 **Commercial Radio 2**	▪ Floods in southern part of Bandung *(Dayeuhkolot)* that are regular impacted by floods/inundation every year ▪ Aside that many industries are located in these areas, this region was the center part of Bandung in early 1900s and located in low land areas, meeting point of two up streams. ▪ This is the indigenous knowledge that needs to be promoted to public for flood risk management (geographical names) ▪ Promoting flood forum across the region in West-Java Province	▪ Breakdown of levees (*Depok* City), huge economic loss and lessons learned for the community in Bandung
NWSP 1 **Newspaper 1**	▪ Regular flood/inundation needs to be regularly mitigated that is closely related with people's daily coping capacity	▪ Tsunami in *Pangandaran* in 2006 (Southern part of Wes-Java Province) are covered and conveyed to people in Bandung → Although Bandung is not located on the coastal area, however, Bandung has a high risk of earthquake → Thus, the news of earthquake in neighboring city will trigger Bandung's communities to be aware
NWSP 2 **Newspaper 2**	▪ Regular and annual floods/inundation spots are identified and discussed (58 spots are recorded), on how to prevent and mitigate the issues ▪ DRR campaign in the form of Tree Planting is made as attractive as possible ▪ The news is shared to the public based on PR	▪ News about floods outside Bandung City is crucial, since Bandung City is neighboring with the affected region. →Although the disaster event is not occurred in Bandung, but the impacts can still be felt by the communities in Bandung (transportation, traffic condition, relatives, living area, etc.)

Type of media	Recent Disaster Coverage	
	IN Bandung	OUTSIDE Bandung
	initiative, inputs from the community and experts	▪ News about *Aceh* Earthquake triggered the communities of Bandung to be aware and prepared about the earthquake risk and also it has raised the social capital and humanity among people of Indonesia
TV 1 **Television 1**	▪ Regular flood/inundation in Bandung City of last April 2013 in highlighting the event and informed public about what should be needed to prevent the event in the future.	▪ Floods in *Cirebon* (Eastern part of West-Java Province, bordered with Central-Java Province) in highlighting how large the impact was and the cause of the event. → This was shared to public as part of lessons learned
TV 2 **Television 2**	▪ Regular and annual floods/inundation spots are discussed →For example recent inundation that disrupts the economic activities for a short time in Bandung in early 2013 has been the focused of PJTV in digging out to the root cause on why it was happened and shared to the audience the impacts and urged people to care and act now	▪ Landslides in neighboring regions, breakdown of levees in *Depok*, Tsunami in *Pangandaran*, Earthquke in *Tasikmalaya* and Floods in Jakarta are few disaster events to name that have been covered by PJTV → The intention was to share the lessons learned of the events and made Bandung's citizen aware and prepared

Starting from the disaster news coverage point of view, these nine media are further investigated in their risk communication process involvement in Bandung. Box 6.1 until Box 6.9 describes the results of the interviews with these media.

Box 6.1: Results of radio interview: Community Radio 1

Community Radio 1

Respondent
Name: Yandhi Supsiandhy
Designation: General Manager
Radio: 108 FM Plus GM Radio
Time of Broadcast operation: 9 am-7pm
Mobile No.: +62-858-60145671
Email: yandhysupsiandhy@gmail.com
Date of Interviews: 18 July 2013

Special details:

- The venue of radio station is in governmental building (*Diaspora: Dinas Kepemudaan dan Olagraga*/Youth and Sport Agency)
- This community radio is organizing and held a course/training of broadcasting for young people
- The KPID (*Komisi Penyiaran Daerah*/Regional Broadcast Commission) recorded 282 Community Radio in 2004 in Bandung. Recently, it decreases until 82 (mostly are dominated by campus-based community radio)



Focus of 108 FM Plus GM Radio
(Background, aim, specialization, target community, penetration level, coverage)

Background
Established in 2002 with education at the foreground. Later, some indie genre and music entertainment was added to the radio. Focusing on communicating information from the government, related to city development, especially Program 7 Titik and PKL (7 spots of illegal business complex) was big issues in early 2000.

Target audience:
Youth – Adult (junior/senior high school students, college, working people, etc.).
Penetration level and coverage:
The radius of coverage is not exceeded the range of 3-5 km. Community radio is bound to share the one digit wavelength with other community radios, which broadcast differently than commercial radios (see special issue).

Covering disaster news and Segmentation news

Reflecting the development of radio facilities, through time, broadcasting about disaster news, the broadcast students are urged to utilize their Facebook in communicating and share the news (Earthquake in Aceh and Floods in Bandung) combined with Radio Facebook, Twitter, live broadcasting, and live streaming. For example, recent flood/inundation in one of sub-district in April 2013 has caused local economic activities disruption. Kinds of disaster news that are usually covered (mixture of casualties, hazard-prone area, damage and loss, and warning).

Segmentation news:

Spontaneous/breaking news (if covering on the same day of event) and integrated in the Program: "Flower City Highlight" (after the event). The Program "Flower City Highlight" talks about Bandung City news (happenings, development, etc.) or Bandung history (preservation, buildings, parks/green spaces in city). In Bandung City news, disaster issues were discussed (disaster, such Tangkuban Perahu volcanic eruption threats, regular inundation). Time of broadcasting the "Flower City Highlight": 11am- 2pm and 4pm-7pm.

Radio gathers the disaster information

Utilizing members personal Facebook, such as uploading and sharing the information to Radio Facebook and Twitter, as well as live broadcasting and digital streaming. The source of information was verified through internet (reliable media online) and they are usually coming from the community radio members itself, students, as well as related governmental website (Dinas Pengairan dan Bina Marga, Dinas Pekerjaan Umum, Dinas Komunikasi dan Informasi, Dinas Tata Ruang dan Pemukiman dan Cipta Karya), and from the official site of city government (City Agenda).

- *Internet is the main source of information (Perencanaan Kota Bandung/Bandung City Planning and Kejadian Bencana/disaster events)*
- *2 hours of live broadcast*
- *No direct information are given by the government to the community radio*
- *Sometimes the community radio comes to city government and asks news that they could convey to communities*

Role of community radio in assisting community in following scenarios

a. *Before disaster:*
   Issue warning and cautions (weather forecast), during "Car Free Day" (Sundays) convey the people of to not littering the waste inappropriately, which could block the drainage and causing inundation during the rainy season. Utilizing the social media more, such as to dig out information of the rainfall precipitation, intensity, etc. from liking the Facebook page of City Meteorology and Climatology Agency, volcanic eruption threats and earthquake from Facebook page of Volcanology and Disaster Mitigation Agency in Bandung. (Awareness Raising on environmental and disaster issue: Do not littering!)
b. *During disaster:*
   Convey, disseminate information to where the community can pool their resources to be donated (phone numbers and venue). Coordination logistic issues (foods and goods). A balance of on-and off-air activities. (Bandung Peduli/Bandung Care)
c. *After disaster:*
   Discussing about the causes and consequences of flood (reviewing the event)

Target of audience for disaster risk communication

This community radio audience is mostly senior high school students to adults

Mechanism of conveying risk information to public

Most of the students of the broadcast course, who have the license to broadcast, are living in many parts of Bandung. When broadcasting, the students have combined the news about Bandung, development, history, education and music entertainment from their own experiences (first hand news) with information from governmental Internet sources/sites and at the end convey to public through live broadcast and digital streaming.

Source of disaster information for radio

- *From the students (first hand news through their Facebook), Internet (credible and trustworthy media online and governmental official sites)*
- *Conveying through social media or tapping the news from the social media is more rapid than waiting for the confirmation of the news from government agency. (Liking the page of governmental agency/BMKG Kota Bandung, Bandung Bersih/Bandung Clean Page)*

Wish: governmental agency has the list of the phone numbers of the community radios. A call to inform/invite when governments events are held, are preferable.

Kinds of disaster risk information

News that trigger and enhance disaster awareness, especially news that would make the community more aware of environmental problems and how the community could minimize the risk to floods.

Validation of the obtained disaster risk information

From the students, live communication (by phone when broadcasting), social media, internet from credible and trustworthy sources (governmental sites and media online).

Partnership

Not yet having a partnership with any stakeholder. If yes, in the future, community radio would like to close a partnership with governmental agency (not business oriented) and youth unions (according to the target of audience). Closing a partnership with other CBSOs, such as WWA and FBO are not preferable and desirable, unless the materials or the news that are originated from these CBSOs are related to youth issues, such as health risk, HIV, drugs, environmental management, etc.

Potential of community radio in risk communication (future role)

Recently, the community radios in Bandung gain more trust from the community, thus private sector is investing their business in the community radio (accurate data of community member). In terms of conveying the news about disaster risk, community radios are more widely acknowledged by the public.

Barrier/Challenge of community radio in risk communication
The rules and regulation about the narrow frequency/width band and less area of coverage (less than 50% of the area of Bandung City, with the radius coverage of no more than 2.5 km and power of no exceeding 50 Watt) has hindered the community radio in operationalizing their on-air activities, thus made them less in conveying the risk information to the public. In terms of equipment to broadcast (podcast, tower, sound mixture, etc.) are very expensive. No subsidy from the government, self-empowered. Thus: limited frequency, coverage, and funds.
Incentives for the community radio
No incentive in terms of monetary issues, however, almost 60% of the community radio activities are social contribution to the community-well being (volunteering).

Box 6.2: Results of radio interview: Community Radio 2

Community Radio 2

Respondent
Name: Dadan and Suhendar Setiadi
Designation: General Manager, Broadcaster
Radio: 107.8 FM Rakita Radio Lovely Green Station
Time of Broadcast operation:
Mobile No.: +62-815-7174656, +62-852-28080451
Email: dadan_jilianz@yahoo.co.id
Date of Interviews: 22 July 2013

Special details:
- This community radio is awarded by the Mayor of Bandung City as a community radio that dedicates to environmental protection
- Consider as the learning/example community radio (from KPID)



Focus of 107.8 FM Rakita Radio Lovely Green Station (Background, aim, specialization, target community, penetration level, coverage)
Background: *Established since 2003 but active since 2006. Focused on environmental issues and community, especially in Coblong Sub-district. Power of broadcasting (especially for the community radio) is limited, thus the community radio covers 1 sub-district only. The radius of coverage is limited as well.* Target audience: *All range of ages, all community of Coblong Sub-district (Sadang Serang Ward). This sub-district consisted of many types of community (school, trade, governmental offices). Sub-district and ward government take part in this community radio. A prominent environmental NGO (WALHI) has been a regular guest/counterpart for this community radio.* Penetration level and coverage: *The radius of coverage is not exceeded the range of 3-5 km. Community radio is bound to share the one digit wavelength with other community radios, which broadcast differently than commercial radios (see special issue).*
Covering disaster news and Segmentation news
Generally, environmental issues are packaged in the environmental program of this community radio (Green Generation Time). Natural disasters, including flood are discussed in this program. Floods in Cikapundung, Citarum, as well as flood in this sub-district (Flood in Lebak Gede). This program is broadcasted everyday for 1 hour in the afternoon time. This is a compulsory program and integrated with Community Service Ads (environment, health risk/AIDS, floods, bio pore). This advertisement is originated from an environmental NGO.
Radio gathers the disaster information
This community radio has news contributors (community members), Internet (Bandung City and its developmental issues), Sub-district and Ward Government, neighborhood groups, and Environmental Agency.
Role of community radio in assisting community in following scenarios
a. *Before disaster:* *Information and dissemination of risk and awareness, how to protect and preserve the environment. In general, community radio is divided into three categories (information media/less off-air and much on-air, development media/much off-air and less on-air, politic control to government).* b. *During disaster:* *Convey and disseminate information to where the community can pool their resources to be donated (phone numbers and venue). Coordination logistic issues (foods and goods). A balance of on-and off-air activities. (Bandung Peduli/Bandung Care). Update the disaster situation; although it might that flood event is not occurring in this neighborhood, people can still aware and care about other disaster-affected area.*

c. <u>After disaster:</u> *Discussing about the causes and consequences of flood (reviewing the event) with the affected communities and experts, lessons learned for future prevention.*
Target of audience for disaster risk communication
All ages of group (community of Coblong Sub-district).
Mechanism of conveying risk information to public
Rakita FM is divided into announcer and producer. Seeking the materials for Green Generation Time from Internet, issues that are brought up by communities, or recent big event that influenced the community. The producer makes the script and pass on to the announcer who will broadcast to the community. During making script, the source of information is coming from the experts as well. This script is taken as important, because of the learning and example of the community radio.
Source of disaster information for radio
From the community members (crew of Rakita FM), experts, NGO, Internet
Kinds of disaster risk information
This community radio is focusing on the before the disaster event. What and how to mitigate flood, how to approach the flood risk, what kind of activities that the community can do to prevent and minimize the flood risk.
Validation of the obtained disaster risk information
Crosscheck the information with the ward government. A program that is carried out in wards in Bandung called PNPM Mandiri (Program Nasional Pemberdayaan Masyarakat Mandiri/ Empowerment Community National Program), a subsidy program from national government (houses and roads reconstruction/renovation, business empowerment, sanitation and hygiene). This community radio is included in JRKI (Jaringan Radio Komunitas Indonesia/Indonesian Network of Community Radio) supports this program and is mandated to crosscheck the implementation of this program. Same mechanism as for a disaster event, crosscheck with ward government is crucial and it is supported by 21 neighborhoods in this sub-district. These neighborhood leaders are being interviewed by this community radio to convey their programs and activities in DRR.
Partnership
In general for environmental issues, this community radio is partnering with an environmental NGO (WALHI), Indonesia Green Generation, BKKBN (Agency for Family Planning), Women Commission, JRKI and RAPI (Radio Antar Penduduk Indonesia/Amateur Indonesian Radio among Communities). Gender issues in environmental issues are also being discussed.
Potential of community radio in risk communication (future role)
In general, the Law of Broadcast No. 32/2002 has mentioned about the role and function of community radio in serving the communities. The community that is represented by this community radio is heterogenic, thus can discuss the root causes of a disaster and convey directly to the public. The spot, where no signal can be received (no internet and mobile phone signal), that is where the community radio plays major role in giving people information, together with RAPI (two way of communication).
Barrier/Challenge of community radio in risk communication
The response to community radio in urban areas is low compare to response in rural areas. The level or sense of awareness and belonging of community-to-community radio is decreasing. The challenge would be on how to wrap the news or disaster risk information in an attractive way; hence the response from the community or its impacts can be capitalized in DRR activities.
Incentives for the community radio
No incentive in terms of monetary issues, however, the community radio activities are social contribution to the community-well being (volunteering).

Box 6.3: Results of radio interview: Commercial Radio 1

Commercial Radio 1	
Respondent **Name: Derry Sastrawijaya** **Designation: Music and Program Director** **Radio: 106.7 Mara FM** Time of Broadcast operation: 5am - 12am Mobile No.: +62-852-20027697 Email: derry.sastrawijaya@gmail.com Date of Interviews: 22 July 2013	





Focus of 106.7 Mara FM
(Background, aim, specialization, target community, penetration level, coverage)

Background:
Already 45 years on-air. The focus or specialization of Mara FM is entertainment, then changed to news & talk-based radio (in the 90s, politics were much discussed in that time). Four/five years back, the focus of Mara FM is shifted to music entertainment combined with light news (tagline: city life and music).
Target audience:
Young-adult (20-39 years)
Penetration level and coverage:
The radius of coverage is Bandung City, regencies, and other small satellite cities (Cianjur, Sukabumi, Tasikmalaya). However, Internet streaming enables wider variation of public listen to Mara FM.

Covering disaster news and Segmentation news

Every hour, news or new development/progress is updated to the public. Broadcast to the community the updated news from local, national, even international. For example, flood/inundation in southern part of Bandung City, at the border of city and regency, riverine floods are always occurring every year. In 2012, there was live report onsite due to human casualties. Thus the focus of the discussion was on human loss and the causes of riverine flood. Mara FM has close collaboration with the city and provincial government (West-Java Province) and is able to discuss the why and how it was happened and what are future countermeasures to prevent such flood occurrence (flood disaster risk reduction). But Mara FM more frequently covers the disaster news about human loss and the causes. Special talk show for one hour has not been organized or broadcasted, but during the broadcasting session/music program, short warning messages such as are cautious during the rainy season, intensity of rainfall, and reports from the community about the spots of inundation are always conveyed.
Segmentation news:
Spontaneous/breaking news (if covering on the same day of event), every hour news update, and sometimes (unregularly) invite an NGO to talk about disaster. The NGO was consisted from volunteers and medical doctor. The discussion was about the impacts of flood, thus highlighting the function of city radio: serving the community with information around the city.

Radio gathers the disaster information

Aside from the broadcaster and community experience, the disaster information was also retrieved from the experts from radio's database. Mara FM has the database, containing experts, contact persons from government, academe, NGO and related organizations, disaster practitioners who can enlighten about the disaster. Usually after the disaster events, or after the rumors, those experts were contacted to confirm and review about the disaster event.

Role of commercial radio in assisting community in following scenarios

a. *Before disaster:*
   Issue warnings and invite experts to know the risks, especially during the intense rainy season.
b. *During disaster:*
   Invite the listeners to participate in the charity and donation activities. The charity/donation is in the form of used clothes, goods, foods
c. *After disaster:*
   Invite the experts in the talk show session to discuss about the causes and impacts of a disaster event. Responsive, in terms of monitoring the aids distribution. Community in the disaster affected area called the radio and inform about the lack of support, the radio will transfer that information to the related governmental agencies. Source of experts: government and NGO (volunteer-based) and affected community (confirmed during live report).

Target of audience for disaster risk communication:

This community radio audience is mostly 20-39, however, other community groups from all range of ages listen to the reports and news from the disaster-affected area.

Mechanism of conveying risk information to public:

Receive issues from government and communities, such as Lembang Fault that heighten the earthquake risk in Bandung. The radio confirms this issue to experts from governmental institution (PVMBG/Geological Agency of Indonesia) and crosscheck with the literature review. The program director discusses with the team member and makes a script about the earthquake risk and convey to the listeners on air. The same goes for flood risk; community report to the radio, radio sends a team member to the flood risk area and convey about the flood risk through live report.

Source of disaster information for radio

The community, experts from the radio's database (governmental agencies, NGO/volunteer) and Internet.

Kinds of disaster risk information
▪ *Issues that are related to the occurrence of an event, issues that are attractive to be reported or conveyed to public* ▪ *It should not be exclusive but embedded in the daily programs, which would trigger the awareness of community constantly* ▪ *Especially for a commercial radio, ratings of programs are important, thus it should be news or information that will not sound heavy and burdened the community. It should entertain the listeners as well, such as updating the recent news (the activity of Tangkuban Perahu volcano) with well-know expert (locally and nation-wide)*
Validation of the obtained disaster risk information
News or report from the community, crosscheck with experts (retrieved from radio's database), and later on crosscheck with Internet (literature review). ▪ *Often, radio reporters that are hired by the radio are walking around the city to obtain actual data about disaster risk (mobile reports)*
Partnership
Aside from partnering with the provincial and local government, the radio is also partnering with Australian Radio and VOA. This radio is a PR for the Governor of West-Java Province, but also involved in the city's development progress although a specific partnership is not bounded.
Potential of commercial radio in risk communication (future role)
Recently, conventional radio has decreased in the amount of listeners. A new digital age, such as news from online media, cable TV and data streaming are more favorable by the public. In the future, conventional radio in Indonesia will be taken a form of digital streaming as well. Thus, more people will listen to radio through Internet.
Barrier/Challenge of commercial radio in risk communication
Due to entering the digital era, conventional radio will turn to digital streaming. However, people with low economic status do not have access to Internet. This will limit their disaster knowledge. Another challenge is that local radio will have to compete with international radio, of which their contents in terms of music entertainment are more favorable. Thus local disaster knowledge has to be conveyed and broadcasted in an attractive manner so that it will still trigger listeners' interest. Local news has to be more promoted, such as news on the spot (disaster, accidents, happenings). Thus news that influence people's daily life (local actions global impacts) has a chance to survive in competing with international radio. Local contents are the glue for local people listening to the local radio.
Incentives for the commercial radio
Iklan Layanan Masyarakat (Community Service Spot Advertisement) is the forefront of a commercial radio to serve the community. Business sector has sponsored these Ads in radio (Mineral Water Company, soap and other hygienic products, etc.). The ads such as saving the water, promote tree planting are part of these Ads. Mara FM is growing in Bandung that listened by generations, thus give back to the community (serving the community) is part of their objective

Box 6.4: Results of radio interview: Commercial Radio 2

Commercial Radio 2

Respondent
Name: Indra Gunadi
Designation: Music and Program Director
Radio: Radio K-Lite 107.1 FM Bandung
Time of Broadcast operation: 5am - 12am
Mobile No.:
Email: indra.gunadi@gmail.com
Date of Interviews: 30 July 2013

Special details:
- Function of radio: tickle the local government to do DRR actions







Focus of Radio K-Lite 107.1 FM Bandung
(Background, aim, specialization, target community, penetration level, coverage)

Background:

K-Lite FM is originally a family radio since 1970, and since 1995 the radio is oriented to business professional radio. The name describes the aims of the radio to bring news from Indonesia across the continent. (Kontinental Lintas Komunikasi/Communication Across Continents). These days is possible due to digital era streaming through internet (live streaming). This radio is the site company of Indonesia Telecommunication National Company since 1996. K-Lite radio is supporting the business activities in Bandung.

Target audience:

Young professional business (25-45 years) to give business information to these groups of listeners, embedded in music entertainment and business programs.

Penetration level and coverage:

The radius of coverage is Bandung City and West-Java Province in general, except cities nearby Jakarta.

Covering disaster news and Segmentation news

Regular floods in Cieunteung areas and regular flood/inundation during the rainy season that disrupted the economic activities of Bandung City. Issues that are discussed, i.e. traffic jam due to flood/inundation (not only the volume of vehicles, but the bad condition of roads is discussed as well). In general, when talking or covering disaster news, K-Lite discussed the socio-economic impacts of these floods/inundations (social aspect such as health, improved city operational system, and disaster management planning), which may affect the business activities in Bandung. This information is broadcasted in the daily program of Lite Nite Magazine (9pm – 12 am).

Radio gathers the disaster information

Usually the resource persons in the affected region who are capable to be as the resource persons for this radio (not only the affected person, but people who are obliged and authorized to manage the disaster risk, such as governmental officers) in finding out the impact to economic activities. Since this radio is the site company of the National Telecommunication Company, this radio also gathers information that would have affected the telecommunication business in Bandung and Indonesia (networks, telecommunication infrastructure).

Role of commercial radio in assisting community in following scenarios

a. *Before disaster:*
   Issues warning, persuasive way and announcement and linking the community with related agency (act as mediator, to mediate community and government). What kinds of information that needs to be conveyed to public. This information is segmented daily from 9pm- 12 am (Lite Nite Magazine), where issues such as environmental issues are discussed in and around Bandung to inspire (generate knowledge) the community/public in talking DRR actions (i.e Dompet Dhuafa Program of planting 1000 trees). This radio is promoting Citizen Journalism, where the community itself can be the resource person for the program.
b. *During disaster:*
   Live report (from script) and brought up in Lite News (spontaneous and flash news that is important)/Hit News (entertainment news) segment.
c. *After disaster:*
   Every Monday morning (Morning Review/Dialogue), this radio holds a talk show with provincial and city government to discuss and review on-air, the activities that are conducted by these government. Especially when after a disaster, what kinds of activities have been implemented in pocket slums/disaster prone areas, what kind of countermeasures *need to be done? Coordination with Communication and Information Service Agency. Public can participate in the discussion through live phone call, SMS, Facebook, Email, and Twitter.*

Target of audience for disaster risk communication

Productive age between 25-45 years old, who are doing or having occupation in business sector. CSR of this National Telecommunication Company has been doing DRR activities (CDC/Community Development Center carries out partnership program on environmental management). Budget of 10% is provided for this type of activity.

Mechanism of conveying risk information to public

The radio gives stimulus, or issues that are going to be discussed with the community on-air, to trigger the interest and disaster awareness of community in the form of reports, invite experts from the business sector. Finding out whether, the private sector/industries have a clear SOP/guidance on DRR and what would be their preparedness and impact to business activities.

Report team is provided with materials, then crosscheck in fields, validated, and finally announce to the public

Source of disaster information for radio

Community, rapporteur, experts (business and disaster practitioners), Internet, Company Agenda (Freeport Mining, they have prepared but nature speaks differently), business actors.

Kinds of disaster risk information

Concerned in the business-oriented issues, related to the impacts on economic activities.

Validation of the obtained disaster risk information

From the journalistic point of view, news to be conveyed has to be in balanced (from governmental perspective, community perspective) → educating people while entertaining.

Partnership

VOA (Voice of America) and Netherlands Radio (once in three months of exchanging the broadcaster), but mainly with provincial and city government. With Dompet Dhuafa (Islamic Empowerment) Program (Planting 1000 Trees) on how to live in peace and harmony with nature. Mosque needs to provide the Muslims clean water to perform the cleansing prior prayer. Trees help to conserve water, thus every student of the mosque is doing a campaign to plant trees in replacing the diminishing ones. This Community Service Ads is broadcasted 20-30 times/day.

Potential of commercial radio in risk communication (future role)
This radio provides education/knowledge to the public, especially providing education to disaster. Network of radio in cities or across region will strengthen the DRR. Having only an audio feature that run from morning till late night, it will motivate and inspire people to do DRR.
Barrier/Challenge of commercial radio in risk communication
The barrier or challenge that is posed to radio in risk communication has to be transformed into an opportunity, opportunity to contribute more to public in providing and promoting DRR. Having only an audio characteristic, it is a challenge to find new method in conveying this information to the public in attractive manner.
Incentives for the commercial radio
K-Lite is not only focusing on business and revenue, but radio carries also social function and public control as serving the community. Main goal is to educate people while entertaining.

Box 6.5: Results of radio interview: Campus-based Radio

Campus-Based Radio	
Respondent **Name: Aliffia Arrahman** **Designation: General Manager** **Radio: 107.9 8EH-ITB** Time of Broadcast operation: undefined (11am – 10pm), usually during the holiday season, it is only for 2 hours on-air and adjusted according to the Mobile No.: Email: aliffia.arrahman@gmail.com Date of Interviews: 30 July 2013	
Focus of 107.9 8EH-ITB **(Background, aim, specialization, target community, penetration level, coverage)**	
Background: *This campus-based radio already existed for 50 years. Before campus-based radio, it was commercial radio, since 1963, focusing more to the revolution and democracy news. Vacuum time was spotted after 1960s the army entered the campus and put student activities on hold. There is an initiative in 1999 from the ITB's President to IRTB's Alumni in re-opening this radio, and it was on-air again in January 2001 focusing on student activities (on news) and few headlines on Bandung and nation-wide condition. All the students (who are involved) now manage the radio. In financial terms, the radio got the funding from ITB and also the students put aside the income from doing MCs for campus-purposes.* *Target audience:* *All ITB's stakeholders (students, lecturers, ITBs officers) and surrounding community.* *Penetration level and coverage:* *Signal is only received in ITB campus, Dago and Tamansari Street.*	
Covering disaster news and Segmentation news	
So far, this campus-based radio has only conveyed the disaster information not in-depth, usually in issuing warnings during inundation. When broadcasted this news, usually in the afternoon time (11am – 2 pm) *In future, more in-depth discussion will be organized, since students inhibit potentials in involving/participating in DRR activities.*	
Radio gathers the disaster information	
Sometimes, live events and seeing from the newspaper headlines in Internet. Online media are now growing and increased in terms of news volume, frequency and intensity.	
Role of campus-based radio in assisting community in following scenarios	
a. *Before disaster:* *Not yet a real preventive actions, not real warnings or persuasive manners → source of information is lacking (although located in front of center of disaster mitigation). Future plan, news contributors will be recruited, enriched source of information and evaluation of ITB facilities for disaster management (shelters, water and sewage treatment, rainwater harvesting).* b. *During disaster:* *Informing of pooling resources for donation and charity. Inform where, when, and how ITB communities can give their donation to be ITB Student Committee.* c. *After disaster:* *Have not involved yet in any post-disaster activities, because none has been occurred, but in the future this campus-based radio will take part in enhancing community resilience, especially who live near ITB campus.*	

Target of audience for disaster risk communication
Students, lecturers, ITB's officers and surrounding community who can receive signal or free stream this campus-based radio.
Mechanism of conveying risk information to public
Five W and one H. Script are also made to convey news to listeners. Headlines news was retrieved from newspaper and Media online to raise awareness and care and motivator to other young people (other students).
Source of disaster information for radio
Newspaper, Internet, and happenings from the student activities. Interviewing or taking ITB's lecturers as resource person have not been conducted.
Kinds of disaster risk information
Focusing on the disaster event itself, less on human loss, except for the total number of loss. It discussed on how are the impacts of those disasters.
Validation of the obtained disaster risk information
First hand news from student association, community and newspaper (media online) that are credible and trustworthy to public (Kompas, PR, SINDO). But have not confirmed with ITB experts (lecturers).
Partnership
Partnership in terms of disaster, this campus-based radio has not been partnering with any stakeholder. However, they have a strong collaboration network with other campus-based radio (in economic activities). So, far in Bandung City they are 15-17 campus-based radio and at this stage, these campus-based radio are working together on legalizing their existence (update permission to be on-air from the Broadcasting Authority). Based on this interview, this campus-based radio is inspired to close and discuss with their campus-based radio network in disaster issues in uniting their vision and mission.
Potential of campus-based radio in risk communication (future role)
The campus-based radio would like to lead, especially for the surrounding community in issuing warnings and informed them about the causes and impacts. Off-air activities in and around campus are desire to be more implemented in terms of DRR activities, especially in covering news of the DRR activities of youth unions around ITB campus.
Barrier/Challenge of campus-based radio in risk communication
How to create programs that is creative and innovative and so far only focusing on students' activities, thus disaster issues are not touched and discussed in depth and in detail. This campus-based radio has the desired to fully discuss the disaster issue in depth and in detail starting from why and how the solution will be.
Incentives for the campus-based radio
Aside from reporting student activities, programs that reunite the multi-cultural background of ITB students and communities are in place and organized, thus preserving a conducive condition among the students. Incentives from the community have not yet been felt, since this campus-based radio has not touched directly community issues in disasters.

Box 6.6: Results of newspaper interview: Newspaper 1

Newspaper 1	
Respondent **Name: Yeni Siti Apriani** **Designation: Journalist** **(Education and Government Issue)** **Radio: Gala Media** Circulation: 15,000 exemplars Mobile No.: +62-815-6152891 Email: yeni1595@gmail.com Date of Interviews: 17 July 2013	
Focus of Gala Media **(Background, aim, specialization, target community, penetration level, coverage)**	
Background: *Focus of Gala Media is the news around Great Bandung (Bandung City and its satellite/neighboring cities such as Cimahi City, Bandung Regency - Western and Eastern Part). General news (government, politic, sport, etc.)* *Target audience:* *Community from middle until high-class.* *Coverage:* *Great Bandung (Bandung City and its satellite/neighboring cities such as Cimahi City, Bandung Regency - Western and Eastern Part).*	

Covering disaster news and Segmentation news

If disaster occurs, then Gala Media will cover the news, however, prior an event, for example in the beginning and during the rainy season, Gala Media will inform the public about things to be considered and take precautions in preparing for the rainy season. This information is the same from year to year, however, community tend to forget and Gala Media is reviewing this to remind and make public aware about flood risk preparedness, from the health and environmental perspective. This news is included in special edition (page 1, headline, for example about health, with health experts).
If a major disaster occurs: news about why and how it was happened, what was the cause of this disaster, who are affected, how was the emergency response. Day 2, about the affected communities. Day 3, about the response from different stakeholder.

Radio gathers the disaster information

Gala Media gathers the disaster information from governmental agency (BMKG/special case, PVMBG/mitigation issues, BPBD of West-Java/disaster management to be interviewed).
Gala Media has their own expert database, whom to call if it needs clarification.

Role of newspaper in assisting community in following scenarios

a. *Before disaster:*
   Interviewed the Health Agency about what kind of things that community needs to be prepared in entering the rainy season. Reviewed the 3M (Menguras, Menutup, Mengubur) in cleaning the drainage system to prevent dengue fever and revitalize the Friday Cleaning Day in neighborhoods.

b. *During disaster:*
   Direct report on the spot, interviewed the affected communities, confirmed with experts on the cause and how it happened, contact governmental agency for the emergency response efforts undertaken.
   Expert: how and why it happened
   Government: emergency response (support and distribution of aids)
c. *After disaster:*
   Inform the community about the important contact of rehabilitation process, who are in charged. Gala Media also reports about the recovery process, keeping the community updated about the whole process

Target of audience for disaster risk communication

Disaster affected community and general public (Gala Media has the online version). For example, Gala Media has covered Eastern Part of Bandung City, automatically the news withdraw community who live on that area, the same goes for other part and communities as well. Thus the audience for Gala Media can relate themselves with the region's news.

Mechanism of conveying risk information to public

Aside from the printed version, for quicker uploading and access the news through Gala Media online version, which updated every day. It can be accessed everywhere. People are subscribed to Gala Media.

Source of disaster information for newspaper

Local government agencies, PVMBG, BMKG, experts (academe), community (neighborhoods and households) can be the source of information for Gala Media.

Kinds of disaster risk information

A special theme or topic about the disaster risk that talks and discusses one particular disaster from every aspect and angle (socio-economic, local governance, efforts, mitigation, prevention, preparedness, recovery, development and sustainability).

Validation of the obtained disaster risk information

Gala Media raises an issue of a special theme (i.e. Scarcity of Water Resources) → contacts the authorized local agency that is in charge and responsible, contact the community in the affected area, news is verified and has a proportion of balance between the authority (undertaken actions) and community (coping mechanism). Everyday, Gala Media serves different theme to the public that are linked to each topic.

Partnership

Aside from Gala Media raise public awareness in the newspaper about flood/inundation risk, Community Service Ads (Health Agency) is conveyed about the risk of dengue fever (KLB: Kejadian Luar Biasa/Extraordinary event). Bio pore campaign by the Women Welfare Associations is taken the form as the news not as the Ads.

Potential of newspaper in risk communication (future role)

Gala Media as part of printed media is highlighting its role in conveying the information in before the disaster event. More news/information has to be shared as much as possible in making people aware of disaster risks. By generating disaster risk knowledge will trigger people to undertake proper DRR actions.

Barrier/Challenge of newspaper in risk communication

Source of information (experts, government, etc.) are difficult to be contacted and interviewed, assuming that the information are properly conveyed. First-hand source of information are crucial part and modality of newspaper in conveying the right information to the public (not as HOAX).

Incentives for the newspaper in risk communication

Social role, function, and responsibility (social spirit) in supporting the community by conveying appropriate information; hence increased community's welfare and resilience (covering the news about the disaster affected areas made the local government/agencies and other communities are triggered in giving their support, such as improvement of facilities and infrastructure, donation and charity, etc.).
Advertisement, including Community Service Ads is the major source of income for Gala Media.

Box 6.7: Results of newspaper interview: Newspaper 2

Newspaper 2

Respondent
Name: Endah Asih
Designation: Journalist (Social and Political issues)
Radio: Pikiran Rakyat
Circulation: approximately 25,000 exemplars
Mobile No.: +62-811-2213345
Email: endah.asih@yahoo.com
Date of Interviews: 17 July 2013



Focus of Pikiran Rakyat
(Background, aim, specialization, target community, penetration level, coverage)

Background:
Pikiran Rakyat (PR) is the most prominent and respected newspaper since 1966 for Bandung and its vicinity. Currently, PR is expanded its coverage to West-Java Province. PR covers variety of news, focusing on social issues (education, economy, and employment), governmental and political issues as well as entertainment as printed the sport news, culture, women, science and technology, and children, which was given periodically to the public as supplementary pages. PR has maintained high quality of news (actual and accurate, trustworthy, high quality printing), therefore the retail price is above the average.
Target audience:
Community at the middle to high-class (from elementary school children-adults)
Coverage:
Bandung City and West-Java Province

Covering disaster news and Segmentation news

Have been experiencing in covering disaster news (in Bandung City as well outside Bandung City) in terms of disaster affected (human and economic loss, area), its causes and impacts, prevention, emergency response, rehabilitation and future mitigation. The disaster news is not printed in a special segment, usually as the today's headline, if it is a major disaster. But if the disaster occurs in Bandung City, the news is printed in Bandung Page, if it occurs outside Bandung City but still in West-Java Province, the news is printed in West-Java Page.
Radio gathers the disaster information:
Information are gathered through interviews, especially with the disaster-affected communities (obtain first-hand updates, news, experience), direct observation to disaster location (crosscheck news with local government/sub-districts, wards), confirm with experts (academe), and Spatial and Development Planning Agency.

Role of newspaper radio in assisting community in following scenarios

a. *Before disaster:*
   Confirming the warning issues and minimize the community's panic attack. For example, Guntur volcano will erupt in three days; PR contributes to generate the knowledge and raise people's awareness without making the public panic.
b. *During disaster:*
   Direct observation and analyzing the event in the field with experts. Day-1: teams are sent to do interviews with disaster affected and taking more pictures with uncomplicated captions to contribute to newspaper as graphical analysis representation. Day-2: live reports and first hand news are written and shared to the public. Day-3: more to analyzing the causes and impacts, resource persons such as experts, government, etc. as the source of information.
c. *After disaster:*
   Observation of the reconstruction and recovery process, news is shared to public. PR has the CSR and it organizes the public/readers in giving support, aids to disaster-affected communities and the news is covered transparently.

Target of audience for disaster risk communication

All communities in Bandung and West-Java Province (disaster and non-disaster affected communities). The neighboring regions will be more aware to disaster risks and enhanced their disaster preparedness.

Mechanism of conveying risk information to public

Crosscheck the information to the disaster risk areas, confirm with the resource persons (experts). Describing the news/information as accurate and detailed as possible with recent data and facts. Aside from printing the news, updating the information in PR Media Online. However, the printed version serves more in depth and detailed than the PR Media Online version.

Source of disaster information for newspaper
Communities (disaster-affected), CBSOSs (WWAs, YUs, FBOs), local government (city, sub-district, ward), governmental agencies, experts (academe, disaster practitioners), NGOs and, Volunteer Groups.
Kinds of disaster risk information
Expert: Natural phenomenon of a disaster (causes and impacts) *Government: Governmental efforts and support* *Community: disaster loss (human and economic)* *NGO: DRR and recovery activities in supporting community*
Validation of the obtained disaster risk information
Crosschecking to all the resource persons and direct observation in the field.
Partnership
Close collaboration with Bandung City Government (Citarum River Forum), Health Agency, CSR of PR, NGO in covering the news about their DRR activities. Especially the Program of Bandung Green and Clean PR has collaboration with the WWAs.
Potential of newspaper in risk communication (future role)
PR has a massive role, being the foremost and prominent printed media in West-Java Province. Furthermore, West-Java Province is declared by the BNPB (National Agency for Disaster Management) as one of the top-5 disaster prone region of Indonesia. Thus newspaper (PR) contributes to the increased disaster knowledge of Bandung's citizen and West-Java's communities, being the most populated Province in Indonesia. Printed media will not only generate knowledge but also reach remote people who do not have access to Internet and electronic media (Radio and TV).
Barrier/Challenge of newspaper in risk communication
In communicating the risk of bigger disaster scenario (Mega Disaster), sufficient amount of qualified human resources, which have to cover and write the risk information to the public in appropriate manner (right to the target and aims, generate knowledge, trigger interest and desire to take preventive/mitigate/risk reduction actions). Most of the journalist are not aware and lack of knowledge in writing and reporting news about disasters and associate risks. What and how is the SOP (Standard Operational Procedure) in sharing disaster risk information? If it is not taken into account properly, it will generate mass panic. *The basic questions that need to be fulfilled are as follow:* ▪ *How to serve the public with up to date, actual and trustworthy information* ▪ *How to educate journalists in writing disaster risk information* ▪ *How to maintain the level of quality*
Incentives for the newspaper in risk communication
PR inhibits social function in the community as being the mediator between news sender (i.e. government) and news receiver (i.e. community). Reporting and writing news about disaster and associate risks are not bringing significant economic income to the newspaper (aside from the increased total number of sold exemplars).

Box 6.8: Results of television interview: Television 1

Television 1	
Respondent **Name: M. Sanif and Sugianto Haddy Prayitno** **Designation: Head of Business Section and Head of News** **Television: TVRI Jabar** Mobile No.: +62-821-1544464 and +62-818-02658269 Email: sanif_tvri@yahoo.com and sugiyantohadi@yahoo.com Date of Interviews: 25 July 2013	
Focus of TVRI Jabar **(Background, aim, specialization, target community, penetration level, coverage)**	
Background: *TVRI Jabar is established in … and is focusing on the regional news of West-Java Province. Documentary pieces have been developed in raising variety of issues (social, economic, politics, lifestyle, education, science and technology, women and children, etc.), issues that are relevant to people's daily life. TVRI Jabar is a national television company.* *Target audience:* *All ages* *Coverage:* *TVRI Jabar broadcast the news, which can be received in 27 cities and regencies in West-Java Province, including Bandung City.*	

Covering disaster news and Segmentation news
TVRI Jabar so far has covered the news about landslides and floods. With 18 news contributors that are hired by TVRI Jabar (some with journalistic skill, including writing and taking/recording pictures and video/audiovisual skill), news about disaster is shared with the public. *BPBD (Local Disaster Management Agency) of West-Java Province has together with TVRI Jabar developed a short documentary feature (running for 2 months) for disaster simulation.* *If a disaster occurs, TVRI Jabar reported the events (occurrence and impacts). The portion of the disaster news would be ¾ for the events and ¼ for the impacts.*
Television gathers the disaster information
TVRI Jabar gathers the information from BPBD (Local Disaster Management Agency) of West-Java Province, freelance contributors (streaming news through laptop), media network, experts, and communities.
Role of television in assisting community in following scenarios
a. *Before disaster:* *Disaster risk information dissemination as widely as possible. Held a talk show: Forum Kita (Our Forum) and discussed what would be the impacts (damages and consequences). In this Forum session, usually 3 key guests are invited (one executive, one legislative, and one expert)* b. *During disaster:* *Covering the news about the event and its momentum* c. *After disaster:* *Inform the community about the concern and needs of the disaster-affected communities, what the authority or other stakeholders have done so far in supporting the disaster-affected people.* *Target of audience for disaster risk communication:* ▪ *Afternoon session (education part, simulation from short BPBD' feature) for children and youth* ▪ *Evening session (talk show during the evening prime time) for adults*
Mechanism of conveying risk information to public
▪ *TVRI Jabar have own database of experts, whom they can be contacted for any clarification related to disaster and risks.* ▪ *Gather information from the news contributors, crosscheck in the field, confirmed with experts and discussed with program producer and team to evaluate what is on and what it is off the news, and then create a program out of it.*
Source of disaster information for television
Disaster affected communities (from news contributors), experts, local government, governmental agencies (BPBD, BMKG, etc.), NGOs, media network, and Internet.
Kinds of disaster risk information
Aside from reporting the occurrence for disaster event itself and how are the efforts from the local authority and community in managing disaster situation as the lessons learned for the audience, TVRI Jabar is also focusing on the preparedness and mitigation efforts, such as informing the public on the importance of knowing the own situation better and urged the community to prepare personally their own preparation.
Validation of the obtained disaster risk information
The gathered facts are crosschecked with the experts before broadcast to the public. Television should not have the opinion but convey the facts and truths about issues that are discussed.
Partnership
Close collaboration with BPBD in broadcasting disaster preparedness Community Service Ads (3 – 4 times/day).
Potential of television in risk communication (future role)
Television as part of Public Broadcasting Agency has the advantage of quick audiovisual ability response. This has to be optimized and explore widely on how the risk communication can be conveyed and visualized in most attractive and innovative way. It should involve the public to interact in discussing disaster risk issues from top to bottom (root causes, impacts, and counter/mitigation/risk reduction measures).
Barrier/Challenge of television in risk communication
Technical equipment of TVRI Jabar is old; some of the hardware already dated more than 15 years back. Lack of budget and funding, although it is a National Television Company, is one of major barrier of TVRI Jabar doing its activities. Competition with private television companies, which have modern technology and have a young and innovative team in making attractive programs, is a big challenge for TVRI Jabar in carrying out/fulfill its duties to the public.
Incentives for television in risk communication
TVRI Jabar bears responsible to educate public, without putting much focus of not commercializing the information.

Box 6.9: Results of television interviews: Television 2

Television 2

Respondent
Name: Ari Sutrisno
Designation: General Manager
Television: PJTV (Paris Van Java TV)
Mobile No.: +62-856-2013489
Email: saya_ari@yahoo.co.id
Date of Interviews: 30 July 2013

Special details:

- The location of PJTV station is next to BPBD office
- Conducted lots of off-air activities that involved youth and Youth Unions of Bandung City







Focus of PJTV
(Background, aim, specialization, target community, penetration level, coverage)

Background:
PJTV is established as local TV of Bandung City, part of Jawa Pos and Radar TV with the aims of giving a local flavor for Bandung citizen. It is a family focused television with family-friendly programs around the clock (6am – 12 am). PJTV is also considered as youth television. Having youth staffs and closely collaborated with Youth Unions and TAGANA of Bandung City in bringing up youth's topic.
Target audience:
All ages, families
Coverage:
Bandung City and neighboring cities.

Covering disaster news and Segmentation news

Disaster news is segmented in breaking news session and also in the form of talk show (Simpang Beraga/Variety Point) as BPBD as the main resource persons. Focusing on disaster awareness, especially of flood risk.

Television gathers the disaster information

Information is gathered through the inputs from the communities (calling up PJTV), BPBD, Cleaning and Waste Agency, Spatial Planning and Development Agency, Public Works.

Role of television in assisting community in following scenarios

a. *Before disaster:*
Since 4 years ago, PJTV has a youth program called "Bandung Weekly", every Saturdays (6.30 am – 8 am) in broadcasting disaster simulation and exercise with BPBD. Thus, more materials for disaster awareness and preparedness.

b. *During disaster:*
Organizing a charity committee by on-air as well as off-air activities, live report and observation for breaking news session.

c. *After disaster:*
Mostly on-air activities, such as 1-hour talk-show by inviting experts and stakeholders in discussing the events (causes and impacts), mostly flash-back on what has happened.

Target of audience for disaster risk communication

All ages

Mechanism of conveying risk information to public

PJTV in conveying/broadcasting risk information to public by talk-show ("Simpang Beraga"), simulation ("Bandung Weekly") and Live Reports.

Source of disaster information for television

Major source of disaster information is BPBD, however local government, governmental agencies, NGO, YUs, TAGANA, and the communities are as well the sources of information of PJTV.

Kinds of disaster risk information
All kinds of risk information, such as: root causes, vulnerabilities, hazard-prone areas, increased phenomenon, preventive actions and countermeasures, coping capacity of people/community.
Validation of the obtained disaster risk information
News or information is handed over to the editor, then editor will approve or disapprove the information, if approved, script with audiovisual will be made, share with program producer for final improvement and approval before broadcasting to public.
Partnership
Close collaboration with BPBD, Communication and Service Agency, YUs, TAGANA, and Leading Environmental NGO (WALHI) in conducting the on-air and off-air programs.
Potential of television in risk communication (future role)
▪ *PJTV sees that the television can be as media partner of government (authority) and communities. Educating and showing public appropriate information will trigger them to take part in protecting the environment and minimizing the disaster risks* ▪ *Funding is not an issue in preventing the television to make a good quality program. Off-air activities can be an alternative in educating and triggering people to act* ▪ *Using social media such as Twitter to spread about off-air activities has been proven effective*
Barrier/Challenge of television in risk communication
Facing the global era, youth are more critical to what is happening. The challenge of PJTV would be how to be more creative in making programs/shows/activities that will trigger the youth to participate in DRR and care about the socio-economic, and environmental issues. How to increase the awareness of community/household/families' preparedness is also a challenge.
Incentives for the television in risk communication
Without neglecting the incentives of PJTV in monetary terms, PJTV has social responsibility as being the local TV in Bandung. PJTV has put the local contents as the forefront and would carry on for the next years. Informing the public about what is all around happening in Bandung City, including disaster and associate risks is weighted more than the revenue or income.

To summarize the findings, Table 6.2 illustrates the results of serial interviews with media, in terms of their level of partnership, nature of information, source of information, the impact of disaster risk information coverage, potentials, and challenges of media in risk communication in Bandung.

In terms of partnership, the interviewed media collaborate with local government agencies, such as *PVMBG, BMKG Kota Bandung, BPBD Jawa Barat*, *Diskominfo*. These institutions are directly involved in disaster risk communication process in Bandung. For example, *PVMBG* is the National Geological Agency for Volcanology and Disaster Mitigation Center, *BMKG* is the Meteorological, Climatology, and Geophysical Agency of Bandung, *BPBD* is the Local Agency for Disaster Management of West Java Province, and *Diskominfo* is the Communication and Information Service Agency of Bandung. This implies that media in Bandung are already aware of the importance of risk communication by engaging the appropriate partners from the government. Thus, the media is linking with experts' society and increased the level of trust. Moreover, the CBSOs such as WWAs and YUs/TAGANA are engaged with media, thus highlighting the results of the study of risk communication process by the CBSOs in Chapter 5 and 6 and confirms that CBSOs plays crucial role in risk communication. Other stakeholders, such as private companies, experts from the academe, and non-organizations/volunteer organizations are associated in risk communication, therefore they manifest their contribution stronger in DRR of Bandung.

In terms of the nature of information, most of the disaster news can be classified in before, during, and after disaster period. The interviewed media contribute warnings and preparedness information to the public before a disaster. For example, issuing

warning and cautions (from weather forecast) entering the rainy season and interview experts for disaster risk (health risk, i.e. dengue fever), writing news about reminding community in revitalizing community collaboration spirit *(Friday Cleaning Activity)* are conveyed to people. During a disaster, usually, the media conduct charity events on-air such as conveying where and when to donate and off-air, such us fund raising activities. And after a disaster, the interviewed media are reviewing the event, such as holding discussion forum and talk show, and writing article about the causes and impacts of the occurred event.

In addition, post-disaster updates are transmitted to public, such as inform communities about the disaster recovery process in the form of articles, radio/TV program, and/or (audio) graphical presentation of the recovery process (Commercial Radio 1, Commercial Radio 2, and Television 1). Community radio contributes to more localized news, bringing up themes and topics that are closely linked with inhabitants in particular sub-district and wards (Community Radio 2). Consequently, newspaper reporters, broadcasters and news agencies/anchors play crucial role in promoting DRR before and after a disaster. Coupled with strong involvement of government and communities' groups, media has the power of change (Figure 6.1).

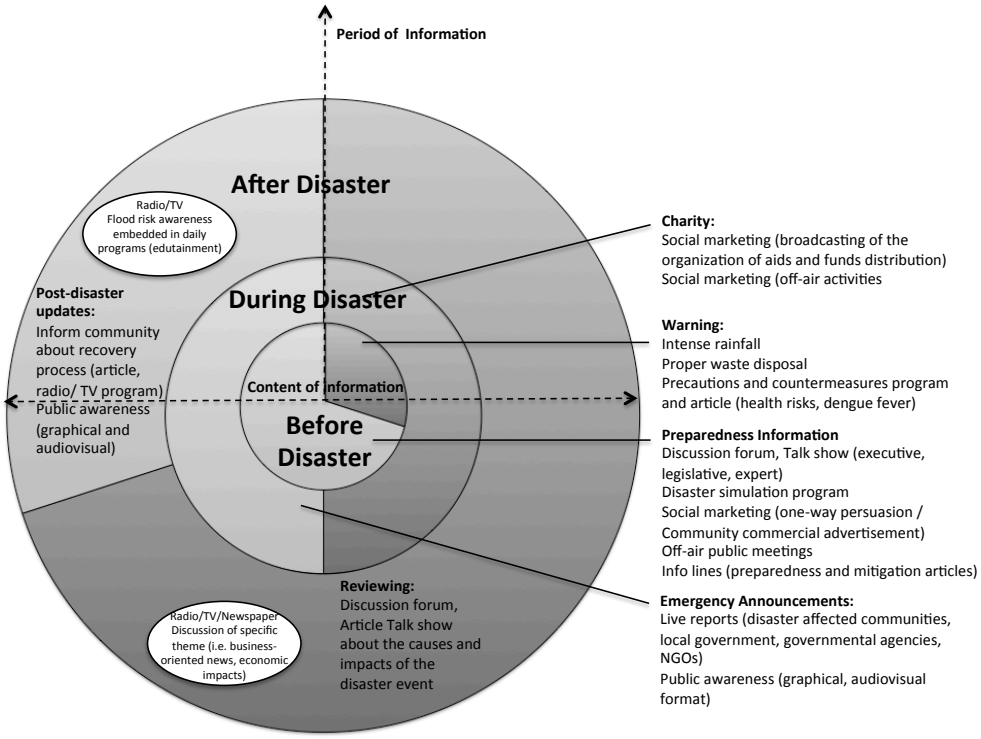
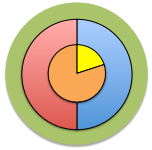
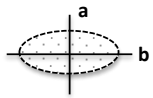
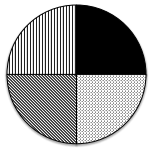
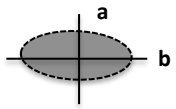
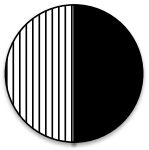
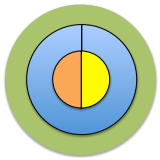
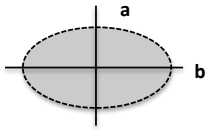
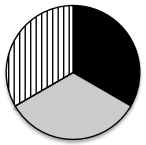
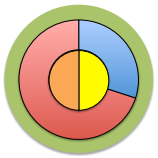
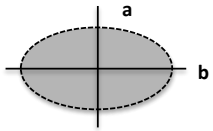
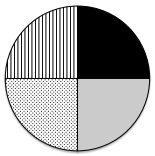
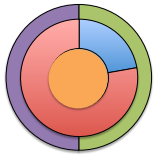
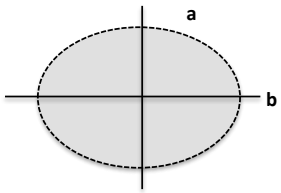
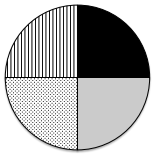
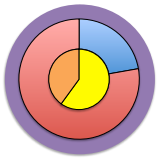
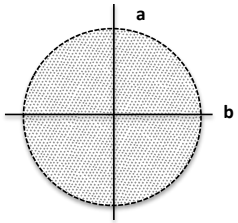
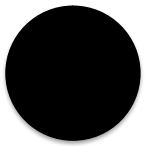
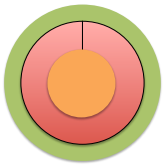
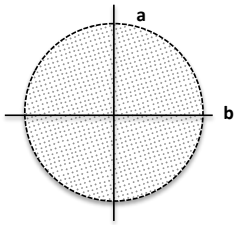
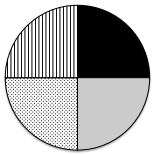
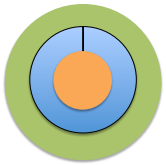
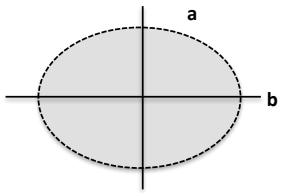


Figure 6.1: Contribution of media in Bandung in disaster risk information

Table 6.2: Characteristics of media in risk communication in Bandung

Types of Media	Level of Partnership	Nature Of Information	Source of Information	Impact of disaster risk information coverage	Potentials in Risk Communication	Challenges in Risk Communication
CR 1			Students (personal Facebook), governmental Facebook Page (BMKG), Internet		Obtaining more trust (High reliability)	Limited frequency, coverage, power, and funds
CR 2			Community members (particular sub-district), community radio crew, experts, NGO, Internet		Heterogenic community (discuss wide variety of disaster risk issues), intervention where no internet and mobile phone signal available	Low community's response in urban than in rural area, wrap disaster risk information as attractive as possible
CPR	NA	NA	NA	NA	NA	NA
R 1			Community, experts (radio database: governmental agencies, NGO / volunteer), Internet		Utilizing live digital streaming	Live digital streaming vs. low economy status (limit disaster risk knowledge), live digital streaming vs. international competition (less people listen local content)
R 2			Community, experts (business and disaster practitioners), Internet, Company CSR Agenda		Collaboration with radio network widely dissemination, educate, and inspire people	Conveying with only audio characteristic requires innovative and breakthrough idea in promoting disaster risk knowledge
NWSP 1			Community (and disaster affected community), governmental agencies (PVMBG, BMKG), experts (academe)		Printing bigger proportion of risk awareness (disaster risk knowledge)	The source of information (first-hand from experts' interviews) difficult to retrieve

Types of Media	Level of Partnership	Nature Of Information	Source of Information	Impact of disaster risk information coverage	Potentials in Risk Communication	Challenges in Risk Communication
NWSP 2			Community (and disaster affected community), CBSOs (WWAs, YUs, FBOs), local government (city, sub-district, ward), governmental agencies *(PVMBG, BMKG, Diskominfo),* experts (academe, disaster practitioners), NGOs, volunteer groups		Covering local news as much as possible that relate with local communities as lessons learned and generate knowledge	How to serve the public with up to date information, to educate journalists in writing disaster risk information, maintain the level of quality
TV 1			News contributors, disaster affected community, experts (academe), local government (city / regency, sub-district, ward / village), governmental agencies *(BPBD, BMKG),* NGOs, media network, Internet		Quick audiovisual ability response that will trigger people to act	Old equipment and hardware, budget and funding, national television vs. private company
TV 2			Community, governmental agencies *(BPBD),* CBSO (YUs, TAGANA), NGO		Media partner between government and community, off-air activities will trigger much people to act combining with social media (Facebook and Twitter)	Creating a creative, innovative program that trigger young generation to act

Legend:

- **Government**
- **Business Sector**
- **CBSOs**
- **Experts**
- **NGO/Volunteer Organization**

Legend:

Before Disaster
- Warnings
- Preparedness

During Disaster
- Charity
- Emergency Announcement

After Disaster
- Reviewing the event
- Post-disaster updates

Legend:

a-axis: the area of coverage

b-axis: coverage of disaster contents

The information that the interviewed media obtain are originated from various sources (illustrated in horizontal axis in Figure 6.2), such as from the community, live observation on the spot, experts from the government, agencies, and academes of Bandung, Internet, other regional media such as online news, and local publication (Figure 6.2). The sources of information are grouped into two categories, namely primary source and secondary source. These sources of news are validated before publishing to the public and are illustrated in numbers and arrows in Figure 6.2. It is worth to note that some of media have their own freelance news contributors that drive around city to catch up to date news. It would be idealistic, if these contributors can be optimized in accelerating the communication process in Bandung. The sources and validation flow of information is illustrated in Figure 6.2. The amount of risk information (illustrated in vertical axis) that media received is mostly from the experts and Internet. However, the validation process is initiated when information is received from the community.

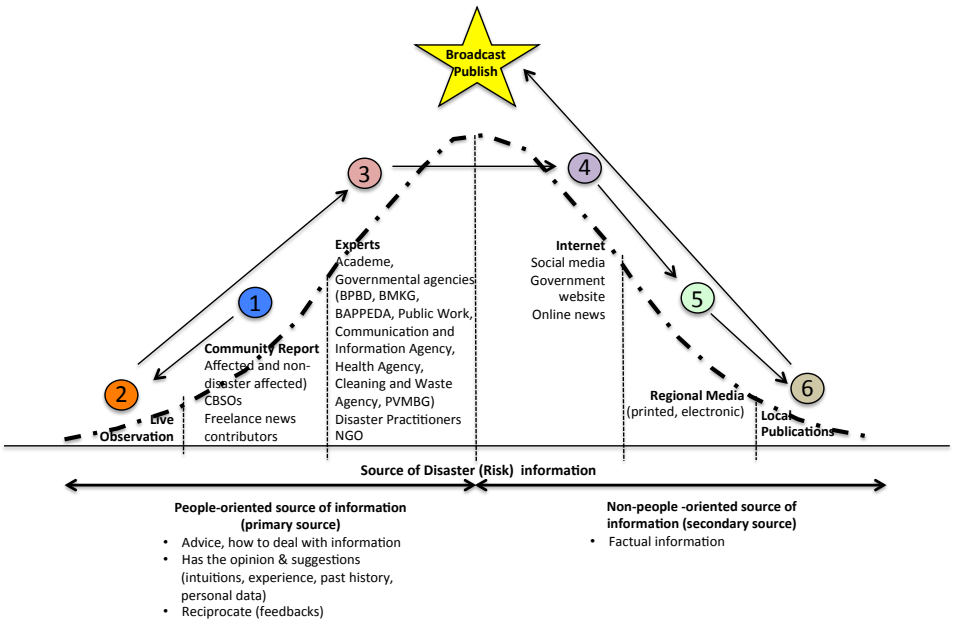


Figure 6.2: Source of disaster risk information and validation process of media in Bandung

In terms of impact of disaster risk information coverage, the interviewed media are identified through their area of coverage (a-axis) and their (wide) variety of disaster (risk) information contents (b-axis) (Table 6.2). The longer the a-axis, the wider the area of coverage of a particular media, and the longer b-axis, the more contents of disaster risk information are inhibited by this media. O'Neill (2004) mentioned that a longstanding challenge in communication is how to target the right message to the right audience. Therefore, audience segmentation is crucial in designing the risk communication program. Consequently, it is important to define the effect of most segmentation approaches to group of audiences and impact of risk messages/information to the public (community: audiences).

According to O'Neill (2004), there are four types of groups of audiences in risk communication, focusing on before the disaster period. These are shown in Table 6.3. Moreover, O'Neill (2004) opined that in many community safety programs, the

audiences have been identified as being on a continuation from risk averse (risk managers) to risk deniers (See also Section 2.5, Chapter 2).

Table 6.3: Proposed approach to segment risk communication audiences

Risk Communication Audience	Characteristic	Target
Risk Averse	Concerned with same hazards as the agency	Target this group with hazard-specific information and messages and focus on how they can message their response to the risk (i.e. what to do in a flood).
Risk Tolerant	Concerned about general family safety	Target this group with non-hazard specific safety initiatives (i.e. what to do in an emergency). Potential for joint agency partnership using the Safe Community approach.
	Ambivalent about the hazard of the effect on them	Target this group with general information about the hazard. Highlight the risk from the hazard and how it will affect their family.
Risk Deniers	Denies that the hazard will likely to occur or that it will affect them	Target this group with the message that builds the credibility and authority of the agency.
Risk Seekers	Sees a disaster as an opportunity to become involved in rescues efforts of to pursue their interest	During the event, warn of the dangers and penalties for interfering with the work of the emergency agencies. After the event, target with specific messages relating to safety for individuals and families.

Source: O'Neill (2004)

Therefore, based on the theoretical approach of O'Neill (2004), the author attempts to apply this approach to sketch the risk communication model of the interviewed media in Bandung (Figure 6.3). The model is a vortex-based shape and has no mathematical basis. It has the purpose to illustrate the point of O'Neill (2004) and Kent et al. (2000), by assuming a different motivation level of risk communication, based on area of coverage (a-axis) and their (wide) variety of disaster (risk) information contents (b-axis). In this model, the campus-based radio is not included, since no involvement in risk communication process based on the interview.

In terms of potential and challenges of risk communication, undoubtedly the interviewed media in Bandung face various issues in the communication process, as can be seen earlier in Table 6.2. Modern technology, such as digital streaming and quick audio-visual ability of responding made the media easy to access by the public. Media has the power of change through its advantage by triggering the public knowledge and desire to act, as well as promoting the DRR actions. Moreover, partnering with stakeholders, such as government, NGOs, and CBSOs will strengthen the risk communication process. However, despite the potentials, media pose some challenges such as for example, limited access to digital streaming, and audio characteristic only, requires a breakthrough innovation to promote more DRR actions. Figure 6.4 summarizes the potentials and challenges of the interviewed media in Bandung, plotted in the risk communication model, based on Figure 6.3. The campus-based radio (CPR) is not inserted in the model in Figure 6.3 nor in Figure 6.4 due to their abstinent in the current risk communication process. However, risk communication will be integrated in their program, as their future plan, based on the interview (see Box 6.5).

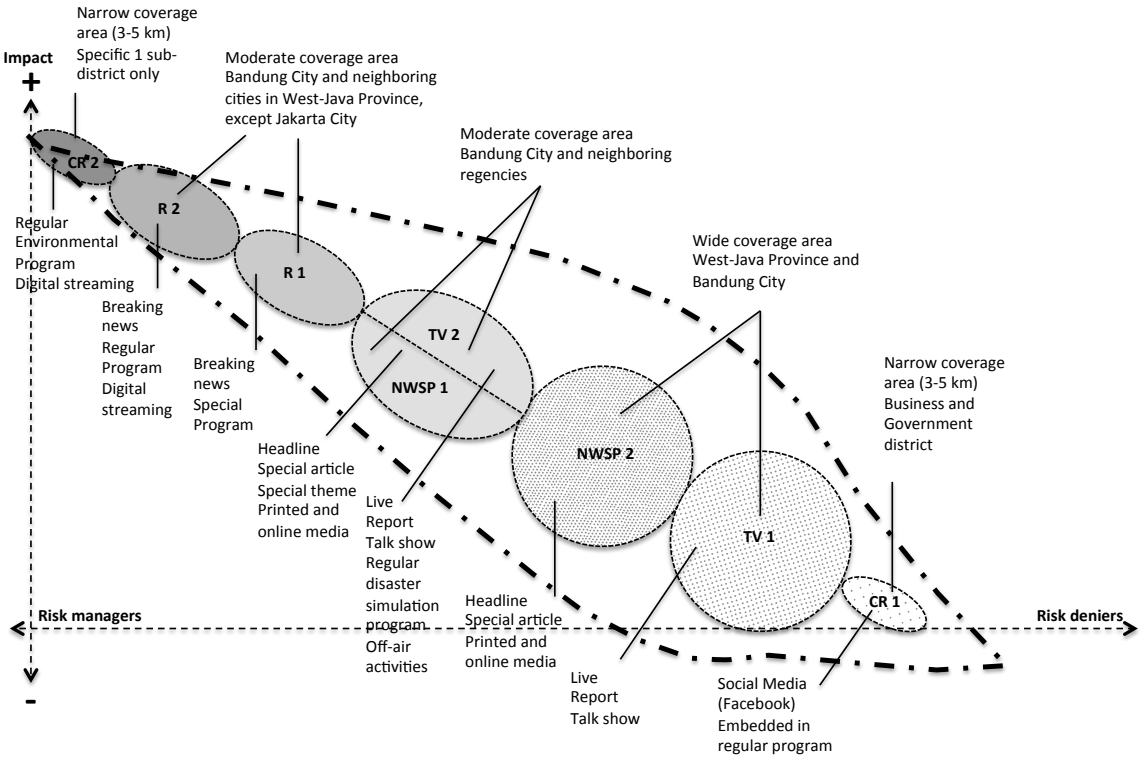


Figure 6.3: The risk communication model of the interviewed media in Bandung

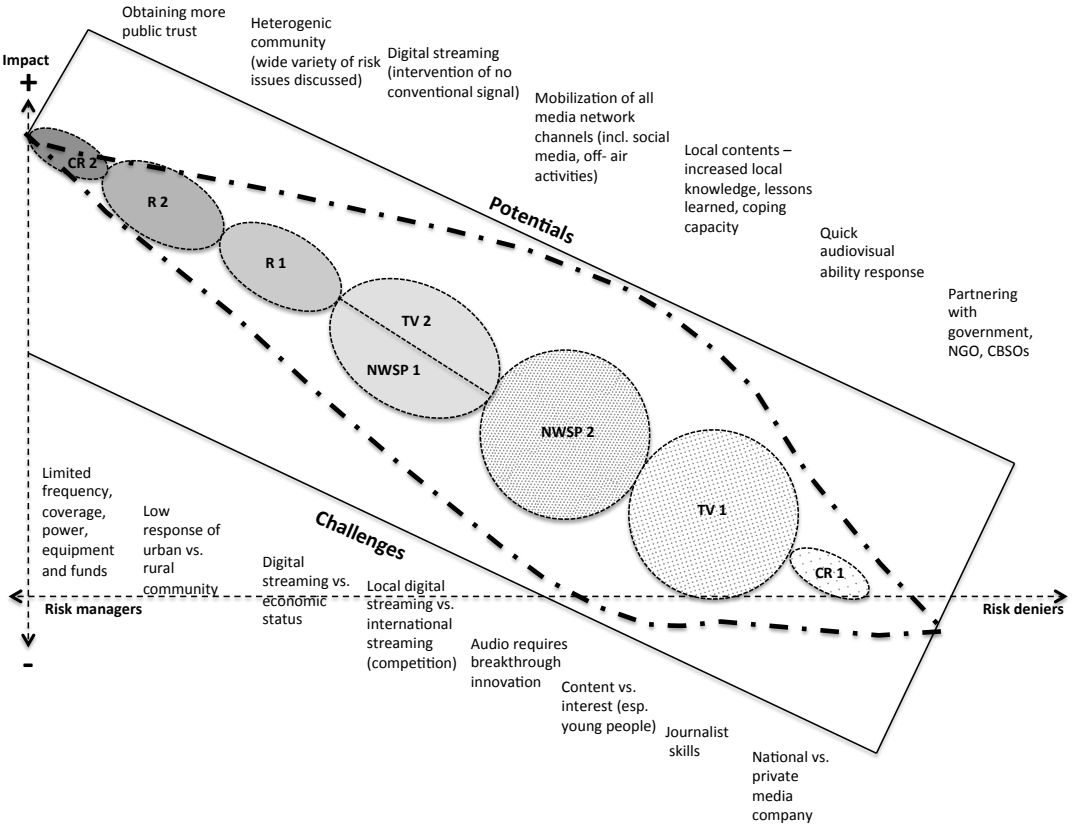


Figure 6.4: Potential and challenges of the interviewed of media in Bandung

6.2 Local Media Organizations in Bandung Dealing with Risk Communication

In addition to the above-mentioned media, there are other two organizations that are dealt with communication in communities of Bandung. These organizations were come to the light during the interview process with the media, thus they are not included in the previous questionnaire surveys. However, they will complete the final model of risk communication framework of climate-related disaster resilience of Bandung. These organizations are as follow:

1. *RAPI (Radio Antar Penduduk Indonesia) and ORARI (Organisasi Radio Amatir Indonesia): Indonesian Association of Amateur Radio*

RAPI/Radio Antar Penduduk Indonesia is an organization of association of amateur community radio, established for Bandung City as well as for West Java Province. Inter radio Indonesian Population (abbreviated as RAPI) is a non-profit social organization in Indonesia, which consists of a radio communication device users. As the name implies, members of NEAT uses radio device to communicate with other fellow members of the community. As a basic user identity verification devices use radio call sign JZ (read: Juliet Zulu) to all members without distinction of hierarchy.

RAPI is also a radio communication that was originally using the frequency band 26968-27405 MHz, which is in their origin country, the United States, known as the Citizen Band Radio (CB). Since 1958, the United States, formally legalized its use CB radio as means of radio communication between residents, as the organization's managers is the Federal Communication Commission (FCC) is in charge of controlling and maintaining and fostering a growing number of fans. In the beginning of the 70s era, the use of CB entered Indonesia and continue to grow, although its use is still not monitored, because there are no regulations for that. The governmental policy through the Ministry of Communications has set MoC Decree No. S1.11/HKn 501/Phb-80 dated October 6, 1980 on the use of radio licensing between residents, whose implementation is governed by Decree No. DG Postel. 125/Dirjen/1980, which sets the decision on the establishment and organization of RAPI, dated 10 November 1980. The decisions were necessary for the implementation of an organization that will assists the government in monitoring and supervising the implementation of RAPI. Following pictures show the communication equipment and activity of RAPI Bandung and West Java Province (RAPI Jabar, 2012).

Thus RAPI is different than community radio in terms of the format of an organization. RAPI is individually steered, meanwhile community radio is driven by group of people/community and has a clear set of programs, while RAPI is not. However, RAPI is obtaining more recognition in being the pioneer of communication access in the disaster stricken areas. For example, when all communication accesses were on halt, the involvement of RAPI member is crucial in connecting the disaster stricken area to the outer world, for example in requesting help and support. In case of *Tasikmalaya Earthquake* in 2009 (a nearby city of Bandung), RAPI of West Java Province has given their support in the emergency warnings and needs during disaster as well as set radio equipment in few community leaders for their future risk communication process. The

ORARI is similar like RAPI, but ORARI is more than one individual brings messages out to many, ORARI individuals do radio as hobby as well.



Figure 6.5: RAPI of West Java Province. (Left) radio equipment for communication between the members of RAPI all over Indonesia, (Right) members of RAPI installed/fixed the communication signal as part of their training for Quick Response Team (TRC/Tim Reaksi Cepat) (Photo courtesy (Right): RAPI Jabar, 2012)

2. KIM (Kelompok Informasi Masyarakat) of Community Information Group (CIG)

Diskominfo of Bandung (Information and Service Agency) establishes the Community Information Group (CIG) recently in 2011. Its function is to have an autonomous group of communities who will serve the community neighborhoods the information from the government. There are no criteria for the recruitment of this group, however, a coordinator is chosen to organize and manage the members in distributing and conveying the information from the government.

Mostly, the members of CIG are also members of other CBSOs, such as Women Welfare Associations (WWA), Youth Unions (YUs), and Faith-Based Organizations (FBOs) (see Chapter 5). Thus, the CIG is an overlapping organization that consisted from the three mentioned CBSOs. The CIG is established at the sub-district and ward levels of Bandung, the same as the CBSOs. Based on the interview with *Diskominfo* Bandung, the CIG is a formal organization, mandated by the decision letter of *Diskominfo* and its offices are in sub-districts' and wards' government.

The way that the CIG organizes their organizations depends on its own characteristic and initiatives. For example, there are CIG who are not that active and no activities at all in the community and there are CIG in a particular ward in the northern part of Bandung, which becomes the role model for other CIGs and even becomes the lessons learned site for other neighboring countries, such as Malaysia and Singapore (*Elly Harlini, Head of Information and Media Division of Diskominfo, Personal Communication, July 2013*). Moreover, a particular CIG in the residential areas of Bandung, establishes a community radio and named after their ward *"RK KIM CIbangkong".*

Thus, the *RK KIM Cibangkong* radio is an active organization, which is focusing on preserving the local culture, tradition, and customs of Bandung/West Java Province (Sudanese). The leader of this CIG (*KIM Kelurahan Cibangkong*) has participated and conveyed their activities in the Focus Group Discussion, which will be described in the next section. For example, their activities are Friday Cleaning (clearing waste, debris from the gutter for flood risk reduction and flood recovery), planting tree, discussion of community livelihood through community radio. Following figures show the radio community activities of the CIG in *Cibangkong* (Figure 6.6).



The flag symbol of Community Information Group (KIM) Cibangkong Ward



The opening ceremony of Community Information Group (KIM) Cibangkong Ward by the Vice-Mayor of Bandung City in 2011



The leader of Community Information Group (KIM) Cibangkong Ward inspected the inundated neighborhoods after heavy rainfall



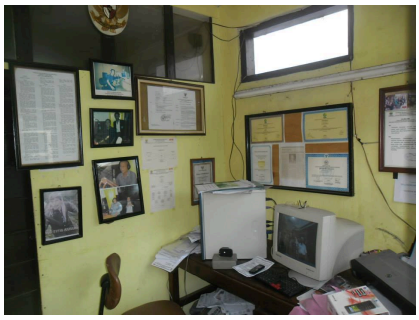
The leader of Community Information Group (KIM) Cibangkong Ward inspected the clogged gutter and drainage with a governmental officer



The leader of Community Information Group (KIM) Cibangkong Ward



The Youth Unions participated in the opening ceremony and activities of Community Information Group (KIM) Cibangkong Ward



The office of Community Information Group (KIM) Cibangkong Ward



The Community Information Group (KIM) Cibangkong Ward establishes community radio in communicating information to the community in neighborhoods

Figure 6.6: The activities of Community Information Group (KIM) of "Cibangkong" Ward (Photo courtesy: Community Information Group (KIM) Cibangkong Ward, 2011 and 2013)

6.3 Media involvement in Risk Communication in Bandung

The findings of this chapter are showing how important it is to involve media in disaster risk communication of Bandung. Each type of media, such as radio (commercial-based, community-based, and campus-based), television, and newspaper, has contributed to the risk communication process differently. The radio can promote disaster risk reduction actions to the community, while a television program will trigger the people in Bandung the interest and desire to act for disaster risk reduction, and newspaper are generating knowledge of disaster risk for the people in Bandung. These characteristics are drawn from the KIDA Model (Shaw et al., 2009). Breaking down into details; the level of partnership, nature of information, source of information, the impact of disaster risk information coverage, and potentials and challenges in risk communication in Bandung will finally determined the impacts and benefits that community will likely feel and receive.

For example, Community Radio 2 engages in disseminating environmental programs to community in neighborhoods, involving the WWAs and governmental agency as their source of information. While Community Radio 1 has limited involvement in DRR, but certain warnings and reminder of proper solid waste disposal is conveyed to public. Commercial Radio 1 and 2 engage in charity and emergency announcements, aside from using the usual frequency; Internet streaming and social media is used to strengthen the communication process in wider outreach and lessons' learned impacts.

Newspaper 1 and 2 are covering articles about risk reduction knowledge, exploring on the health issues and the causes and impacts of these high frequency and low consequence flood events. Newspaper 2 has the luxury of covering the disaster event, not only occurring in Bandung, but outside as well; the full page of graphical colored format is the add-on value in generating the disaster knowledge. This is a method of risk communication that media such as radio cannot perform. Moreover, Television 1, as being the national television with local contents has utilized national facilities such as news contributors, equipment, and its anchors/presenters to hold on-air activity such as talk shows and off-air activity such as discussion forums with disaster experts and local authorities on reviewing Bandung inundation problems as high frequency and low

consequence events, which may lead to catastrophic event in the long-run. This activity has taken 60% from the overall post-disaster contribution of media in Bandung, while the remaining 40% is on the post-disaster status update, when a large inundation occurs.

Thus, results of media interviews provide evidences that they have included DRR contents in their programs and articles. It might not hundred percent fulfill the needs and requirements of people's safety, but it is an initial starting point of risk communication processes in city that needs to be enhanced and sustained over time. A specific media program and article need to be improved by addressing collectively with other media type for risk communication actions to be effective. For example, Television 2 and Newspaper 1 have collaborated in informing the citizen of Bandung about the conduction of disaster drill in public open space, where people can participate. The way that these media conduct their activities is contributing to generate the risk information and knowledge. The knowledge of promoting risk reduction actions and warnings and tapping new or reminding old issues that leads to the superlative goal of risk communication; the knowledge that trigger the desire to act upon the information.

Consequently, the findings are pointing out the important role of media in disaster risk communication in Bandung. Taking the example of the nine interviewed media, the results provide the entry point of media involvement in risk communication. Media cover disaster events and stories of affected people in Bandung, particularly on regular flooding that impacted the southern part of the city. This has triggered the humanitarian side of journalism and contributing to the social incentive that media gained in risk communication. Almost all the interviewed media raised that monetary incentives that they received is small, but the social responsibility that bears by the media as educator and motivator for the public passes the economic benefits. This social incentive possibly triggers media in Bandung in risk communication. Due to the importance of publicizing the news about the increasing (climate-related) hazards, it may call the social responsibility of media in broadcasting disaster-related news. According to National Research (1989), it is true that newspapers, radio, and television stations are businesses-oriented and it is true that they must pay attention to income and profits. But the direct effect on subscriptions or advertising income is not likely to be in the minds of reporters and editors when preparing news and determine the placement of this news. Media is motivated by events, by what other media are paying attention to, by information provided on a regular basis by sources they has cultivated, by deadlines, by what interests the media actors (reporters, editors, etc.) as citizen. And the latter item is what triggers media in bearing social/moral responsibility in communicating risks.

For example, media's primary function is to inform and holding parties accountable for their areas of responsibility. Its primary duty however is to provide an accurate picture of the situation on the ground, without compromising the quality and the fairness of the news. For this, Media in Bandung are engaging in in the flood recovery process of the city and its surrounding, thereby confirming themselves as an evaluating tool for short term (through flash news, current disaster situation, where to donate, etc.), medium term (updating disaster and non-affected about the recovery process), and long term

(engaging the experts, government authorities and agencies, non-government organizations, private sectors, and community leaders in discussion on the causes and impacts of disaster and on improved and innovative disaster awareness to prevent and prepare future disaster) flood recovery process and thereby enhances city's resilience. Therefore through this development of journalism that media in Bandung are performing, it leads to social/moral incentives that these media obtain in communicating risks.

Other finding of media involvement in risk communication is how the media contribute in the socio, economic, and institutional resilience of Bandung. Wasko and Faraj (2005) examine the social capital and knowledge contribution in electronic networks including in the media. The theory of collective action is how individual motivations and social capital influences knowledge contribution in electronic networks and in turn these networks might bring closer organizations that transmit the knowledge. According to Grant (1996) and Liebeskind (1996), knowledge is organizations' most valuable resources, because it represents intangible assets, operational routines, and creative process. Thus, when these nine media in Bandung convey the knowledge of Women Welfare Associations, Youth Unions, and Faith-Based Organizations activities, media has contributed indirectly to the social resilience. Direct contribution of media in Bandung is in the form of broadcasting community service spots and talk shows on family planning and health campaigns, environmental protection as well as broadcasting disaster simulation. These activities are strong at sub-city entities, which need to be up-scaled by the help of media for wider dissemination and multiplier effect.

Commercial Radio 2 is orienting in the business sector. Interview results show that the radio has targeted private and semi-private companies, industries, and offices in their daily programs. Conveying risk information supports appropriate decision making process of these business entities on how they will plan the employment division, finance the activities, and develop budget and subsidy for disaster management in their corporate social responsibility units and thus contributing to the overall economic resilience of Bandung. An example of strengthening the institutional resilience, Commercial Radio 1 has their disaster experts' database as their "usual" source of disaster risk information and has signed a memorandum of understanding with the Government of West Java Province and Bandung City. All governmental development activities and announcements are being broadcasted. This type of cross-institutional collaboration will not only enhances the cooperation and knowledge dissemination and management but it ensures the good governance aspect in the institutional sector. This type of partnership model should be grasped and taken as an example for other media group in partnering with local government and agencies. The collaboration of media with organizations at community level is often seen, such as the Women Welfare Associations with community and commercial radio, the Youth Unions and TAGANA of Bandung with Television 1. But the collaboration of media groups with the professional networks and governmental agencies need to be strongly encouraged as to find new approaches of risk communication.

One aspect that is highly considered is that electronic networks within the media groups make it possible to share information quickly, globally, and with large number of

affected individual. Electronic networks that have focus on knowledge exchange frequently emerge in fields, when the pace of technological change requires access to knowledge unavailable within a single organization (Powell et al., 1996). And it is widely recognized that electronic networks have been found to support organizational flows between geographically dispersed organizations and individuals (Constant et al., 1996). Thus it is evident that how information technologies support cross-organization knowledge exchange and endorsed the institutionalization of information flow in Bandung City. Below section discusses more on the electronic networks, namely the rise of social media usage in Bandung City.

6.3.1 The Rise of Social Media in Bandung

Social media has grown in popularity to become a part of the daily lives of many people in the beginning around 2005 (Peary, 2012). Prominent social media such as Facebook®, Twitter®, and Google+® are social networks that boast large numbers of users of about hundreds millions of users worldwide (Abram, 2006; Mashable, 2011; Shiels, 2011; Kaste, 2011; Svetlik, 2011). Peary (2012) in his study defined social media as asset of application and services that use the Internet to connect people. More specifically, social media is a communication medium, made possible by the Internet, which combines dynamic, collaborative Internet-based tools, social networks, computers, and increasingly, mobile devices. It allows users to connect to each other, exchange information and collaborate. It consists of social networks, which act as a means of connection between users and is constantly being redefined because of the evolving nature and the rapid change of the technologies.

The use of Internet and mobile technologies, which act as pathways and access point for social media, is also rising. According to the International Telecommunication Union (ITU, 2011), an agency of the United Nations that specializes in information and communication technologies, over the ten years from 2000 to 2010, the rate of Internet users worldwide rose from less than ten per 100 people to nearly 30 per 100 people. However, much social media requires Internet data to be utilized. In developing countries only one in every 20 people have a high-speed mobile subscription; compared with one in two people in developed countries, developing countries had the sharpest rise in the adoption of high-speed mobile subscriptions (Cell phones ubiquitous, 2011). But some social networking websites like Twitter®, can be used without an Internet data plan by using SMS (Short-Messaging Service/text messages through mobile phones). Thus, all mobile phone users could be potential social media users. This is seen as huge opportunity in the governance system of Bandung City in term of information flow. In the time the author write her dissertation, Bandung City on September 16, 2013, has elected a new Mayor for the period of 2013-2018. The new mayor (M. Ridwan Kamil, ST., MUD) has instructed immediately that the Government of Bandung and its agencies to set up a Twitter® account, not only in enabling the communities for having direct interaction with the authorities in raising their views and suggestions to the city's development, but local government can directly convey their information and messages to its citizen.

The rise and usage of social media has implications to the risk communication process in Bandung. Firstly, the information is accessible by everybody, anywhere and anytime. Secondly, upon receiving the information, both parties can act upon it, provided most of communities have access to the Internet, through mobile devices and domestic Internet connection. And thirdly, it supports the local government in being transparent and as credible and trustworthy source of information. To strengthen above arguments and efforts, the Government of Bandung has set up *RW-Net* (neighborhoods' network platform through Internet), where all the neighborhoods in Bandung are able to communicate among each other and exchanging information and views. This will also take into the consideration in the comprehensive model of risk communication approaches. Figure 6.7 shows the examples of direct communication platforms of Government of Bandung City with the citizen and neighborhood network with the wider public in city.



Figure 6.7: The official Twitter© account of the Government of Bandung City (left), and the neighborhoods' network (right) (RW-Net) (Source: RW-Net, 2013)

The utilization of the social media in Bandung City for risk communication is thus seen as large potential platforms of exchanging information between many people with different background, but though has one common goal. As stated by Kietzmann et al. (2011) and Mayfield (2008) that social media is media that "employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content" and having characteristics of participation, openness, conversation, community and connectedness. This implies that social media might work also in disaster situation. Although the disaster is not climate-related, but the principle of the utilization of social media is worth to take as lessons learned. For example Peary (2012) studied on the role of social media in the 2011 Great East Japan Earthquake and Tsunami. The social media such as Twitter® and Facebook® has supported the disaster affected to keep in touch with "outside" world and keeping the outsiders and other affected in different locations

updated, especially on the information of infrastructure such as evacuation shelters. Other lessons learner's of the utilization of social media in disaster is 2010 Eruptions of *Merapi* Volcano in Indonesia. A community-based organization called *Jalin Merapi*, which started as community-radio station to broadcast updates about the volcano's eruptions, used Twitter® to get the word out and organize. The organization has sent out 700 volunteers to locations that have not been able to receive government aid and has them report their needs to the organization and the community by using Twitter®. Status updates or "tweets" enabled the organization sending messages of requesting help within second and received feedbacks instantly in terms of logistics.

Social media use in disasters is a new phenomenon that is constantly changing, evolving, and likely to grow. The unique set of circumstances that existed of past disaster events gives insight into this new phenomena and provides a model for how to understand social media in pre- and post-disaster and pointing the roadmap for future developments (Peary, 2012). Given the use of social media in past disasters and the strong approval of it as a reliable source of information, it is likely that social media use in disaster risk information will rapidly grow, whether it is supported by organizations and governments or not. Therefore it is necessary for Bandung City to recognize that this increased use will likely create dependence on social media as a form of communication in disasters. Consequently, with this knowledge, government and organizations in Bandung would benefit from following changes related to the use of social media in disaster. This implies that they should look into how to protect and secure the pathways of information that social media use from dis-functionality in disasters.

6.3.2 Implications of the Role of Media in Risk Communication for Disaster Resilience

To summarize above efforts, risk communication processes and approaches by media groups are already occurring in Bandung. Sample from the interviews showed that community radios have contributed largely on addressing more contextualized problems and issues in neighborhoods, engaging these local actors (WWAs) and local authorities in communication process of risk reduction and resilience building. However, narrow used frequency that allowing them to operationalize is limiting the community radios to be heard widely; only up to a radius of 2-5 km. Thus the lessons learned that other areas in Bandung can adopt is also limited. Therefore there should be additional new way on how the experiences and news of a particular area, ward and sub-district can be heard and shared to other areas. In this respect, one to many or many to many communication approaches is suitable in sharing the experiences and information, which goes in the direction of interactive media such as the social media. For this, RW-Net (neighborhood network) is established to convey information to other community members and is an interaction platform for other wards and sub-districts.

While commercial radios are more business oriented and gain their incentives from commercial advertisements, they have wrapped risk information in the form of spots that are daily broadcasted. Although this may seem minimum efforts, but the essence of promoting risk reduction actions regularly will have impact to the behavior change

(Kasperson et al., 1988; IFRC, 2011). Moreover, both interviewed newspapers have covered the disaster issues within social, economic, and institutional aspects. However, the articles are not continually written; it is seasonal, only when a disaster occurs. When newspaper wants to generate risk knowledge, the information has to be set regularly. Therefore, a weekly column on editorial notes that are written by different stakeholders (local government, agencies, academe/experts, CBSOs, NGOs, or even private sector on their CSR activities) on different aspects will enrich the knowledge and updating the citizen of Bandung on what is going on. This in turn will reside and store it in the memory and will have long-term effects on audiences, based on the universal and consistent stream of messages that they presented to audiences (Scheufele and Tewksburry, 2007).

Despite television has an added value of audiovisual mode for risk communication, televisions in Bandung have the least contribution in communicating risks and enhancing socio-economic and institutional aspects compare to other media groups. Although Television 2 conducts disaster simulation, aired on weekend morning to reach out all age group, this is not a regular program. Addressing this issue, Television 2 initiates in conducting off-air activity such as disaster drill and is engaging local disaster management agency and TAGANA and Youth Unions in an outdoor venue that are accessible by the public and attracted young people. But when it is not regularly done, it hampers the cognitive effect of behavioral change towards positive risk attitude. The long-term effects that the television wants to present to audiences (public) will not easily store. Therefore, to make this activity sustained and ensuring the participation of all citizens, television can collaborate with other media groups such as radio and newspaper in promoting their off-air activity. As the follow up, this off-air activity can be recorded and broadcasted on different schedule; hence people who were not being able to participate and experience live during the off-air activity, can still watch on the television.

Consequently, above findings illustrates the media literacy of the people of Bandung. Media Literacy aims to empower citizens by providing them with competencies (knowledge and skills and attitude) necessary to engage with traditional media and new technologies (UNESCO, 2014). It understand the role and functions of media in democratic societies, the condition under which media can fulfill their functions, critically evaluate media content, engage with media for self-expression and democratic participation, and review skills (including ICTs skills) needed to produce user-generated content. The access to quality media and information content and participation in media and communication networks are necessary as stipulated in Article 19 of the Universal Declaration of Human Rights (UNESCO, 2014). Media in Bandung engage community leaders as their news contributors and thereby promote as well the citizen journalism. In addition, current utilization of social media by Government of Bandung City and its citizen and the Neighborhood-Networks (RW-Net) have clearly showed a high level of media literacy of the citizen of Bandung, which can be advanced in disaster situation. The resilience assessment at sub-city entities revealed that more than 80%, all households in Bandung has television and radio as their communication assets and have access. This condition underlines the media literacy in Bandung.

Lastly, although currently, the campus-based radios have not participated and contributed in the risk communication process, they have large potentials in bringing the risk information, regardless to specific areas, to the campus community. Since campus is not only an academe society, there are other workings supporting staffs that are potentials information receivers. Therefore, to pool on risk information resources, campus-based radios firstly have to be engaged in campus-based network and secondly, engaged in the community radio network. The intra-local media network is important in identifying local risk information, news, activities that can be broadcasted in campus society. Thus, at the end, people are aware on what is occurring in their and other neighborhoods. Not only risk information will make people aware, but also promoting more widely and intensively on risk reduction activities that may enhance the resilience to climate-related disaster.

Thus to conclude, media in Bandung communicate risks to public, however it is unstructured and randomly done. What Bandung really needs is as follow:
First: developing the inventory of local media, such as community and campus-based radios as well as the inventory of larger media groups, such as radio, newspaper, and television for pooling all risk information, news, and activities.
Second: constructing intra-local media network, including amateur radio groups (RAPI and ORARI) and community information group (CIG), as well as constructing larger media network as platforms in risk information exchange among themselves.
Third: fabricating the linkage between the inter-local media and larger media networks in Bandung to ensure the risk information contents and flow reach all people in Bandung. To fabricate the linkage between local and larger media groups, Government of Bandung City as the most authorized governmental institution in the city, has to take the initiative in endorsing Bandung Media Network (BMN) as one media group of Bandung.

Above implications of the role of media in risk communication process in Bandung sum up that risk messages arise from different sources, through informal channels, which is not a novel discovery as most discussions of risk communication recognize the importance of multiple audiences and acknowledge that the public is a highly diverse aggregation of individuals (Krimsky and Plough, 1998; O'Neill, 2004). But, beyond the diversity of the audience, multiple generators of risk information including non-official sources are playing key role in the overall communication process in Bandung City, due to their level of trust.

Findings of earlier chapters of resilience assessment with CDRI tool in Bandung (Chapter 4) mentioned that it needs local actors, potentials that may increase the resilience of the city. These local actors were identified such as women's groups, youth's groups, and mosques' councils or faith-based groups. These are defined as Community-Based Society Organizations (CBSOs) in neighborhoods in Bandung. These CBSOs through SIERA approach are increasing the resilience through their disaster risk reduction (DRR) activities in social, economic, and institutional aspects. Their DRR activities are regarded as platforms of risk communication to wider communities. In implementing their DRR activities, thus communicating risk; the CBSOs are utilizing media as tools to convey the risk information that are discussed earlier in this section.

Thus, the role of media in Bandung is not only in risk communication process, but it has the linkage to enhance the larger resilience of the city.

6.4 Way Forward

The involvement of different media groups in risk communication in Bandung is the last mile of the exploration of different risk communication approaches in enhancing climate-related disaster resilience. Blending the media groups with other local risk communication approaches and generators in communities will contribute to the overall risk communication and resilience building in city. An attempt at understanding the role of the media in the development of environmental issues for public as well as for political concern calls for a perspective, which goes beyond, without ignoring the contributions of traditional approaches to the study of media (Hansen, 1991). Therefore, the next chapter will discuss from the beginning the key findings from earlier chapters that support to the development of risk communication model in effectively communicate risks to enhance climate-related disaster resilience in Bandung City.

6.5 Key Findings of Chapter 6

The key findings of this chapter 6 are highlighted in the table below.

Box 6.10: Key findings of Chapter 6 and linking to the current study

Highlights and link to the current study
▪ Media such as radio, newspaper, and television in Bandung and more localized media such as community radio have been engaged in communicating disasters and risks information to the citizen in three phases (before, during, and after a disaster). ▪ Media in Bandung are collaborating with CBSOs, by involving community groups' leaders as news contributors and thereby make these media as a trustworthy source of information for the public. In addition, commercial radio has its own database of experts as regular source of information and increases the trust level and therefore showing the example of linking media with expert's society. ▪ Media, in addressing the HFLC floods as silent disaster, should be utilized in communicating these risks, in issues that are close and related to their living condition within community's daily activities. It should highlight community's risk reduction actions on social, economic, and institutional dimension, thus promoting of the application of SIERA approach for risk communication and involving CBSOs as their focal point and trustworthy resource persons. ▪ Media in Bandung are engaging in the flood recovery process of the City and its surrounding, thereby confirming themselves as an evaluating tool for short term (through flash news, current disaster situation, where to donate, etc.), medium term (updating disaster and non-affected about the recovery process), and long term (engaging the experts, government authorities and agencies, non-government organizations, private sectors, and community leaders in discussion on the causes and impacts of disaster and on improved and innovative disaster awareness to prevent and prepare future disaster) disaster recovery process and thereby enhances city's resilience.

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Chapter 7
Comprehensive Risk Communication Approach for Disaster Resilience

"When the trust account is high, communication is easy, instant, and effective."
~Stephen R. Covey

Chapter 7
Comprehensive Risk Communication Approach for Disaster Resilience

This chapter illustrates research questions and hypotheses, and is summarizing key findings of earlier chapters (Chapter 2,3,4,5, and 6). This chapter proposes the model of comprehensive risk communication approach for Bandung City, Indonesia to understand the resilience to climate-related disasters in urban context through effective risk communication processes at the local level.

7.1 Resilience Assessment of Bandung City in Promoting Local Governance

This study is focusing on local governance in disaster risk reduction, resilience, and communication. It is how risks are reduced and resilience is enhanced at the local level through risk communication. It is how mainly the two major actors in DRR, namely local government and community are interacting towards a common goal of enhancing resilience to climate-related disasters. The first research question of this thesis was "To what extent is city and its sub-city entities resilient to climate-related disasters?" The hypothesis to this question was that they are resilient to climate-related disasters to certain extent. In order to answer the first question, an assessment was carried out to measure the resilience of Bandung City and its 30 sub-districts, advancing a tool named Climate-related Disaster Resilience Index (CDRI).

The results of the assessment are spatial maps to reveal the strengths and weakness of a city in different sectors (physical, social, economic, institutional, and natural). Furthermore, the cross-sectoral analyses allow linkages and relationships to be drawn between different aspects/dimensions, parameters, and variables in the form of coefficient of determination. Once the resilience of all the sectors is identified, the process of addressing potential weakness, in one or the other sector, in the form of participative action planning begins. The strong character of the CDRI to involve the Government of Bandung City highlights the importance of this institutional body to effectively develop, apply, and cooperate with local stakeholders, such as CBSOs (WWAs, YUs, and FBOs), local agencies, academe, non-governmental organizations, private sectors, and media in implementing disaster risk reduction measures for enhancing Bandung City more resilient to climate-related disasters. Therefore, the research proposes an establishment of Multi-Stakeholders Platform (MSP) at the city level that consists all parties of different types of "community", representing different views to address the weakness in collaborative manner.

The CDRI approach is also establishing a linkage with the HFA (2005-2015). HFA is regarded as a comprehensive tool to address the DRR issues holistically, with five priority areas focusing on five key pillars of risk reduction approaches (See Chapter 2). Current condition has pushed a local level implementation of HFA to be imperative (KU and UNSIDR, 2010). Through the process of training and capacity building of the local governments, there is an established link of HFA and CDRI. The CDRI Capacity-building Program with blended learning methods was designed and implemented from February to April 2010 in collaboration with Kyoto University Graduate School of Global Environmental Studies, CITYNET, Tokyo Development Learning Center (TLDC), The World Bank, Socio-Economic-Educational-Development Service-India (SEEDS), UN International Strategy for Disaster Risk Reduction (UNISDR), and the Asia Regional Task Force on Urban Risk Reduction (RTF-URR) (KU, CITYNET, TDLC, SEEDS, UNISDR, and

RTF-URR, 2010). The program supports city government officials become more aware and able to communicate more easily about current and potential future risks facing their cities. Furthermore, it promotes the development of comprehensive plans to address the issues. In addition, distance learning methodologies used in the program ensure that local government officials are able to get continued support and feedback over the long term, using much more reasonable expenditures. Hence, the overall goals of this program are to motivate and enable city government officials to become aware of current and future potentials risks of climate-related disasters and initiate the development and implementation of the Climate Action Plan (CAP) in their own contexts in order to build the resilience of their urban systems and communities.

In regard to this, CDRI is thus considered as one of the useful tools in implementing HFA at the local level. The approach of the CDRI and HFA is different. The HFA is low-resolution guidance document providing 5 priority areas to take actions on comprehensive DRR. On the other hand, the CDRI is a high-resolution document that has more details and contains 125 specific indicators. The 2 documents can be used simultaneously to effectively address urban resilience issues. For this, Matsuoka and Shaw (2011) has framed a matrix to assess local government performances against the two approaches that links to specific city services like physical (water, sanitation, infrastructures) or natural (ecosystem services, environmental policies). Consequently, CDRI facilitates city governments to identify specific areas they need to address and take actions from practical perspective, and at the same time ensure that these efforts are aligned to implement comprehensive DRR policies along with the HFA implementation.

Utilizing a set of compact CDRI questionnaire form and deriving from data analysis; resilience status, opportunities and challenges of resilience assessment in Bandung were identified from Chapter 4. Therefore, as the last mile of an assessment process, the results of the resilience assessment are extremely important and need to be communicated to wider public for the reduction of risk in the enhancement of overall resilience in the city.

7.1.1 Resilience Status and Linkages of City to Sub-City Context

At City

The results drew from Chapter 4 highlight key findings that delineate the resilience status of Bandung City and its sub-city entities. Earlier it is mentioned that the resilience value spans from 1, very poor to 5, best. Currently, Bandung City has the overall resilience value of 3.01 and therefore needs improvements in some of the sectors. The results of city assessment showed the following:

- Physical aspect, its resilience is higher than the other four aspects. Social, economic, and institutional aspects have lower resilience compare to physical and natural. Bandung city has tremendous increased in the construction and structural development sector. Being the third largest city in the country and center of education, service, and trade, the city has expanded its territory for housing and real estates that are concentrating in the Eastern part. Because of the increased population and high demand in delivering better services to its citizen, for example, electricity and water supplies are seldom interrupted. However, the sanitation and

solid waste management sector is rated low. Current overcrowded population is becoming a burden for the city and calls for improvement; especially at wards and neighborhoods. Therefore, a communal system for solid waste management has to be enforced.

- Socially, the resilience value is poor, particularly on the parameters of population and health, whereas high number of population density in residential areas and out fringes of the city affects the health condition of people. However, the resilience value of social capital in Bandung is best (value of 4.13 out of 5), which indicates that the social cohesion among the population is high, despite the high urbanization rate that brings people outside Bandung region to migrate into the city. This needs to be channeled as entry point and asset for better disaster risk reduction and resilience.
- Economically, the resilience is low due to the income condition and finance and savings that communities in Bandung are practicing. Less number source of income made low income and less skilled population group could not pool their resources for future. In terms of disaster, the city does not have a budget and subsidy for disaster management. Emergency responses and impromptu actions need to be shifted to awareness and preparedness with better planning as has been stipulated in the DM Law of Indonesia that disaster management should focus on local level with local actors. Therefore, formulating Bandung Disaster Management plan is highly demanded.
- Institutionally, the resilience value of the city is poor, due to its poor disaster crisis management, disaster knowledge dissemination and management, and good governance. Due to the unavailability of disaster management plan, the city requires guidelines, standard operation procedure and contingency planning. Clear early warning systems and its effectiveness is lacking as well as promptness of city body to disseminate accurate emergency warnings to lower administrative units. Thus highlighting the need of a comprehensive risk communication process involving the city administration, local governments at sub-districts and wards, and local potential actors at community level with different types of media.
- Natural aspect, although the intensity and severity of natural hazards is low, but small high frequency and low consequence (HFLC) flood events, are occurring and will contribute to a large catastrophe that city needs to cope with and be prepared. The causes are not only due to natural terms, such as high and long duration of rainfall, but insufficient capacity of the drainage system and less surface to absorb the rainfall precipitation due to over construction and limited availability of open green spaces are contributing to the cause of these HFLC events. Therefore, its ecosystem services is low, consequently, the environmental policies in Bandung City needs to be stronger reinforced.

Overall, these key findings summarize that the resilience of city is best in the physical sector, with strong basic lifelines services and social capital. The resilience assessment for the five key sectors is also a momentum for Bandung City in rectifying the development towards pro-green and livable place; hence promoting local tourism and brings additional income to city than before. But, despite mentioned positive aspects, the city is poor in the social, economic, and institutional resilience and therefore pointing the need of exploring and tapping local potentials for enhancing these resilience at lower level in city (sub-city entities) of Bandung City.

At Sub-city entities

CDRI approach is also a non-scale tool, in terms of its application. It can be used for the city and micro-city level (sub-district/ward). The methodology can also be used for neighborhood level, depending on the availability of data. The more the city has points of data, the more CDRI results can be of higher resolution. Therefore, CDRI allows the measurement of values of Bandung City and its 30 sub-districts. This in extremely important to analyze the mainstreaming of risk reduction measures, which depend on how effectively the actions are linked to the city services and delivered services to communities by the sub-city entities such as sub-district; as well as how effectively the city budget is used to support some of the activities at the lower administrative units and how sub-districts utilized their CBDRR resources. Therefore, CDRI is not only a resilience assessment tool, but it is a process to create and trigger Bandung City and its community-based risk reduction initiatives.

Drawing upon the resilience assessment results at the higher level (city level), a detailed assessment was conducted at sub-city entities, such as at sub-district level, to look further in details for the local potentials in the process of the enhancement of Bandung City resilience to climate-related disasters. This sub-city level assessment is required and extremely important to identify the current status of resilience at community level, in developing better strategies and appropriate risk reduction measures that could enhance its resilience. In addition, the sub-city level assessment was conducted to better grasped local potentials, capacities, concerns, and needs of communities. Chapter 4 has addressed this issue and key findings on sub-city level resilience assessment are the following:

- In overall, the average of resilience for the 30 sub-districts is better than for the city. With a resilience value of 3.43 the sub-districts government are performing and delivering better services than city's. The close relationship and direct interaction with communities, neighborhoods, and households enable the sub-district governments to better grasp and accommodate communities concerns and requirements. Moreover, governments at lower administrative units have better overview of communities' activities that may contribute to the resilience, which may overlooked by the central government at city level.
- Physically, the sub-districts has strong resilience, likewise at city, basic lifelines are available with less interruption. However, sanitation and solid waste management is also poor, similarly with city, which confirms that urgent countermeasures and actions to manage the solid waste should initiate at neighborhood level. This should be one of main priority of local development, since one of the major causes of flooding/inundation is clogging of drainage channels due to waste. Local actors and drivers of actions within communities are therefore strongly required.
- Socially, the resilience is high at sub-districts, compare to city. In terms of population, health, community preparedness to disaster, and social capital, the average resilience of sub-district is high. Chapter 4 and 5 have identified that community activities and practices in these sectors is an important factor that contributes to the high social resilience. Community-Based Society Organizations (CBSOs) as identified in Chapter 5 play major roles in the community in the process of enhancing resilience. However, although the education and awareness is relatively higher than the city, but compare

to other four parameters, it is low. Therefore, community activities and practices in pre-disaster time frame need to be more strengthened.

- In terms of economic, the average of resilience of sub-districts is lower than other 4 sectors. Especially on finance and savings as well as budget and subsidy is very low, compare to other parameters. This is already indicated in the result of the assessment at city, that a disaster management plan is lacking, which it is reflected at sub-districts as micro entities of Bandung. Addressing the budget and subsidy issue steered at city government and allocating it at lower administrative units, is as much important as addressing sanitation and solid waste management system locally, because the impacts of disasters will be largely felt by local authorities and communities.
- Institutionally, the average resilience of sub-districts is also high. Although, disaster management plan is unavailable in the majority of sub-districts, their disaster crisis management and institutional collaboration are highest. A strong social capital and social cohesion by local potentials and actors within communities have supported local authorities in responding disasters, such as frequent floods and to certain extent landslides and fire, thus showing that local authorities have mainstreamed DRR and climate-related disasters. Interestingly, disaster knowledge dissemination and management is lower than other parameters, which confirms the lower resilience value of disaster education and awareness. However, the results of the institutional sector for sub-districts are more or less equal, indicating that aspects such as population density, livelihood, and employment have no impact on the resilience and/or quality of local authorities are preparing to cope with and respond to climate-related disasters.
- In terms of natural resilience, the average value of the resilience of the sub-districts is moderate compare to other aspects. This condition has indicated that the natural term is subjected to each of sub-district situation. Clearly, sub-districts that are located in flood risk areas are more susceptible to disasters. Moreover, the changing of the rainfall pattern and intensity has exacerbated these sub-districts and calls for better warnings, risk communication, and management.

Looking further into details of the resilience assessment at the sub-city level, there is a high degree of relationship between disaster knowledge dissemination and good governance. The governance system at sub-district governments influences the knowledge dissemination and management of disasters, thus affecting the process of resilience enhancement at communities. High degree of relationship was also showed for frequency of natural hazards that affect to the severity of these hazards in sub-districts, disregarding the geographical location of these sub-city entities. Thus all in all, sub-city level resilience assessment is showing more localized and contextualized actions. Therefore appropriate local risk communication approaches is important to address issues at sub-city level and consequently, Bandung City depends on local potentials at micro entities in enhancing the relative weak resilience.

7.1.2 Implications of Resilience Assessment in Promoting Local Governance

Key findings above have answered to the first research question, to what extent the city and its sub-city entities is resilience to climate-related disasters for the 5 key aspects

(physical, social, economic, institutional, and natural). The Government of Bandung City is the key institution in the assessment process. As the implications of the assessment at city and sub-city entities, the results need to be disseminated to wider public. It implies that risk communication has to be conducted in enhancing the resilience of the assessed weak sectors. Therefore the involvement of DRR actors, variety of local stakeholders, and local champions at more localized context is extremely important. Thus, the resilience assessment is promoting the local governance for risk reduction and resilience building with different key stakeholders. However, there are challenges encountered by the CDRI application in this study. Those challenges are as follows:

Although the CDRI covers a large variety of aspects that represents either vulnerability, or resilience, or both of a parameter, the large number of variables (125) is posing a great challenge for local authorities in Bandung, especially sub-district authorities to answer the questionnaire adequately. The obstacle lies in the lack of data for various variables, which as a result, it demands authorities' best choice to give valuable answer for those variables for which secondary data do not exist (Joerin and Shaw, 2011). Additionally, since local authorities are the target group for filling up the CDRI questionnaire, the CDRI depends on data and views coming from local authorities that may not sufficiently reflect communities' view on the city's condition. To address this challenge, local government/authorities in Bandung when filling up the questionnaire may raise the issue during the weekly coordination meetings with CBSOs, as the representative of communities. These meetings were raised in Chapter 5 as one of risk communication interface between government and community at more local level, where issues and probable solutions are discussed among them.

Another challenge that is posed by CDRI is that only hydro-meteorological hazards or climate-related hazards, such as floods, rainfall-induced landslides, storms, or droughts, leading to disasters are reflected; therefore geophysical disasters are not addressed, although *Lembang Fault* makes Bandung City susceptible to earthquake. However, the results of the study are an important lessons learner, in terms of approach as well as in terms of process. This CDRI assessment is also triggering the Government of Bandung City in renewing the earthquake assessment, which the last one was implemented in late 90s (IUDMP and RADIUS Project, see Chapter 4). Therefore, the research suggests that the Government of Bandung City could adopt the climate-related disaster resilience assessment to other type of disasters that the city is at risks. The renewed earthquake assessment will not end by knowing only the strength and weakness sectors of the city and community, but it should also further apply the risk communication process in triggering people to act. By engaging the CBSOs in risk communication, CBSOs have proved that they are effective risk communicators for wider communities in Bandung.

Subsequently, as it was emphasized earlier, local authorities are the key target group for filling up the CDRI questionnaire. At the city level assessment, although the city government covers most aspects of the CDRI questionnaire, but there are certain parameters that cannot be answered by city officials, such as the provision of electricity or water that can be provided by state or private companies, which is not necessarily directly dealt with city government. The health department might answer other example, such as health issues or the accessibility of roads maintained by another

department within a city government. Thus the data have to be retrieved individually from these organizations (city agencies and service authorities). The listing of possible departments as sources for data and responses to the CDRI questionnaire, clearly varies, whether a city-wide assessment is undertaken or if the CDRI is applied at the sub-city level, the local governments at sub-district level may have limited availability and accessibility to robust secondary data for the questionnaire; however, they are likely to have greater knowledge to understand the local context well and to provide "best choices" that serve the overall objective of this initiative to disclose the sectors where improvement is most needed in order to make the cities more resilient. Holistically, The CDRI assessment demonstrates the linkage between the academia, the local government, and to some extent the communities. Although current approaches in retrieving the data for the CDRI assessment tend to be in rather close collaboration between the academia and local governments, the wider aim of this approach is to engage communities, especially in the process of developing and implementing DRR actions for improvement, which it might sometimes not run smoothly. Therefore, there are few requirements that need to be addressed by Government of Bandung City in promoting local governance. These can be of challenge for local authorities in implementing their duties and functions, as well as serving the community following the resilience assessment. These requirements are as follow:

- Managerial skill

More work does not equal to more budgets' requirement; instead Government of Bandung City could plan, adjust, and assign the budget strategically by listing the priorities. The prioritization process might need an excellent managerial skill and strong collaboration and coordination across sectors and agencies. Thus it is posing great challenge to authorities at city and micro-city level to improve their capacity in project management and coordinating competence to work with diverse agencies, put them in one line, and make collaborative plan that fill each other gaps without having overlapping function, tasks, and activities. Developing and organizing regular training on the project management and decision making process thus will be likely encouraged.

- Strong commitment to act

The genuine intention and willingness to push the resilience assessment to be followed up is extremely required by the authorities in Bandung City to make it work. Without a strong commitment to act, it is difficult and possibly impossible to increase the resilience. Renewal of pledge and vows to provide and deliver better service to public will to certain extent revitalizes the spirit of good governance

- Develop a tool and system of monitoring and evaluation

The monitoring and evaluation tools and its mechanism are tended to be lacking in most of governmental activities. Government of Bandung City needs clearly to make an inventory the current monitoring and evaluation tools, develop proper adjustment with clear parameters and indicators of achievements. This is of great challenge, since authorities are working individually and less of harmonization between the section within the same authority and between other authorities and agencies. To overcome this hurdle, authorities and agencies need to open clear communication channels among each other to out discuss and agree on issues that need to be settled and creating inter- and intra agencies monitoring and evaluation tools and mechanism.

But one distinctive character of the CDRI application in this study demonstrates that the tool is beyond assessing the current conditions than on developing measures for improvement. It is evident that the effective implementation risk reduction measures and actions need to be supported by the people and wider organizations, such as Community-Based Society Organizations (CBSOs). To conclude, local key actors involved in the approach are thus diverse; ranging from the academia, local government, private sectors, and other organizations that pose a great challenge for Bandung City in unite them in one working platform to commonly increasing the city's resilience to climate-related disaster. Therefore, wider dissemination, announcement, sensitization of the approach is compulsory to harmonize and pooling common views of all stakeholders. This can be addressed through a regular Multi-Stakeholders Platform of Risk Communication (MSP RC).

Other implication of resilience assessment for Bandung is that the assessment results, as one of the outputs of this study, is promoting local governance in terms of actors. Aside from Bandung is aware of its resilience, strengths, capacities, and weakness; an opportunity of improvement is open for the five mentioned sectors in city in terms of collaboration in development risk reduction action planning through risk communication. For example, a Multi Stakeholder Platform (MSP) composing of Government of Bandung City and agencies, academe, private sector that has always been the support for Youth Unions and commercial radios, and other supporting organizations such as Bandung Disaster Study Group is necessary to be established to bring all related stakeholders closer, to discuss, learn, prioritize, and plan on issues and actions needed to be undertaken. Since the HFLC floods are occurring, thus Bandung City should assess its resilience regularly. Consequently, this semi-formal gathering of MSP should also be held periodically. Particularly it is important to design on who is doing what, how, and when; thus addressing the DRR strategically and communicating risks effectively, a comprehensive risk communication should be at hand in Bandung.

The next implication of the resilience results for Bandung in promoting local governance is in terms of mechanism and operationalization. The results have directly pinpointed the sectors that needs to be enhanced, allowing the city, local authorities, and agencies to plan clearly allocated time and budget for particular activities accordingly. This enables them at a later stage to present clear outputs as follow ups of the assessment to city senate on the designated budget, diminishing corruption practices and supporting good local governance principles. This would be good exercise and learning process for local government and authorities of Bandung in increasing their capacity and skill in sharpening their disaster preparedness and risk management knowledge, which is a good asset and investment in delivering better services to public (communities).

As plans are set, including methods, actors, and time frame; DRR activities are set to be operationalized. Clearly, for this purpose, a communication method is required to transfer the set initiatives down to communities. A strategic actors, or better, risk communicators then are vital. Making thus the existing actors within communities visible to city government and local authorities that link the needs and concerns between government and community. This two-way process of communication is consequently ensuring public participation and minimization of conflicts. This two-way

of communication warns people and motivates behavioral changes about issues that pose threat to health, safety, and environment from the sender to the recipients of information (Aakko, 2004). Reflecting back to the assessment results, risk communicators at community level is therefore required to enhance the social, economic, and institutional resilience, which may promotes the up-scaling of existing community activities to be utilized as risk communication process and vehicle for DRR. Thus above evidences and arguments presented for the first research question will strongly promote the local governance. These will lead to risk communication process and approaches to designate disaster risk reduction strategically, which is asked as the next research question.

7.2 Risk Communication Approaches at Community Level

The second research question of this thesis is "What are the risk communication approaches in the community that can enhance the disaster resilience?" The hypothesis to the question is that to enhance disaster resilience, approaches of existing community-based disaster risk reductions actions, and resilience activities of Community-Based Society Organizations (CBSOs), acting intermediaries between government and community at the local level, are conveyed and communicated to wider communities and served as risk communication platform. To identify and explore these CBSOs' risk communication processes, an approach named Social Institutional and Economic Resilience Activities (SIERA) is developed. This was formulated in this study to reveal their existing DRR activities at the community level. The SIERA approach highlights their contribution to the risk communication process as the follow up of the resilience assessment, in the overall resilience building of Bandung, which are identified as weak sectors at city level assessment.

CBSOs such as Women's Associations, Youth Unions, and Faith-Based Organizations have proved in Chapter 5 that they are effective risk communicators for wider community. Key findings to support the above justification are described in the following sections below.

7.2.1 Women's Active Involvement in Sustainable Development

Women in Bandung form associations that initiate at the city until neighborhood level. Results from the empirical studies in Chapter 5 has showed that Women Welfare Associations (WWAs) have wide range of activities, which can be identified and characterized as disaster risk reduction actions, precisely what the study is trying to investigate. The research has grasped their perceptions and current situation on their activities in the social, institutional, and economic sectors. The empirical study was targeted WWAs leaders at ward, city's administrative unit that are the closest to communities, neighborhoods, and households. The structure and nature of WWAs' organizations and activities are unique. The WWAs leaders are the spouses of particular heads of government at city, sub-districts (30), and wards (151). This relation brings influence to their activities; therefore WWAs' activities are mainstreamed on to the path of city development. Moreover, WWAs leaders are influential and regarding as the role model for women. Women tend to listen to their leaders and therefore have a clear

command and demand line from the city until ward level and vice versa. Consequently, they can represent the majority view of women in the community (members of WWAs).

The SIERA approach has revealed and categorized WWAs' risk reduction activities within three sectors (social, institutional, and economic) in different disaster time-frames (pre-, during-, and post-disaster). Key findings showed that WWAs tend to invest long-term DRR activities in pre-disaster and are mostly active in the social aspect (population and health sectors), although their first priority of DRR actions are desired to be put on the economic aspect, such as in income and finance and savings sectors that may add value to the enhancement of resilience to disasters. WWAs' risk reduction activities are strong in the social aspect, such as conducting family planning to decrease the city's growth rate, conducting health concern campaigns at the community level, and protecting children and elderly with specific empowerment programs. These are WWAs' key actions in Bandung. Constructing bio pore absorbers (small holes on the ground surface to absorb rainwater) is the distinctive WWAs' flood risk reduction measures in their neighborhoods. This activity is mandatory and becoming the regular program of WWAs in Bandung. Aside through their activities in engaging the communities to participate in their DRR activities, WWAs in Bandung have also utilized media, such as commercial radio to promote their risk reduction activities to wider public as their solid risk communication method. Lastly, local disaster risk communication processes are showed in different types of areas of Bandung (mountain, center, old part, out fringes, etc.). These are derived from five specific WWAs' DRR activities (mostly in social and institutional aspect) such as: (1) awareness and drills, (2) emergency and early warnings, (3) data collection and communicating to officials, (4) establishing early warning system with local government, (5) inform and update disaster condition to officials. To perform these risk communication processes, it requires coordination and strong networks among members, communities, and between local authorities. Therefore the results presented for the WWAs have confirmed that women in groups can act as intermediaries for risk communication processes in Bandung City. They have utilized their social networks and tools (women's activities and radio) that may function as effective means to transmit risk information (Gandelsonas, 2008 in Mulyasari and Shaw, 2013). Potentially, social networks based on gender can have positive social value and strategic significance in the communication of vital knowledge and information (Gandelsonas, 2008). Thus women in groups drive the DRR process and subsequently build an active citizenship that addresses development priorities in Bandung, reduces vulnerabilities and paves the way towards resilient community for sustainable development (Mulyasari and Shaw, in press).

7.2.2 Youth Participation in Disaster Risk Reduction

The participation of youth in DRR activities for the adoption of risk communication process was investigated. Likewise the results of empirical studies of WWAs, the youth in Bandung are active in the form of unions, with the same hierarchical organization structure as WWAs, at city to neighborhood level. Utilizing the SIERA approach with different set of activities that characterize youth actions, key findings to answer the second research question and support the respected hypothesis are as follow:

- Youth are mostly active during the disaster, compared to activities in other disaster time frame, and proved by high coefficient of determination. They have perceived and affirmed their current activities in emergency responses. Youth Unions (YUs) at wards are active in fund raising, such as collection of used clothes and goods for donation; mobilization in aids distribution; mobilization of youth in neighborhood watching; inventory of disaster losses; and collaboration with community leader in early warning. The involvement of TAGANA members, a Youth Disaster Preparedness Unit, established by Bandung Social Department is influential in promoting DRR among youth in YUs. Addressing the lack of youth activities, especially in pre-disaster time, is partnering with other youth-campus-based DRR, such as Bandung Disaster Study Group who have profound knowledge of awareness and preparedness is highly encouraged.
- Although YUs are strong in institutional resilience, such as in institutional collaboration and crisis management during emergencies, due to TAGANA's influence, most prioritized Youth DRR activities are in the social and economic sectors. Particularly in the economic sector, YUs in Bandung City have established the so-called Productive Economic Business Sector program in their organization. It has administered youth as members of YUs to actively participate in conducting business and bring revenue income to the unions and households. Clothing, merchandise, and prepaid mobile vouchers are few businesses to name. The modality was given and invested by private companies such as National Telecommunication and tobacco industries. These were utilized as YUs' effort in strengthening youth's economic resilience in having wider options of alternative source of income and are mostly needed if the formal sector is interrupted due to a disaster.
- The milestones of risk communication process that are drawn from key findings are that in different types of areas in Bandung, YUs in the residential- and newly developed areas, and out fringes of the city are the most active in communicating the risks. All five-risk communications actions that are similarly identified in WWAs (see Section 7.3.2) are implemented in those three regions in Bandung. Again, the TAGANA-factor (Youth Disaster Preparedness unit) is giving a positive resonance to the operationalization of SIERA approach. TAGANA members that are resided in above regions are as well members of YUs, thus the involvement of TAGANA is crucial in setting the course of YUs DRR activities. These have to be replicated in other types of areas in Bandung; hence a holistic youth-centered DRR will be achieved.
- Aside the YUs' DRR activities comprised in SIERA approach as platform where risk are communicated and treated; media such as television, radio, and newspaper are the top three preferred means of communication by YUs that opens window of opportunity of media to be more actively involved in risk communication process. This was manifested in the form of disaster simulation, broadcasted by Bandung local television, where Youth Unions and TAGANA of Bandung City, as well as Local Disaster Management Agency of West Java Province are strongly involved.

7.2.3 Faith-Based Organizations' Contribution in Minimizing Disaster's Impacts

The basic character of faith-based organizations is in its role of humanitarian aspects. Faith-Based Organizations (FBOs) in the form of mosque councils throughout

Indonesian cities and rural areas play major role in the community. Key findings in the study showed that mosque leaders in FBOs in Bandung are determinant figures within communities and neighborhoods. In disaster situation, FBOs have distinctive actions that make all community-members, disrespected the organizations they belong, united to carry out activities collaboratively in minimizing the impacts of disasters. Most of WWAs and YUs members are also members of FBOs. The SIERA approach highlights that FBOs' DRR activities are strong in socio-economic sector, compare to institutional aspect. FBOs' distinctive activity such as listing the most vulnerable households is annually updated. Local authorities gave this task to FBOs, since FBOs has wide access to households' information. This enables local authorities to disburse aids and strategize actions in case of a disaster. Moreover, FBOs' actions also dominate the humanitarian aspects, such as collecting goods, used clothes, and foods for donation to the poor and disaster-affected people. FBOs also raise funds and charities during the prayer sessions and distributing the collected funds to the needed.

FBOs in Bandung have fulfilled the three key words that may explain the nexus of FBOs as risk communicators, keeping in mind the role of mosques in disaster situation. The first key word is resilience. It highlights the understanding of resilience from UNISDR (2009), to determine of how far the social system is capable to organize itself in order to improve its capacity to learn from previous disasters for better protection in the future and to improve risk reduction actions. Mosque councils in wards in Bandung have showed that they are capable in managing their organizations members and even helping the outsiders. For example, more than one mosque councils in a sub-district in the out fringes of the city were collaborated with the local market, community, and private sector in managing wastewater and sewage system to avoid clogging and reducing the flood risk during the rainy season. These FBOs mobilized the community and local market people to take action in repairing the pipelines and initiated in the construction of a water pump. The second key word in regard of FBOs as risk communicators is community. Community in FBOs in Bandung means a group of individuals who gather based on the common interests and goal with a social bond. In their unconsciousness, the mosque leaders and members (surrounding community of Islamic believers, such as men and women of different age groups) of FBOs in wards in Bandung have built such a social system, that they are the first responders during emergencies. It is common that they are also overlapping members of other organizations in the community (WWAs and YUs). Being aware of living in hazard prone areas and susceptible to floods, ignite the FBOs to be aware and responsive in disaster situation. The third key word is disaster management. The Islamic perspective of disaster management is traced in Al Qur'an (Holly Book of Islam) and operational actions of FBOs in disaster management cycle will success if the resilience mechanism, in this respect, role of mosque is functioned. Therefore, actions in disaster take place, if there is high participation from the community. FBOs and its members can give support in the form information to emergency authorities. FBOs in Bandung, particularly those that are located in flood plain, showed by key findings through statistical method, that their action on data collection and communicating to officials has a high degree of relationship with informing and updating disaster status. This is inline with the time during the Prophet Muhammad SAW (after 570 AD), that a mosque had multi-functions,

such as place for education, hospital, court for prisoners, etc., including information center (IRI et al., 2011).

Lastly, the close knit-tight relationships with communities made mosques as trusted place for communities in seeking psychological solace in post-disaster. Moreover, the mosque construction allows the place as evacuation shelters. Simple but complete facilities such as hygiene, sanitation, and open space for resting, made the mosques as FBOs in Bandung are accounted by local authorities as their representatives in delivering communal service. The speakers in mosques' minarets that are used to announce prayer times during normal situation is effective in conveying warnings to wider communities. Thus, the combination of FBOs' nature of organization and services they deliver and its physical facilities, made FBOs in Bandung as place-based risk communicators for communities. The adding value of mosque councils as risk communicator is the regular prayer of five times daily as the opportunity for communities to interact and discuss essential issues, such as disasters. Thus all in all, the empirical study of FBOs in Bandung has showed that they are contributing in minimizing the impacts of disasters.

In overall, the involvement of CBSOs and its activities, explained through key findings in the study, have contributed to the risk communication, risk reduction efforts, and enhancing the resilience effectively. Although the CBSOs risk communication process is focusing on enhancing the social, economic, and institutional sectors, however their risk reduction activities may contribute positively to other sectors. The resilience assessment earlier has covered physical and natural sectors. For example, land use in natural terms such as area vulnerable to natural hazard and settlements on hazardous ground are closely linked with risk communication. CBOSOs and community members particularly living in these areas may communicating to other members and outside stakeholders the high risk of land use activities in these regions during regular local coordination meeting of Bandung development. This risk communication is extremely important and needed, particular for northern part of Bandung, where the amount of open green spaces are overdeveloped (Chapter 4). Their activities serve as platform of interaction in exchanging risk information. Therefore, risk communication at community level is an essential contribution to the development of a model of comprehensive risk communication approach for disaster resilience and addressing the third (last) research question in the next section.

7.3 Model of Risk Communication Approach for Disaster Resilience in Bandung

The third and final question of this thesis is "How is the effective risk communication approach contributes to disaster resilience?" The hypothesis to this final question is that a comprehensive risk communication approach that enables the integration of resilience assessment and risk communication in allowing the two-ways communication processes between city and its citizen, between government and communities, takes place.

Based on evidences and key findings that are promulgated in this thesis; starting from the extensive five major issues of literature reviews on (1) climate-related disaster and resilience in urban context with its emerging risks, (2) role of local government in DRR,

(3) CBDRR and Management approaches, (4) risk communication and (5) role of media in risk communication process; followed by the national context analysis of DRR, Climate Change and its related disasters (climate-related disasters) in Indonesia, down-scale to the need of climate-related disaster resilience assessment in local context (Bandung City), and empirical studies on risk communication approaches at the community level through three CBSOs (WWAs, YUs, and FBOs) and for individuals; to the role of media in DRR and risk communication, the model of comprehensive risk communication approach as the final output of this research is presented in Figure 7.1.

The model is labeled as Comprehensive Risk Communication Approach for Disaster Resilience, or in short City-Community Communication. This model approach is effective, because of several reasons:

It is comprehensive, hence it involves all actors, approaches, means, sector-wise, and time-scale based. It is integrated, hence it assimilates two approaches namely resilience assessment and risk communication process, blending local government and community efforts to act upon improvements in resilience in achieving ultimate disaster risk reduction; with the media as the connector and mediator in bringing the gaps and issues, concerns, and needs of both sides, government and community closer. The Multi-Stakeholders Platform for risk communication (MSP RC) at the city level is the key forum in addressing the aspects collaboratively in seeking ways, solutions, strategies, and plans; and to set planned actions in operationalization, key local stakeholders such as government and agencies, academe, private sector, CBSOs, and other organizations are strongly involved. This risk communication approach is called network practices, because it consists of a larger, loosely knit, geographically distributed group of individuals engaged in shared practice, but who may not know each other (Brown and Duguid, 2001), working towards a collaborative goal. From this point, risk communication processes and approaches through Community-Based Society Organizations, such as Women Welfare Associations (WWAs), Youth Unions (YUs), and Faith-Based Organizations (FBOs) take over. With their respected DRR activities as Single Platform for risk communication (SP RC), risks information and key messages are transformed and conveyed to communities. This risk communication approach is called community practices, because it consists of a tightly knit group of members engaged in a shared practice who know each other and work together, typically meet face-to-face, and continually negotiate, communicate, and coordinate with each other directly. In a community of practice, joint sense making and problem solving enhances the formation of strong interpersonal ties and creates norms of direct reciprocity within small community (Lave and Wenger, 1991).

Finally, it is two-way communication, hence a process of exchanging risk information between city and community takes place; where concerns, prioritization of actions, and needs are communicated and addressed. It is reciprocating, creating a two-way of communication of informed decision and actions, knowledge, and messages between sender and receiver through media practices and underpinning the fundamental principle of risk communication. The novelty of this model is that it can be applied not only in Bandung City but other cities in and outside Indonesia.

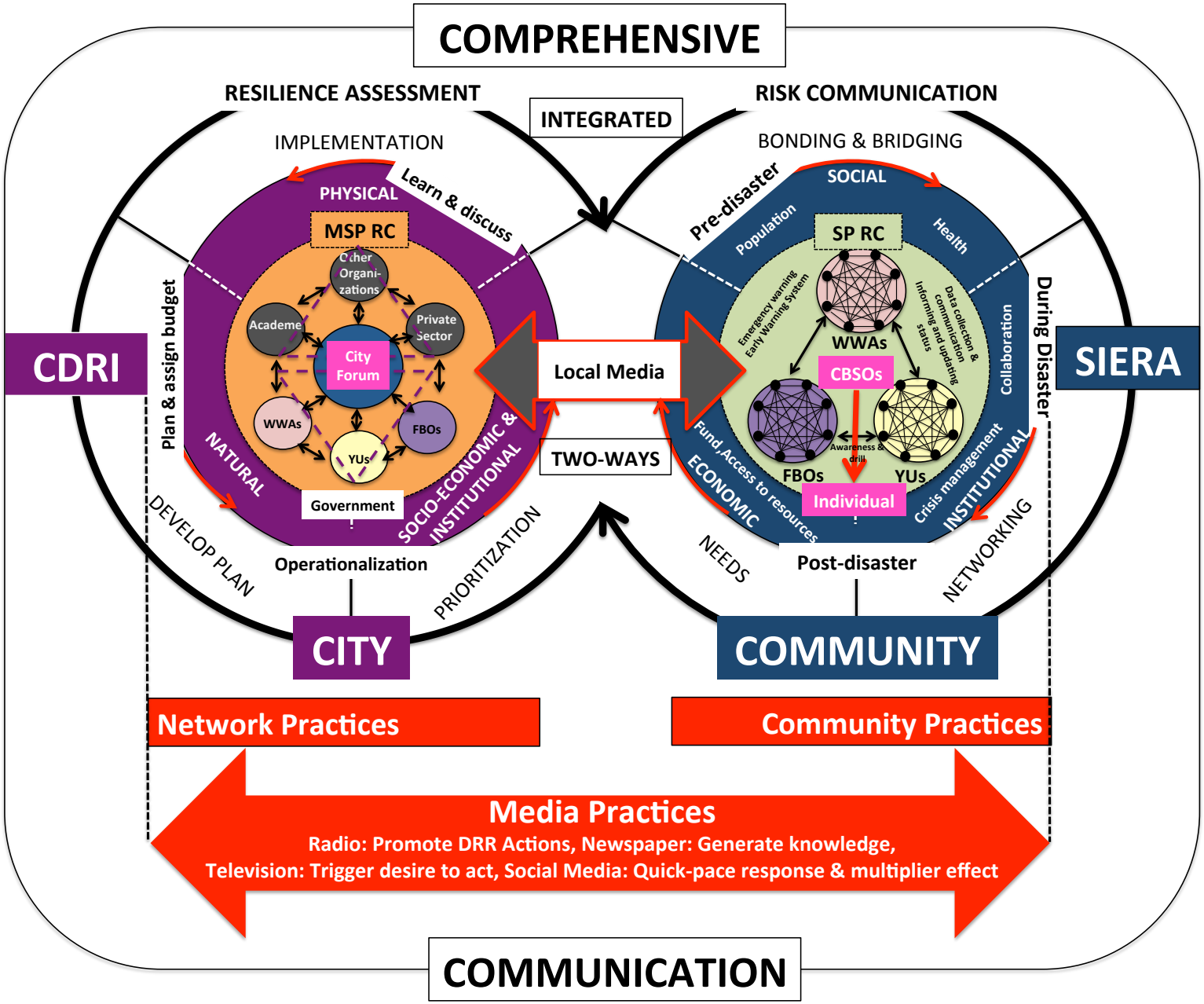


Figure 7.1: Model of Comprehensive Risk Communication Approach for Disaster Resilience

It is a contextualized, yet a generic risk communication approach. To have a comprehensive approach of risk communication, three indispensible elements should be in place; network practices, community practices, and media practices. The contents of each practice are subject to and contextualized to each area's condition. For example, it may happen in other area that in community practices, CBSOs other than WWAs, YUs, and FBOs are arising and identified as local champions and risk communicators to community. The bottom line is that there should be local actors and local actions that drive community to take actions in enhancing the resilience, as in accordance with the fundamental principle of risk communication that it triggers people to act, correctly.

In enabling risk communication approaches to be comprehensive, integrated, and two-ways; supporting assessments, plans, and actions are required to be strategically placed. This study attempts to elucidate first the guiding/fundamental principles for the risk communication model. These are: (1) risk communication is an integral component of risk management, including resilience assessment (2) local stakeholders are the focal points, (3) decisions on risk communication actions/resilience activities are evidence-based, tapping from the local experiences of local actors and natural sciences (experts' and authorities' views), (4) risk reduction that leads to risk management and risk communication processes are transparent, and (5) strategic risk communication processes and approaches require continuous improvement through evaluation. The above fundamental principles are illustrated within the stages of continuous DRR and risk communication cyclic process in Figure 7.2.

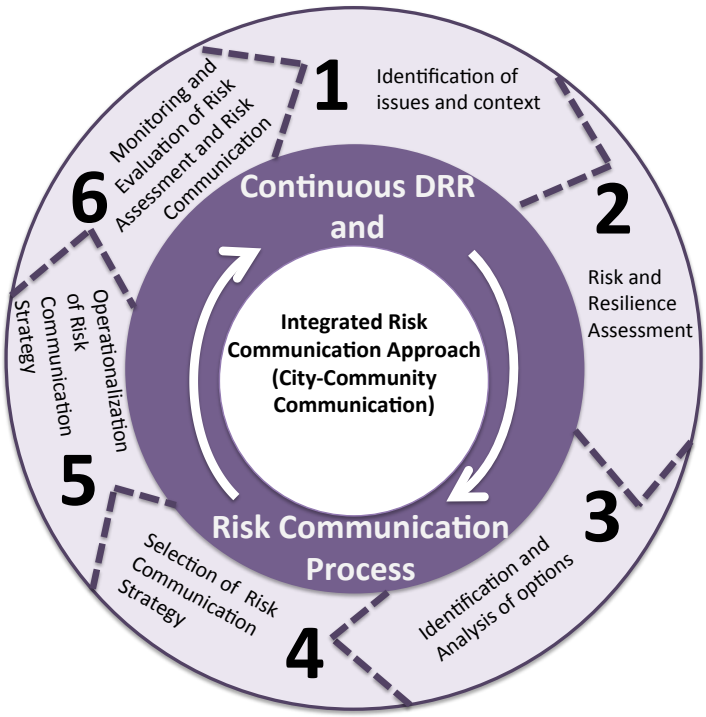


Figure 7.2: DRR and risk communication cyclic process:
Roadmap to comprehensive risk communication model in enhancing the disaster resilience

Figure 7.2 is drawn from key findings of this study that are needed to generate the comprehensive risk communication model as discussed in following sections. This

stages/step by step process will help the Government of Bandung City due to several reasons:

- Bandung City does not have a body/city agency yet that deals with disaster issues (disaster management agency at the city level), thus no disaster management plan and DRR framework is currently in place. In the previous years, disaster issues were a small part that is being tackled in Bandung Agency and Service, namely in Community Empowerment, Protection, and United Nation Agency *(Kesbanglinmas)* and Social Service *(Dinas Sosial).* In December 2013, the Government of Bandung City has established an Ad-Hoc Disaster Emergency Body, while waiting for the establishment of City Disaster Management Agency (Merdeka, 2013). Reflecting the need and the urgency of Bandung in recent years (mostly due to HFLC disaster events), the Mayor conveyed that establishment of City Disaster Management Agency is in the planning for the next budget year (Merdeka, 2013). Therefore, the step-by-step process will enable and guide Bandung City to approach the risks and disasters issues in systematical manner and involving the related stakeholders.
- The step-by-step process can be utilized for other hazards that the city is as well at risks, such as earthquake risk *(*due to *Lembang Faults)* and volcanic risk *(*due to *Tangkuban Perahu Volcano)*. And thereby renewing and triggering Bandung City in enacting the RADIUS Program, which was halted in late 90s (Chapter 4).
- Reflecting from above reasons, the proposed risk communication contributes as well to sudden-onset disasters, such as flashfloods, landslides, etc. It is how the small disaster preparedness leading by CBSOs within the neighborhoods contributes to risk communication for rapid onset hazards.

This step-by-step process is elaborated and discussed in following sections.

7.3.1 Emerging Urban Risks and Increased Climate-related Disasters

Key findings from literature review in Chapter 2 serves as a foundation of the proposed risk communication model and are the first stage in DRR and risk communication cyclic process (Figure 7.2). There is a need to identify the issues and its resilience context in the beginning, to find out the current status of the city's resilience and capacity, especially at the local level. This is imperative to know on what ground the city and its communities are at risk. Key findings from Chapter 2 showed that based on global evidences presented in literatures, climate-related disasters are tending to be increased over the years. Although major geophysical disasters such as earthquake, tsunami, and volcanic eruption are the deadliest, however major climate-related disasters such as flood, landslide, storm, and drought are affected the most people. People at the local level suffered from major economic losses and foremost due to high frequent and low consequent (HFLC) floods. This condition is exacerbated due to the growing urban population as the most emerging risk. Thus, drawing upon the theoretical understanding and worldview facts, there is strong need in understanding the resilience to climate-related disasters in urban context, where risks and resilience needs to be assessed and communicated locally. Shaw (2012) mentioned that local components of a city, such as local authorities and communities obtain largest disaster impacts. It implies that the need of resilience to climate-related disaster at the local level is strong.

7.3.2 Local Resilience Assessment

Key findings of Chapter 2 thus recognized the importance of resilience at local level, emphasized by Matsuoka (2013) and Gulsan et al. (2011). This brings to the second stage of the cyclic process of assessing the risk and resilience locally (Figure 7.2). The diversity within a city and its impacts on vulnerabilities and resilience is extremely important in assessing the strengths, weakness, opportunity and threats of city's sub entities. As Gulsan et al. (2011) discusses, to build a resilient city requires detail and careful assessment of its current vulnerabilities' and resilience' level. Because there are large differences in risk and vulnerability within urban areas, and therefore, the vulnerabilities and the resilience level would not be the same for all parts of a city (Satterthwaite et al., 2009).

Therefore, key findings of Chapter 2 highlight the resilience theory that underlines the contexts of underlying and emerging urban risks need to be identified. It is extremely important to properly address issues in communities. It defines the different dimensions, whether a city and its components (infrastructures, government, people, etc.) can be considered as resilient. Godschalk (2003, p.137) mentioned that "a resilient city is a sustainable network of physical systems and human communities", whereby both elements must be able to survive and function under extreme stresses. Thus a resilient city and its components are regarded as "a constructed phenomenon, not just in the literal sense that cities get constructed brick by brick, but in a broader sense" (Valle and Campanella, 2005, p.135). This implies that the conceptualization of disaster resilience of this study is based on the view that the term resilient city is approached from the perspective to understand the strengths, weakness, abilities or capacities of communities (van Aalst et al., 2008; Bruneau et al., 2003; Cutter et al., 2008), which are embedded in a densely environment to cope with climate-related disasters. Thus, the concept of a resilient city is the ability of human beings that are living in built environment (physical context), to absorb and manage a disaster is shaped by political (institutional and governance contexts), socio-economic and natural dimensions (Adger, 2000). It summarizes and underlines the context of physical, social, economic, institutional, and natural dimensions that aim to address the city and its components to function in case of a disaster. Local implementation on risk reduction and resilience building is thus imperative.

Key findings of Chapter 3 on risk reduction approaches and resilience to climate-related disasters from a country perspective, such as Indonesia, emphasizes the essential of disaster management at the local level. Institutional framework and disaster management at local level is stipulated and enacted in new Disaster Management Law. This implies that local actors should take more part on local DRR implementation and resilience building. Therefore, to carry out proper risk reduction actions, resilience needs to be assessed and risks need to be informed to communities. Risk communication process includes as the crucial element in disaster resilience. This provides the entry point of assessing the resilience and communicating the risks in the city context, such as Bandung City in Chapter 4.

Key findings of Chapter 4 on the resilience assessment in Bandung City highlights the different level of resilience values at two different spatial levels; at city and sub-districts

as sub-city entities. Based on the assessment with CDRI tool, it comprehensively measures and reflects aspects of Bandung City's resilience to climate-related disaster. The conducted assessment tries to disentangle specific aspects of emerging risks in Bandung City, such as unplanned development, urbanization, the income and employment sectors, the quality of ecosystems that are amalgamated as parameters to alleviate the probability of shocks and to respond socially, institutionally, and economically effectively, if a disaster occurs. The key findings in Chapter 4 also show that Bandung City in overall has a moderate resilience value (score 3.1 out of 5), which underpin the need for improvements, especially on the social, economic, and institutional dimensions that has scored a resilience value of below than 3. On the contrary, at sub-city entities such as sub-districts' assessment in Bandung, the resilience values, particularly on the aspects that are rated poor at city scale (social, economic, and institutional), are the strongest sectors. It underlines the essential of implementing resilience assessment locally in order to identify the entry points for enhancing this weak resilience. This implies that in sub-districts, there are local actors that are potentials in enhancing the resilience and take a role as risk communicators to communities.

7.3.3. Risk Communication through Local Actors

The third stage in the DRR and risk communication cyclic process (Figure 7.2) in this study is identifying and analyzing options for risk communication strategy. Once the status of risks and results of the resilience assessments are known, local government has the responsibility in informing the status to what extent are the public at risks; hence solutions, ways, and means can be determined collaboratively with different stakeholders, underpinning the gravity and priority in local DRR and disaster risk management (DRM). Key findings of Chapter 3, on the Indonesian context, illustrated the progress of Indonesia in building resilience to disasters and climate change. Important key findings from the Chapter 3 are built around for the third step in the cycle process. One is that DRR and DRM in Indonesia is bond by the Law No. 24/2007 on Disaster Management (DM) and that Indonesia's progressive changes in DRR planning have been driven by the existence of regulatory frameworks related to the DM Law and the existence of the participation of multi-stakeholders at the local level. It introduced as well a fundamental paradigm shift in DRR from emergency response to preparedness and pro-active approaches. These can be discussed in the multi-stakeholder platform (MSP) at the city level, where various city' stakeholders are participating in identifying and analyzing options of resilience improvement and DRR. As mentioned by Pelling (2007) that participatory disaster risk assessments are extremely influential to be examined for their potential to be empowering, to generate knowledge, to be scaled up, to be a vehicle for negotiating local change and as part of multiple methods approaches to disaster risk identification and reduction. The establishment of MSP in Bandung is thus an innovative strategy at the city level in facilitating better coordination and collecting of resources and knowledge that can facilitate better proactive approaches. Thus Bandung's MSP encourages the identification of innovative pro-active approaches at the local level and setting risk communication strategies collaboratively.

7.3.4 Risk Communication Strategies

To be effective, risk communication process component enters the fourth stage of the cycle process (Figure 7.2). Key findings of Chapter 5 identified the enabling environment, means, and foremost actors that will receive the risk and resilience status information from the MSP, and transfer these messages to community, thus as the intermediaries; hence appropriate countermeasures, preparedness and DRR, and resilience activities can be decided and taken. Key findings of Chapter 5 identified and elaborated on possible risk communicators existed at sub-city entities. Innovative local risk communication approaches are needed on the ground, within the communities, to be revealed. It is also open the window of opportunity in reducing the gap between the theoretical and evidence-based knowledge to practical solutions in enhancing the resilience. This is showed by the existing Community-based Society Organizations (CBSOs) in Bandung at sub-district and ward level that are offering these practical approaches and have for long benefitted the wider communities through their activities. These existing CBSOs, such as Women Welfare Associations (WWAs), Youth's Unions (YUs), and (religious) faith-based/mosque-based organizations (FBOs) are the major groups found in Bandung City that have knit-tight networks and collaboration with the surrounding communities. Key findings of Chapter 5 highlight the involvement and participation of women, youth, and community leaders in mosque-based organization in Bandung. It has come to light of several reasons: long history and typical community groups found nationwide in Indonesia, close and working together with and for communities, have access to vast human resources and great influences to bringing change within the community.

Thus, these CBSOs are the social capital for government and community, which entail working across communities and could also be advanced to promote objectives of participation and community involvement that are key to many government regeneration initiatives (Putnam, 2000; Begum, 2003). One credential issue is that these CBSOs inhibit is typical, signature activities that can be categorized as DRR activities to enhance the community resilience. Not only that these CBSOs are shaping the motor engine for the community to commonly undertaken risk communication process, wrapped up in DRR activities, but for an example, the involvement of women's associations in Bandung has addressed the cross-cutting issue of this study, such as gender in DRR and resilience. Since gender and social relations mediate how women and men live, women and men do not experience the physical and social spaces of their neighborhood in the same way (Mulyasari et al., in press). Thus, Khosla and Masaud (2010) raised that women's social and institutional stratification inhibits different experience, knowledge, and perceptions, which are central to the understanding and reduction of impacts of climate-related disaster events at community level. The participation of other community members, which are not belonging either to women and youth's group and mostly men, has been accommodated in the mosque organizations in Bandung. Thus, all in all, the inclusion of women associations, youth unions, and mosque organizations in the research have comprised all community across gender, age's range to common organization. Moving from this point forward to the fourth stage of the cycle process, leads the revelation of strategy in the risk communication processes and approaches through the identified CBSOs from this study.

Key findings of Chapter 5 also reveals through SIERA approach that women's groups are most active before the disaster on social issues such as population and health. Whilst youth's unions are most active during the event and strong in institutional issues such as crisis management and institutional collaboration, the influence of TAGANA members is accelerating the unions in DRR activities. Faith-based groups are participating more in after the disaster. Their strengths in humanitarian issues such as funds rising, charities, and donations, practicing thus their communal service that made them acknowledged by the local government as their partner in disaster situation. These findings imply that none single community organizations can work alone in every disaster situation. To make risk communication work, strategies among the organizations should be developed in mapping their strength and weakness to fill each other gap. Because the SIERA approach for risk communication conforms that risk reduction and management should no longer imply a response attitude; the collaborative of CBSOs' activities with communities serve then as platform in conveying risk information and messages throughout all disaster phases. In turn, the SIERA approach addresses all agents and all actors, and all phases pertaining to disaster vulnerability; thus it illustrates effective and strategic risk communication approach that was raised by McEntire (2001). These findings bring to the fifth stage of the DRR and RC cyclic process of the operationalization of risk communication though local actors.

7.3.5 Operationalization and Implementation of Risk Communication Strategies

Thus, the formulation of SIERA approach in the previous stage in analyzing the risk communication process through CBSOs' DRR activities is uttermost essential, as the gate opener for overall disaster risk management and resilience building at communities. The emerging studies of risk communication by various scholars have not clearly mentioned about the role of community entities (CBSOs) as the actors; therefore this study offers the SIERA approach. It shed the light on the probability on how CBSOs' DRR activities in Bandung contribute to risk communication process, because it includes the function of social networks within the social context in risk communication (Johnson, 1987). Consequently, the extent, complexity, and membership of social networks can affect the speed and the accuracy with which messages about hazards are transmitted. Such networks, which are fabricated in groups in community, will then affect the credibility of informed messages. Thus, the CBSOs' SIERA approach was also built upon the approaches by O'Neill (2004) that the small group of people who are involved through a participatory process at the beginning of the communication program may co-define what capacities are needed in a community and by which means they should be developed.

Therefore, the SIERA approach as risk communication strategy calls for action. It is how DRR activities of the three identified CBSOs in Bandung are transformed and channeled as appropriate risk communication actions. Because the foundation of risk communication process is at the end carving on how informed decision translate into actions in appropriate and timely manner. This local risk communication approaches at the community level is extremely important not only that it has been justified in the earlier chapters why there is a need of risk, resilience, capacity assessment at different levels in city and across different disaster phases, but because virtually all disasters

experienced at the local level (Col, 2007). The foremost argument that this study would like to argue is that the small and medium scale disasters (High Frequency and Low Consequence/HFLC disaster event), such as regular flooding and inundation in Bandung will lead to large scale disasters. Thus local actors (three CBSOs) have to cope with these disasters by themselves because the support to respond to and recover from these small and medium scale disasters are not extended by the central government (Kafle and Murshed, 2006). Consequently the stakeholders at the local level have to acquire sufficient capacity to prepare for and cope with the crisis on their own.

Key findings of Chapter 5 identify four key points that are considered on the operationalization of SIERA approach for the risk communication process as the exit DRR strategy for enhancing the resilience. The first key point is the root causes of disaster risk communication problems in Bandung. The decomposition of these threads was addressed during the Focus Group Discussion (FGD). The three CBSOs and local authorities in different types of areas in Bandung are standing on the common ground that there are three major contexts that should not be overlooked in risk communication process. These are the socio-economic, institutional and policy, and technical (sender and receiver issues) context. Whilst the socio-economic defines on how risk communication responses to risk are embedded and evolved within broader social environments and achieving the promise of risk communication across a diverse economic condition of society (Vaughan, 1995; Grothmann and Reusswig, 2006). The institutional and policy aspect underpins the success of communication and participatory strategies if diverse communities are engaged as partners in the policy process (Vaughan, 1995).

The second point is the technical aspect. It is focusing on how the sender of risk information conveys the messages and how the receiver of risk information is acting upon the message. Only through these contexts, CBSOs' DRR activities can optimally be set to operationalization and inline with the context set in resilience assessment at the initial stage (social, institutional, and economic). WWAs are addressing more to social issues such as in the population and health sector. Their activities in health and population are the entry point of risk communication process to communities. Family planning campaigns in reducing the population growth so that Bandung will not be overcrowded are recognized as the most impacted activities in the province. Bandung being the third largest city in the country is as well the capital city of West Java Province, the most dense populated part of Java Island. Thus, WWAs are making efforts in anticipating one the underlying urban risks to climate-related disasters. Some micro WWAs' risk communication actions work in different types of areas, especially in the flood prone areas. Risk communication actions such as data collection of disaster losses and communication the data to local officials and establishing early warning system (EWS) with local government have been identified and are strongly related. This imply that solid and women-sensitive EWS in flood prone areas needs to be established in enabling the WWAs to convey proper risk information to women and communities in their areas and underpins that the influence of women can greatly contribute to the adoption of protective measures and hazard adjustments (Perry and Lindell, 1986). It confirms that women in groups are contributing in enhancing resilience, addressing priorities for sustainable development. Thus, it signifies women's empowerment in risk

communication advancing the RC SIERA approach. This provides women a platform to interact and a commitment to act with the local government in enhancing their resilience (Mulyasari and Shaw, 2013a).

Similarly, the youth in the form of unions throughout different types of areas in Bandung, are participating in DRR process. They are mainly communicating the risks through community events that they are organizing. Events such as national commemoration days and religious occasions are few to name as the glue that bring all communities together and commonly undertake actions. The role of TAGANA members in youth unions as Youth Disaster Preparedness Unit is significant in the acceleration of risk communication and DRR process in the community. Evidences from the empirical studies showed that the risk communication process is working in areas where the youth participation in DRR is influenced by the TAGANA. Thus, the existence of TAGANA within the communities is extremely important in the risk communication process and setting the course of DRR. Their nature of responsive actions and mobilization during emergencies are not isolating from other type activities of other CBOSs, but youth's responsive actions complement to the DRR cycle process. Thus risk communication actions such as emergency response and early warning, data collection of disaster losses to local officials, and informing and updating the disaster status to local government are youth unions' DRR benchmarks (Mulyasari and Shaw, 2013b).

Mosque leaders in FBOs are influential in accommodating community needs and inspiring the community to act. With these qualities, therefore FBOs are strong in performing social responsibilities and has social-religious leadership roles in communal system. Aside from the psychological trauma healing function, evacuation shelter and financial aid issue are strong for FBOs, since mosques have simple sanitation facilities, mosques can also mobilize and pool emergency supplies and community resources (funds, charities, donations, etc.) for disaster affected after an event. And therefore FBOs in Bandung have the role of *POSKO* (Disaster Coordination Unit), a familiar terminology among Indonesian in disaster situation. Moreover, self empowerment is the key of FBOs, rooted back to historical function that mosques do take part in risk reduction and communication as part of larger disaster management concept, of which these evidences are stated in the Al-Qur'an (Holly Book of Islam) (IRI et al., 2011). With the arguments origin from the Qur'an, FBOs currently shift their views from fatalistic paradigm on disaster and revitalizes the initial role of mosque in serving the community in any condition, foremost in disasters. Thus FBOs in Bandung demonstrate that they are at their best in collecting and distributing aids, such as charities and goods as well as communicating emergency warnings. The speakers in minarets have considerably support the communities in wider message outreach. Results from the empirical study of FBOs showed that they play important role in post-disaster activities and currently contributing to the socio-economic context of the community, revitalizing the self-empowered role of mosque, which is extremely important in disasters situation.

The third key point of the operationalization of SIERA approach is the identification of communication patterns other than their DRR activities. Key findings of Chapter 5 identify risk communication patterns by the three CBSOs to communities. Face to face and direct interactions through weekly and monthly coordination meetings are the most

applied communication mode by all three CBSOs, whether it is inter- or intra-organization. The linking hub of communication among the three CBSOs with communities is THE activity that binds them together, creating another platform is not recommendable by the author; instead, exploring and make that particular informal activities regular and institutionalized, and updating these to government at wards, sub-districts, and city that ensure the communication is two-ways where needs and concerns are raised, is strongly encouraged. For example, the long abandoned tradition of *"Jumsih"* or Friday Cleaning in every neighborhood of Bandung needs to be revitalized. Not only it helps creating environmental friendly neighborhood, thus reducing the disaster risk, but also it binds the entire community member to actively undertake common issue that benefit all and the time to update their neighborhoods in every aspect, where risk and concerns are raised and addressed. This momentum needs to be apprehending by local government to provide communities with tools and resources. Aside from CBSOs' DRR activities for risk communication process as collective perceptions and actions, individual perceptions on disaster risk and CBSOs as risk communicators are captured. It is important in the notion of accentuating individual risk communication approach in influencing behavioral changes towards risk. The finding highlights that individuals in Bandung are aware, understood and participated in CBSOs' DRR activities. Thus it underpins that risk communication does take place in neighborhoods of Bandung.

The fourth key point of the operationalization of risk communication is the involvement of media (radio, newspaper, and television). Key findings of Chapter 6 highlight the essential contribution of those different types of media in Bandung in risk communication and overall improvement of resilience. Media in Bandung (through interviews) have confirmed their contribution and roles in assisting community in different disaster scenarios and contributing in enhancing community resilience in socio-economic and institutional sectors. While the role of the three CBSOs in Bandung is as partner as well as source of risk information to the media, media are regarded by the CBSOs as the tool in conveying information and messages to wider public. WWAs in Bandung advance commercial radio in promoting their DRR activities. The YUs with TAGANA of Bandung City collaborate with local television in visualizing the disaster simulation and drill, although not on regular basis, but sufficient in triggering people to act. The FBOs at wards in Bandung are using printed media, such as local newspaper, leaflets, and bulletins in generating community's knowledge. They distribute this printed information during the regular praying sessions. Thus key findings on involvement of media in Bandung is not only capturing their role in risk communication, but their involvement is also link with the larger issue of the resilience building of Bandung and the roles of the three CBSOs within (WWAs, YUs, and FBOs).

Other key findings of Chapter 6 is the involvement of local media such as community radios, campus-based radios, *Musrenbang* (local annual coordination meeting of development plan between government and communities), RW-net (connection between neighborhoods and government through electronic network), amateur radios (RAPI and ORARI), and CIG (Community Information Group) in Bandung. They considerably help in bringing closer communities issues to households and individuals, translating theoretical approach into risk communication practice. Last important key

finding of Chapter 6 is the recent use of hourly/daily social media (Official Twitter accounts of Government of Bandung and its agencies) in narrowing the communication gap between government and communities. The use of social media in Bandung is promoting government as transparent, credible, and trustworthy source of information for public and has multiplier effect due to vast amount of followers. Thus, the whole concept of media in risk communication and resilience is built on the notion that the process of communication in pre-and post-disaster time frame has to have a balanced proportion of dissemination. Equal attention has to be put not only on events but also on sustaining awareness for the topic 'quiet times' of no immediate danger (Höppner et al., 2010). This implies that risk communication processes, approaches, and risk reduction actions and resilience activities need to be monitored and evaluated on regular basis. It concerns the assessment, contents of information; the actors/senders in risk communication; communication strategies; and the way the information is communicated. Therefore it brings to the last stage of DRR and RC cyclic process (monitoring and evaluation of risk communication).

7.3.6. Monitoring and Evaluation of Risk Assessment and Communication

The sixth and last stage of the cycle process is the monitoring and evaluation of the whole risk communication in the context of enhancing resilience, where risk and resilience are properly assessed, contents of information; the actors/senders in risk communication; communication strategies; and the way the information is communicated are properly planned and set into action (Figure 7.2). Challenges, gaps, and potentials in Bandung City have to be further identified and addressed. This is needed in order to seek whether there are improvements of the resilience aspect in Bandung that will change back the context set in the first stage of the cyclic process. These arguments are not derived from the key findings of the study, but it suggests on the way forward of this study.

Based on the evidences presented in this study, the resilience assessment is dynamic, contextual, and subject to change. Because natural disaster risks and people's understandings of those risks are a dynamic process and they are not static features but change over time (Xiang et al., 2012). Addressing this issue, continuous and regular resilience assessment have to be genuinely indorsed by the Government of Bandung City; hence proper risk communication approaches can be adjusted by the CBSOs as the actors and media as the mediator in the process. As the last mile of risk management, effective risk communication punctuates that the impact of communication will be felt when appropriate action is taken.

7.4 Linking Risk Communication with Bandung City Development

Below are the final key findings emerged from the study. These are possible linkages of the research that can be integrated into Bandung City's current development.

Strengthening the Government Program

The research of risk communication can be linked for further development of Bandung City and not only in disaster situation. The resilience assessment (CDRI results) can strengthen the government program, thus linking the risk assessment results with the

existing documents within the existing framework in Bandung, such as Disaster Management (DM) Plan and Local Action Plan (LAP) for DRR with city development plan documents. This linking was stipulated in the current institutional framework (DM Law No. 24/2007) of the country (Chapter 3). However, since currently Bandung does not have a DM Plan nor LAP for DRR yet, the resilience/risk assessment results therefore is an essential document for Government of Bandung City in guiding them to develop the city in disaster-concerned manner (Figure 7.3). There are general principles in mainstreaming DRR in development planning - budgeting - and operationalization/implementation process. As stipulated in the laws and regulations of Republic Indonesia, all development planning, both non-spatial and spatial, mentioned in Government Regulation/PP No. 8/2008, should have considered the disaster risk in the planning (based on risk/resilience assessment).

It stipulates also that all DRR measures should be programmed in all development planning document (Long term-, Mid term Development Plan and Annual Program). This legal framework background gives the justification for risk/resilience assessment results to be considered and accounted in the budgeting system of City Legislative/Council (House of Representative of Bandung City). The development of DRR budget based on the risk/resilience assessment should be in accordance with the existing nomenclature, as the division of existing authorities, based on Government Regulation/PP No. 41/2007. Therefore, the planning and budgeting process based on the governmental regulations, have the implication that disaster risk assessment and dissemination, including risk communication should be integrated as part of city management activities.

The CDRI results in the form of Bandung City Profile at City and Sub-City level will further strengthen the development at more localized level, because the City Profile contains information that pinpoint the strength and capacities (good and best resilience) that need to be sustained and weaknesses (less and poor resilience) that need to be enhanced/improved; especially on how risk communication process should work for DRR in three crucial periods (before, during, and after disaster). For example, CDRI results can be utilized by the responsible authority for disaster (future Bandung City Disaster Management Agency) as the guidance for awareness rising in the city.

By knowing the capacities and weaknesses in advance, local actors such as CBSOs and their actions at sub-city level can be identified to enhance those weak sectors. Vice versa, the CBSOs can utilize the CDRI results as their programs in the community. These two processes imply on how local government translates the plan into actions, drawing the actions down from city to local context by utilizing available risk communication interfaces such as city forum/MSP at the city level, *Musrenbang* (local annual coordination meeting of development plan between government and community), and *Rakor* (weekly coordination meetings) at sub-city levels (sub-districts and wards) (Figure 7.3).

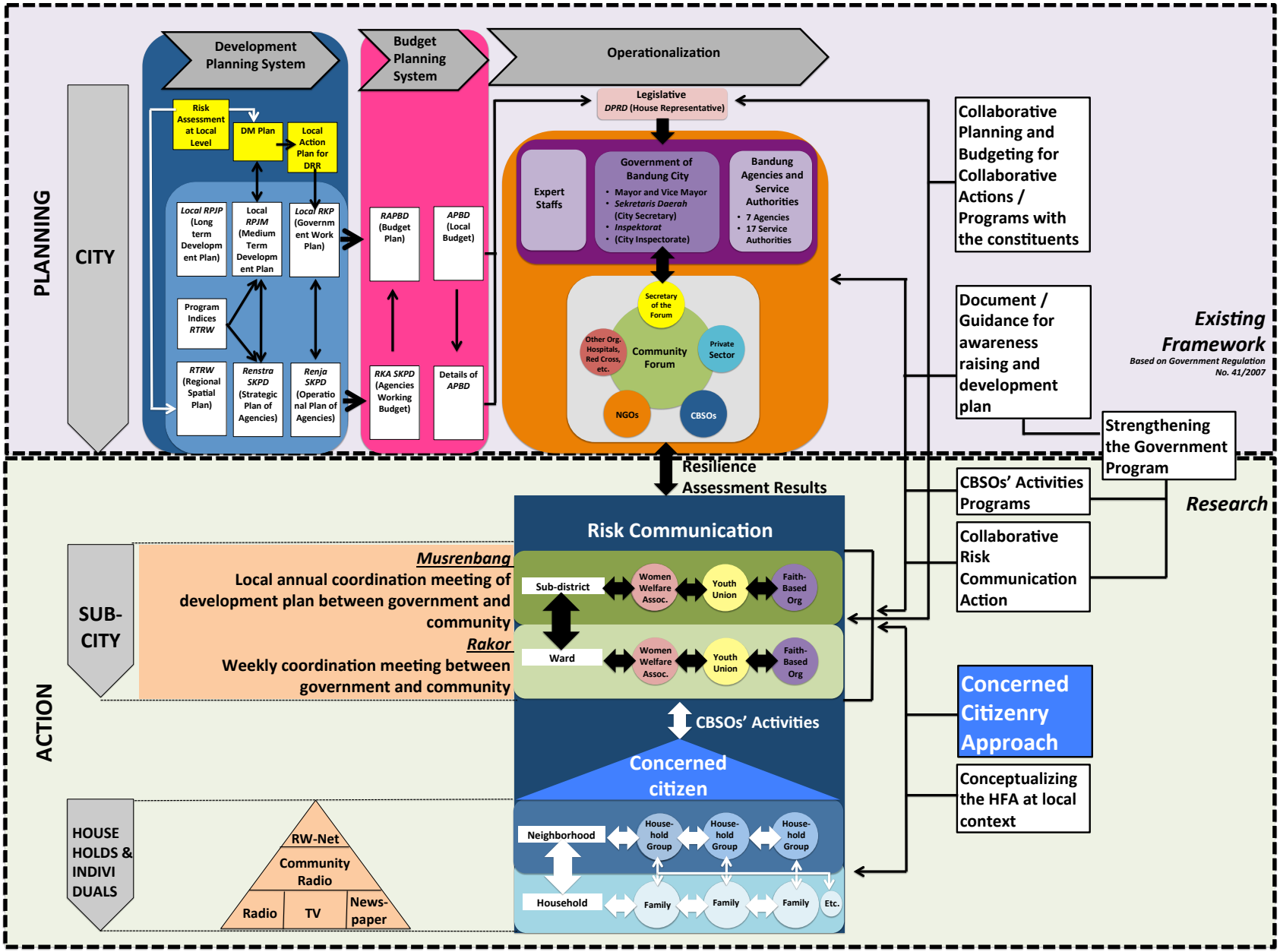


Figure 7.3: Linkages of research with development plan in the study area

Planning Collaborative Risk Communication Actions

The existence community forum together with Government of Bandung City can be described as the Multi-Stakeholder Platform (MSP), as in the earlier section proposed by the author. This community forum/MSP is to inform the key stakeholders in the city on developing strategies in risk communication (RC Plan), containing who is doing what (what areas they should focus on and which activities they should focus on) and where and when the activities are carried out. Simultaneously, the CBSOs are implementing many activities in the social, institutional, and economic domain (WWAs-, YUs-, and FBOs SIERA) that can be stated as good practices in their neighborhoods. These activities need to be up-scaled in order to make the local authorities (who fill out the CDRI/who is doing the sub-city level assessment, such as the sub-districts' and wards' leaders) aware/inform and update about the CBSOs' activities. Hence, the support in terms of budget and funds can be planned and allocated. This process is an important credential issue in addressing the different risk perceptions between three large groups (government, community, and private sectors). Through risk communication at MSP, different perceptions can be pooled, followed by a consensus of a unified view among these different stakeholders in creating a shared understanding of risks through meaningful dialogue. Thus, risk communication is a way in bringing closer the gap of risk perceptions, working towards a common goal (enhanced resilience) (Figure 7.3).

Concerned Citizenry Approach

The risk communication process done by the CBSOs addresses the concept of Concerned Citizenry Aprroach. Through their activities, which are not only focusing on the depth of the DRR issues but also its breadth; they are addressing the sustainability of risk reduction activities in neighborhoods as well. Risk communication of CBSOs through three different types of groups (WWAs, YUs, and FBOs) covers largely wide variety of outreach such as to women, youths, and mosque members, in which most of citizen in Bandung are members of a CBSO in their neighborhood; sometimes members of two CBSOs. Due to their knit-tight relationship with communities, the CBSOs inhibit solid framework and obtain high level of trust from community members. Therefore due to these characteristics of CBSOs, community participation is ensured and sustained. Thereby CBSOs' activities together with community members create communities (individuals) in neighborhoods of Bandung City concerned to disaster issues. Concerned Citizenry Approach has the goal to develop committed citizen who are aware about the risk and to explore, identify, and know possible solution for DRR.

Tucker (1978) mentioned that to capitalize on the information inputs of the committed citizen, public policy makers must be able to identify those individuals comprising the environmentally responsible segment of the society. In turn, these individuals are not only more capable of processing and evaluating information on environmental issues, but also can provide public policy makes valuable inputs on the nature of existing environmental problems, including natural disaster issues. This was confirmed by Conrad and Hilchey (2010) that the movement of concerned citizen is on the rise. Thus, more important, the concerned citizens segment may be potential influence agents in the community who are capable of rallying the general citizenry in supporting, for example, environmental policy programs and disaster risk reduction actions.

CBSOs and families in Bandung City as exemplified in the study have a strong role to play within the community in conducting collaborative DRR actions (SIERA). Reflecting back to the earlier finding of the survey in risk communication approach for individuals, more than 50% of the surveyed people are participating frequently, once per month, in community activities (CBSOs' activities) in their neighborhoods. This strength features Concerned Community Approach, because Concerned Community is built upon individuals and characterizes people who initiate the actions. Thus, the risk communication by CBSOs, an agent-driven approach is gradually shifting to- and triggering the people-driven approach.

In addition, individuals put high trust to these CBSOs (particularly the FBOs) and the traditional mass media (radio, newspaper, and television) for risk communication. Media in Bandung play an important role in risk communication. Results from the interview showed that media involve in humanitarian journalism that leads to social/moral incentives. Media cover stories of affected people, engage community as the news contributors, and contributing in short, medium, and long-term recovery. Because of these qualities, people in Bandung trust the media. Thus the combination of individuals of having well-informed risk messages and high level of trust for CBSOs with their activities and media in Bandung, construct the people to be aware and concerned about disaster issues and respected risk reduction actions. Thus, it is people who eventually drive the risk reduction actions in Bandung and enhance the disaster resilience in their neighborhoods. Therefore, risk communication process in Bandung City is the platform of creating concerned citizen in Bandung (Figure 7.3).

Conceptualizing the HFA at local context

Since the CDRI methodology is based on global agreed DRR framework, the resilience assessment is thus based on the HFA. Keeping this in mind, the CBSOs through their risk communication process can get the opportunity to link their activities as well to HFA, particularly on what new areas they should work on. Thus bringing the global framework down to more localized context that is do-able. Therefore the risk communication interfaces starting at MSP, *Musrenbang*, *Rakor,* and CBSOs SIERA activities are the vehicles in communicating and implementing the HFA at local level.

The above three points are the identified research findings that are possible to link with current system of Bandung City Development. These linkages provide the opportunity in boosting the agenda in the movement, setting forth plan into action with the available resources in the city.

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Chapter 8
Conclusion

"Research consists in seeing what everyone else has seen, but thinking what no one else has thought."
~Albert Szent-Gyorgyi

Chapter 8
Conclusion

The last chapter of this dissertation concludes the understanding of enhancing resilience to climate-related disasters in an urban context through risk communication. The combination of impacts from urbanization and climate change is expected to further increase pressures on urban systems to function not just only during normal times, but to cope with future increasing disaster events due to climate change. Risk communication as an integral component of risk management is creating a platform to enable stakeholder participation in risk reduction process of risk analysis cycle. Risk communication supports the stakeholders to understand the rational behind risk assessment results and management options to take appropriate actions against risks.

8.1 Key Findings

The emerging key findings that are crystalized to surface are coming from several stages of research during the course of the study. It is a huge task in enhancing community resilience through effective risk communication. This concluding chapter attempts to summarize the understanding so far on how risk communication approaches conceive disaster resilience for the society. The emanate points are as follow:

- *Increasing trends of climate-related disasters and emerging urban risks are the driving force for cities in taking actions towards resilience*

The key findings from the literature, that are shaping as the entry points in conducting this study, confirm that the emerging urban risks, such as urbanization, urban setting, poverty, health, lack of sanitation and solid waste management, describe as urban stresses, exacerbated the cities. Particularly for cities in the Asian regions where the most global population reside. The increasing trends of climate-related disasters such us urban flooding, storm, and rainfall induced landslides, which are occurring increasingly due to global climate change compare to geophysical disasters such as earthquake, tsunami, and volcanic eruptions, are adding burden to these cities. This condition forces cities in Indonesia, country prone to climate-related disasters, to take prompt actions to be adapted and resilient towards this phenomenon. Therefore analysis from literatures suggests that there is an urgent need of DRR at the local level. Analysis from literatures also emphasizes two important DRR actors at the local level: local governments and community groups. The community groups, describes as Community-Based Society Organizations (CBSOs), are groups of people who collectively use coping and survival strategies to prepare, face, and respond the disaster situation. The adding value of these CBSOs as important DRR actors at the local level is their close and knit-tight relationship and networks with community members that made them as trustworthy actors of DRR. On the other hand, local government is regarded as best positioned to implement DRR due to their position closer to communities and due to the accumulation of the basic environmental management and regulatory framework and governance functions. Therefore these analyses drawn from literature underline the importance of local DRR actions by local government and communities in enhancing the resilience to climate-related disasters in urban area.

Other key finding that is drawn from literature, which is extremely important in the context of resilience, is that the concept of resilience is closely related to risk reduction. To carry out proper risk reduction action, resilience needs to be assessed, and risks need to be informed to communities. Consequently, risk communication is an essential

part of resilience and risk reduction. Therefore, resilience and risk communication are two important entry points for conducting this study in Indonesia (enhancing climate-related disaster resilience through risk communication). Thus, the urban stresses coupled with shocks are disrupting the lives and affecting people, therefore risk communication in this study becomes very effective in managing small scale disaster.

- *Policy analysis of DRR at national context leads to implications for local level actions in cities in Indonesia*

The proposition of local institutional framework for risk reduction in enhancing resilience is strongly endorsed in Indonesia country. Key findings from the policy analysis of disaster management and DRR at the national level have important implications for the local level DRR. Indonesia as one the most disaster prone countries in the world has enacted a newly Disaster Management (DM) Law. The establishment of DM Law No. 24/2007 was triggered by the 2004 Great Aceh Tsunami, where giant casualties and economic losses are taken place. The impacts of this disaster are thus felt most strongly at local level. Therefore, the newly enacted Law on DM has stipulated that local governments and its entities have to be empowered and self-efficient in risk reduction and disaster management. As the consequence, the national policy on DM and DRR has submerged implications to the local level. These are as follow: i) the urge need of risk and resilience assessment at the local level, ii) the identification of local potentials that may reducing the risks and enhance the resilience through their actions, and iii) the need of institutionalization of local risk reduction actions and practices that make these efforts nailed more to the ground through risk communication. Thus, these key findings also confirm the important role of Indonesia's local/city government and CBSOs in implementing resilience assessment and risk communication.

- *Resilience assessment and risk communication in Bandung support the city development and local governance*

The implementation of resilience assessment through CDRI methodology in the study is an approach to institutionalize local initiatives in risk reduction that are not enough reflected in the national context. Key findings drew from the assessment at the city level supports the Government of Bandung City in pointing out weaker and stronger sectors in stimulating action planning of DRR and resilience activities. Socially, institutionally, and economically are measured weak at city level. On the contrary, these sectors are strong in sub-city level; whereas this sub-city level assessment helps in contextualizing specific DRR and resilience actions by local actors, such as Women Welfare Associations (WWAs), Youth Unions (YUs), and Faith-Based Organizations (FBOs), as the most active CBSOs at neighborhoods in Bandung. Through women's, youth's and mosque leaders' social, institutional, and economic activities, risks are informed and DRR are implemented and therefore it underpins the promotion of local governance in city.

WWAs have proved through SIERA approach to be effective in communicating risk in pre-disaster period. Awareness and drill and emergency warnings, as well as establishing early waning system with local authority and informing, updating disaster status to local authority are as most conducted WWAs' risk communication. Women's activities are strong in social issues, specifically on population and health issues, of which these are the platform in engaging communities in DRR and resilience. Due to

WWAs' nature of organization, their activities are inline with governmental programs and thereby WWAs in Bandung contribute in city development. The YUs are mostly active in during disaster period. Most of the members of the active YUs (40%) are members of TAGANA (Youth Disaster Preparedness Unit) in Bandung. This affects YUs' skills and knowledge during emergencies, such as mobilization of youths as first responders and fund raising. Due to involvement of TAGANA, YUs are strong in institutional sector and have close networking with local agencies and authorities, such as sub-district and ward governments, as well as Bandung Social Service. Most distinguished YUs' risk communication is data collection of disaster losses and communicating these to officials. Additionally, mosque leaders within FBOs engage in humanitarian aspects. Key findings point out that mosque leaders in Bandung are determinant figures within communities and neighborhoods in mobilizing all community members in taking DRR actions. FBOs are strong in socio-economic sector. Mosques' activities provide communities the psychological solace in post-disaster and its construction enable as community evacuation shelters due to its simple yet complete facilities; thus made FBOs as place-based risk communicators and disaster coordination units (POSKO) in the neighborhoods.

Therefore, the conducted resilience assessment through CDRI initiates the translation of planning into action through CBSOs' SIERA. The strength of the three CBSOs is showcasing local practices in risk reduction within the community. Key findings of the involvement of CBSOs and their activities as important local actors in DRR and risk communication at communities have confirmed that they are not only enhancing the resilience of Bandung towards climate-related disaster, but they contribute to city development and local governance as well.

- *Media groups of Bandung City as supporting tool in communicating risks, trigger community in taking risk reduction actions and enhance the resilience*

The larger media and local media groups in Bandung are the crucial tools for Government of Bandung City and CBSOs in conveying trusted messages to wider communities such as development, risk reduction plan and actions. Key findings from larger media group such as commercial radio, newspaper, and television are taking part in risk communication in pre-, during, and post-disaster period. Radio collaborates with WWAs in promoting the DRR activities in environmental sector such as Bandung Green and Clean Campaign. Newspaper is generating disaster and DRR knowledge for communities by engaging experts as the source of information. Articles of preparedness information in facing rainy season, causes of urban flood and countermeasure actions are shared to wider public. Television is triggering people to act as exemplified through the collaboration between local television station with YUs and TAGANA. Disaster drill and simulation is visualized during the weekend to give more impact to people. Social media, such as official Twitter account of Government of Bandung City and its 24 agency and service authorities is a rising and promising risk communication platform in the city to bridge the communication gap between government and its citizen. Local media groups such as community radio, *RW-Net* (neighborhoods' network), and hobby-based group such as amateur radio are bringing the risk information in more localized context, conveying issues that are close to communities and individuals. There are currently four types of risk communication interfaces (RCIs) in Bandung that may serve as platforms in

enhancing the resilience of city and its community. The first RCI is the community forum together with Government of Bandung City, forming the Multi-Stakeholder Platform (MSP) at the city level; second, is the *Musrenbang*, the local annual coordination meetings of development plan between Bandung local authorities and community, represented by the CBSOs; third, is the *Rakor,* the weekly coordination meetings between government and CBSOs at sub-city level; and fourth is the common direct meetings between CBSOs and their members (community members) such as face to face, coordination meetings, common activities (CBSOs' SIERA), praying sessions, religious events, and council meetings. All these four RCIs are platforms between the aforementioned crucial DRR actors. Additionally, media engage community leaders as their news contributors and thereby promote the citizen journalism in Bandung.

- *Effective risk communication in Bandung is creating Concerned Citizenry Approach*

This emanate point concludes the accumulated key findings of the study in Bandung City. Effective risk communication illustrates as comprehensive, integrated, and two-way approach. It is comprehensive because of involving: all actors (Government of Bandung City, Community Forum, and CBSOs), approaches (assessment and communication), sector-wise (physical, social, economic, institutional, and natural), and time-scale based (before, during, and after disaster). It is integrated, hence it assimilates two approaches namely resilience assessment and risk communication process, blending Government of Bandung City and CBSOs to act upon improvements in resilience in achieving ultimate DRR, with the two media groups and four RCIs as the connector and mediator in bridging the gaps and issues, concerns, and needs of both sides Government of Bandung City and its citizen closer. The RCIs act also as platforms in addressing the aspects collaboratively in seeking ways, solutions, strategies, and plans; and set those planned actions in operationalization. Effective risk communication is also two-way communication; local authorities convey development plan and risk information, and captured the aspiration of community (planning innovative ideas for DRR and resilience activities); and CBSOs (community) raise their needs and concerns, convey their aspiration and activities to be accounted in the city development plan towards the path of resilience to climate-related disaster. Thereby, effective risk communication underlines the fundamental principle of triggering people to act towards the risks. With the high frequency of people's participation in community activities and high level of trust putting to CBSOs and media, it is the citizen in Bandung who will eventually drive the DRR and enhancing the resilience in their neighborhoods. Thus, the risk communication approach is gradually constructing people's movement concerning DRR and underlines the Concerned Community Approach, which is not only limited to climate-related disasters, but to other disasters' risks that threat Bandung City.

8.2 Further Research Scope

The study of enhancing climate-related disaster resilience through effective risk communication in Bandung, Indonesia has brought some deep thoughts on further investigations and tries to identify recommendations and innovative ideas as future research scope. These are as follow:

- Institutionalization of regular assessment

Resilience assessment needs to be regularly updated, since Bandung City is campaigning for National Champion City 2014 *(Bandung Juara).* It is an opportunity for Bandung to improve in terms of small local actions but bring significant impact to city's development towards the betterment. Regular resilience assessment should be included in the annual working program of Government of Bandung City. It will reduce the gap horizontally (bring governmental agencies closer in terms of coordination) and vertically (bring government at city and sub-city level closer in terms of collaboration). Thus, the assessment process needs to be included in city's development planning, with clear task description and budget allocation, formally applies to and endorses by city house of representatives.

- Gender studies

There has been less or none significant exploration about the implications of risk communication to gender studies; specifically on different thinking between men and women. Since men and women have different worldviews, their way of thinking are different that will shape different decision on risk reduction action in enhancing the resilience. This is interesting, since the total population of men and women in Bandung are currently almost equal. Gender studies in disaster have not been under scrutinized for Bandung. This will be an add-on value to the overall resilience building on how making individuals resilience to disaster.

- Media performance

The involvement and role of different media, such as radio, newspaper, television, social media, community radio, campus-based radio, amateur radio, and regular local two partite meetings of development planning between local authorities and communities *(Musrenbang* and *Rakor)* combine with local risk communication patterns (face-to-face, direct- and indirect meetings, etc.) needs to be explored more on how these media contributes more to risk communication. Specific approach of risk communication through appropriate media for disabled persons that is not answered in this study needs to be explored.

- Combination of formal and informal education for risk communication

This study is only addressing risk communication through informal system. Traditional and localize risk reduction activities by community groups are the focus of risk communication approaches. Future risk communication research in Bandung can include the formal education pathway to complete the risk communication approach for enhancing the resilience. The formal education system encompasses primary to higher education such as university. It needs further investigation on which level of education system to focus on for risk communication.

- Replicating the model of comprehensive risk communication approach (city-community communication)

Further investigation is encouraged on the model whether it fits to other large Indonesian cities (such as *Surabaya* and *Semarang*) or other region outside Indonesia, keeping in mind the three components of practices mentioned in the model (Figure 7.1 Chapter 7: network practices, community practices, and media practices). All above are

some issues arising at the end of the study that illustrates limitations and triggers new researches in Bandung as well as providing insights to other city than Bandung and other region than Indonesia on finding new approaches of effective risk communication in enhancing climate-related disaster resilience.

8.3 Epilogue

There are other certain limitations in the study concerning the resilience assessment tool as CDRI and risk communication approach as the SIERA. For example the CDRI tool only assesses climate-related disasters and not other disasters, such as geophysical disasters like earthquake and volcanic eruption that Bandung is at risk too. But the dissertation has surpassed why it focused on high frequent and low consequence floods. Moreover, on the risk communication process by means of SIERA approach, it looked to the three dimensions and its respective predetermines parameters only (social, institutional, and economic). It may arise in the future, as city is dynamic, that the weakness sectors are not in terms of social, institutional, and economic aspect. Thus, the risk communication approaches should be revisited from a different angle. But the main principle remains the same; local actors inhibiting risk reduction activities within the community have to be collected, preserved, and capitalized as community's precious assets in risk reduction and eventually enhance the resilience.

Through the exemplary case of Bandung City, the Community-Based Society Organizations prove to be effective risk communicators. The resilience assessment and local risk communication approaches highlight the overarching goal of the study: to enhance the climate-related disaster resilience through effective risk communication. It is worth to note as the final statement of the study that to make the risk communication effective, which means effective in many ways (adequate, compelling, competent, direct, efficient, forceful, impressive, potent, powerful, practical, useful, and valid) for enhancing climate-related disaster in urban areas; people-centered actions and not people-oriented is unarguable.

In this study, resilience thinking in the field of risk communication suggests that actions need greater focus for both pre-disaster of strengthening communities and for the longer term of disaster-affected communities' welfare. This study exemplified that resilience is intimately associated with effective communication, whereby mutual understanding, fostered by two-way communication delivers both needed resources to communities and communities' concerns to government. The role of communication in fostering community resilience is threefold: (1) support the prevention, preparedness, and mitigation through careful communication campaigns, (2) facilitate emergency response during the disaster, and (3) contribute to disaster recovery over combination of information sources and dialogues. Effectively engagement of people and community in groups across society showcased in Bandung City are vital in supporting resilient communities; where high levels of trust and shared values and objectives are aligned with understanding and accepting differences in views and aspirations. Therefore, risk communication to enhance resilience has the meaning more than simply delivering information.

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Appendixes

Appendix 1. List of Sub-districts and Wards in Bandung City

Appendix 2. Climate-related Disaster Resilience Index (CDRI) Questionnaire and Summary of CDRI Results for Sub-districts in Bandung City

Appendix 3. Questionnaire Survey on Role of Women Welfare Associations as Risk Communicators in Enhancing Climate-related Disaster Resilience of Bandung City

Appendix 4. Questionnaire Survey on Role of Youth Unions as Risk Communicators in Enhancing Climate-related Disaster Resilience of Bandung City

Appendix 5. Questionnaire Survey on Role of Faith-Based Organizations as Risk Communicators in Enhancing Climate-related Disaster Resilience of Bandung City

Appendix 6. Questionnaire Survey for Individual:
Risk Communication and Community-Based Society Organizations in Bandung City

Appendix 7. Semi-Structured Interview on the Role of Media in Disaster Risk Communication in Bandung City (Radio, Newspaper, and Television)

Appendix 1

The Map of Bandung City and its 30 Sub-districts and type of areas classification

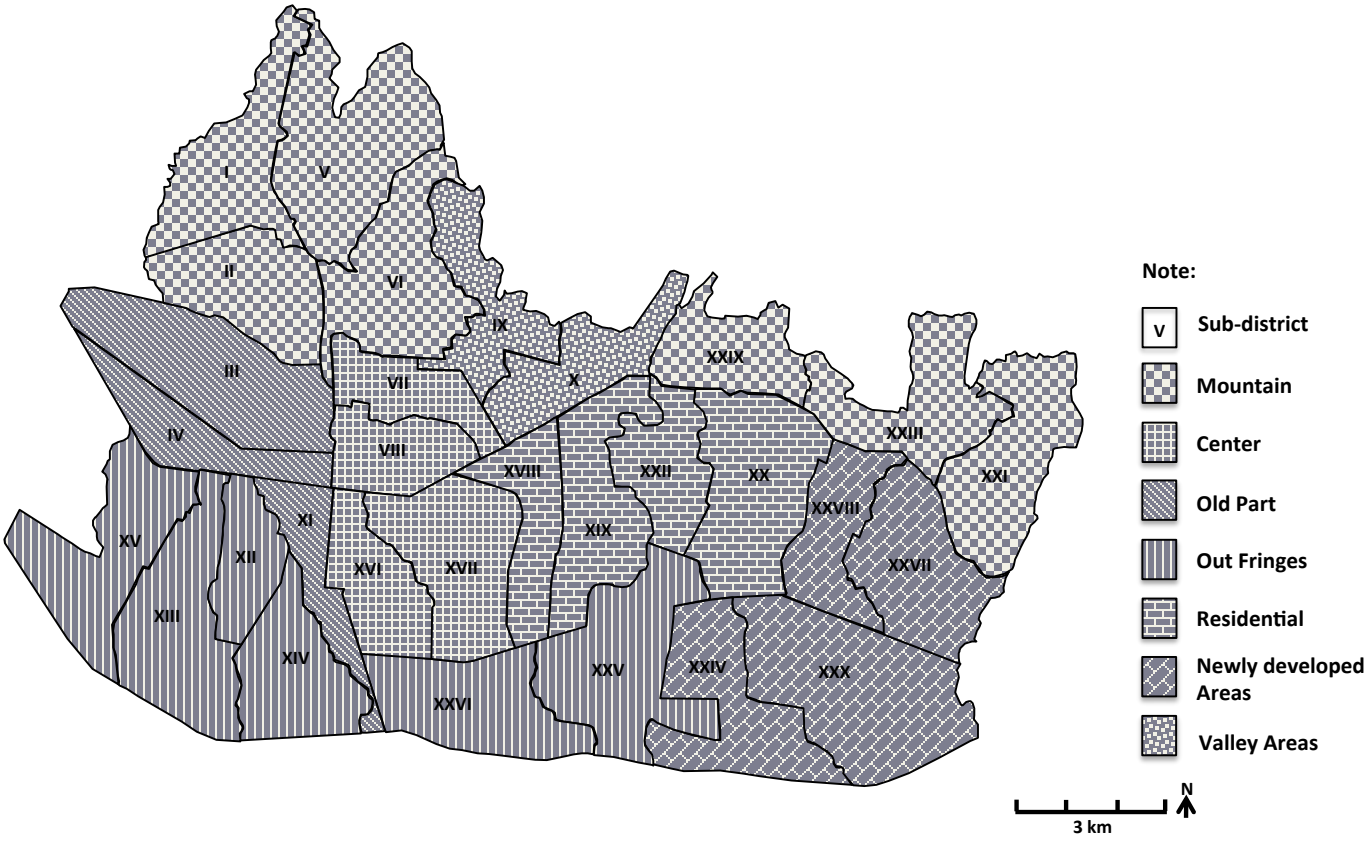


Table of list of the respective 30 sub-districts and its details

No.	Sub-district	Geographical Location	No. of wards	Area (km^2)	Total Population	Population Density
I.	Sukasari	Mountain	4	6,27	79.211	12.633
II	Sukajadi	Mountain	5	4,30	104.805	24.373
III.	Cicendo	River, Plain	6	6,86	96.491	14.066
IV.	Andir	River, Plain	6	3,71	94.361	25.434
V.	Cidadap	Mountain	3	6,11	56.325	9.218
VI.	Coblong	Mountain	6	7,35	127.588	17.359
VII.	Bandung Wetan	River, Plain	3	3,39	29.807	8.793
VIII.	Sumur Bandung	River, Plain	4	3,40	34.446	10.131
IX.	Cibeunying Kaler	Plain	4	4,50	68.087	15.290
X.	Cibeunying Kidul	Plain	6	5,25	104.575	19.919
XI.	Astanaanyar	River, Plain	6	2,89	66.658	24.065
XII.	Bojongloa Kaler	Plain	5	3,03	117.218	38.686
XIII.	Babakan Ciparay	Plain	6	7,45	143.203	19.222
XIV.	Bojongloa Kidul	River, Plain	6	6,26	83.600	13.355
XV.	Bandung Kulon	River, Plain	8	6,46	138.644	21.462
XVI.	Regol	River, Plain	7	4,30	79.316	18.446
XVII.	Lengkong	River, Plain	7	5,90	69.307	11.747
XVIII.	Batununggal	River, Plain	8	5,03	116.935	23.248
XIX.	Kiaracondong	River, Plain	6	6,12	127.616	20.852
XX.	Arcamanik	River, Plain	4	5,87	65.607	11.177
XXI.	Cibiru	Mountain	4	6,32	67.412	10.666
XXII.	Antapani	River, Plain	4	3,79	72.006	18.999
XXIII.	Ujung Berung	Mountain	5	6,40	72.414	11.315
XXIV.	Rancasari	River, Plain	4	7,33	72.046	9.878
XXV.	Buahbatu	River, Plain	4	7,93	92.140	11.619
XXVI.	Bandung Kidul	River, Plain	4	6,06	57.398	9.472
XXVII.	Panyileukan	River, Plain	4	5,10	37.691	7.390
XXVIII.	Cinambo	River, Plain	4	3,68	23.762	6.457
XXIX.	Mandalajati	River, Plain	4	6,67	60.825	9.119
XXX.	Gedebage	River, Plain	4	9,58	34.299	3.580
	Total Sub-districts: 30		**Total wards: 151**			

Source: (Bandung Statistical Agency, 2011)

List of Sub-districts and Wards in Bandung City

(Based on Bandung City Local Regulation No. 06/2008 on Changing of Bandung City Regulation No. 06/2006 on Expansion and development of working areas of sub-districts and wards in Bandung City Government)

No.	Sub-district	No. of wards	Ward
I	**Sukasari**	4	Isola Sukarasa Gegerkalong Sarijadi
			
II	**Sukajadi**	5	Pasteur Cipedes Sukawarna Sukagalih Sukabungah
			
III	**Cicendo**	6	Husein Sastranegara Arjuna Pajajaran Pasirkaliki Pamoyanan Sukaraja
			
IV	**Andir**	6	Maleber Dungucariang Ciroyom Kebon Jeruk Garuda Cempaka
			
V	**Cidadap**	3	Hegarmanah Ciumbuleuit Ledeng
			
VI	**Coblong**	6	Cipaganti Lebak Gede Sadang Serang Dago Sekeloa Lebak Siliwangi
			

No.	Sub-district	No. of wards	Ward
VII	**Bandung Wetan** 	3	Cihapit Tamansari Citarum
VIII	**Sumur Bandung** 	4	Braga Merdeka Kebon Pisang Babakan Ciamis
IX	**Cibeunying Kaler** 	4	Cihaurgeulis Sukaluyu Neglasari Cigadung
X	**Cibeunying Kidul** 	6	Padasuka Cikutra Cicadas Sukamaju Sukapada Pasirlayung
XI	**Astanaanyar** 	6	Karasak Nyengseret Karang Anyar Panjunan Cibadak Pelindung Hewan
XII	**Bojongloa Kaler** 	5	Kopo Babakan Tarogong Jamika Babakan Asih Sukaasih

No.	Sub-district	No. of wards	Ward
XIII	**Babakan Ciparay**	6	Babakan Babakan Ciparay Sukahaji Margahayu Utara Margasuka Cirangrang
			
XIV	**Bojongloa Kidul**	6	Situsaeur Kebon Lega Cibaduyut Mekar Wangi Cibaduyut Kidul Cibaduyut Wetan
			
XV	**Bandung Kulon**	8	Cijerah Cibuntu Warung Muncang Caringin Cigondewah Kaler Gempol Sari Cigondewah Rahayu Cigondewah Kidul
			
XVI	**Regol**	7	Cigereleng Ancol Pungkur Balonggede Ciseureuh Ciateul Pasirluyu
			
XVII	**Lengkong**	7	Cijagra Linkar Selatan Burangrang Paledang Turangga Malabar Cikawao
			
XVIII	**Batununggal**	8	Gumuruh Maleer Cibangkong Kacapiring Kebon Waru Kebon Gedang Samoja Binong
			

No.	Sub-district	No. of wards	Ward
XIX	**Kiaracondong**	6	Sukapura Kebon Jayanti Babakan Surabaya Cicaheum Babakan Surabaya Cicaheum Babakan Sari Kebon Kangkung
			
XX	**Arcamanik**	4	Sukamiskin Cisaranten Bina Harapan Cisaranten Kulon Cisaranten Endah
			
XXI	**Cibiru**	4	Cipadung Pasir Biru Cisurupan Palasari
			
XXII	**Antapani**	4	Antapani Wetan Antapani Tengah Antapani Kulon Antapani Kidul
			
XXIII	**Ujung Berung**	5	Pasir Endah Cigending Pasir Wangi Pasir Jati Pasanggrahan
			
XXIV	**Rancasari**	4	Cipamokolan Manjahlega Derwati Mekar Jaya
			

No.	Sub-district	No. of wards	Ward
XXV	**Buahbatu** 	4	Sekejati Margasari Cijawura Jatisari
XXVI	**Bandung Kidul** 	4	Batununggal Wates Mengger Kujangsari
XXVII	**Panyileukan** 	4	Cipadung Kulon Cipadung Wetan Cipadung Kidul Mekar Mulya
XXVIII	**Cinambo** 	4	Cisaranten Wetan Pakemitan Sukamulya Babakan Penghulu
XXIX	**Mandalajati** 	4	Jati Handap Karang Pamulang Sindang Jaya Pasir Impun
XXX	**Gedebage** 	4	Ranca Bolang Cisaranten Kidul Cimincrang Rancanumpang

Appendix 2

Sub-district Climate Disaster Resilience Index

Questionnaire for local Climate Disaster Resilience Index (CDRI) in Bandung

This study is jointly conducted by Kyoto University (Japan)
and Center for Disaster Mitigation-ITB (Indonesia)

This study aims to develop a Climate Disaster Resilience Index (CDRI) for the thirty sub-districts of Bandung Municipality. The sub-district's resilience is assessed only against climate-related natural hazards, like flooding, rainfall-induced landslides, water scarcity, etc. Thus, earthquakes, volcanic eruptions, and other geological hazards are not considered as part of this study. All the information retrieved from this questionnaire will only be used for the purpose of academic research and not given to any other party, except research team members from Kyoto University. It is expected that the dissemination of this study will help in understanding the resilience of the thirty sub-districts of Bandung.

Contact details of the selected sub-district **Sub-district No.**

Name of the Official:……...
Designation:……
Contact address:……..
Phone/Fax:……...
E-mail:……
Date when questionnaire was filled out:……

Photo representing the sub-district

Part I – Introduction of the sub-district

1 Details of the sub-district

1.1 Name of the sub-district:…….....
1.2 Approximate age of the sub-district: .....
1.3 Brief history of the sub-district (focus on disaster history):

How to fill out the questionnaire?

This questionnaire consists of five dimensions with each section providing a few questions to measure the resilience of the sub-district against climate-related natural hazards. The five dimensions are: physical, social, economic, institutional, and natural and include a number of parameters, see list.

List – Dimensions and Parameters of CDRI

Physical	Social	Economic	Institutional	Natural
Electricity	Population	Income	Mainstreaming of DRR and CCA	Intensity/severity of natural hazards
Water	Health	Employment	Effectiveness of sub-district's crisis management framework	Frequency of natural hazards
Sanitation and solid waste disposal	Education and awareness	Household assets	Knowledge dissemination and management	Ecosystem services
Accessibility of roads	Social capital	Finance and savings	Institutional collaboration with other organisations and stakeholders	Land-use in natural terms
Housing and land-use	Community preparedness during a disaster	Budget and subsidy	Good governance	Environmental policies

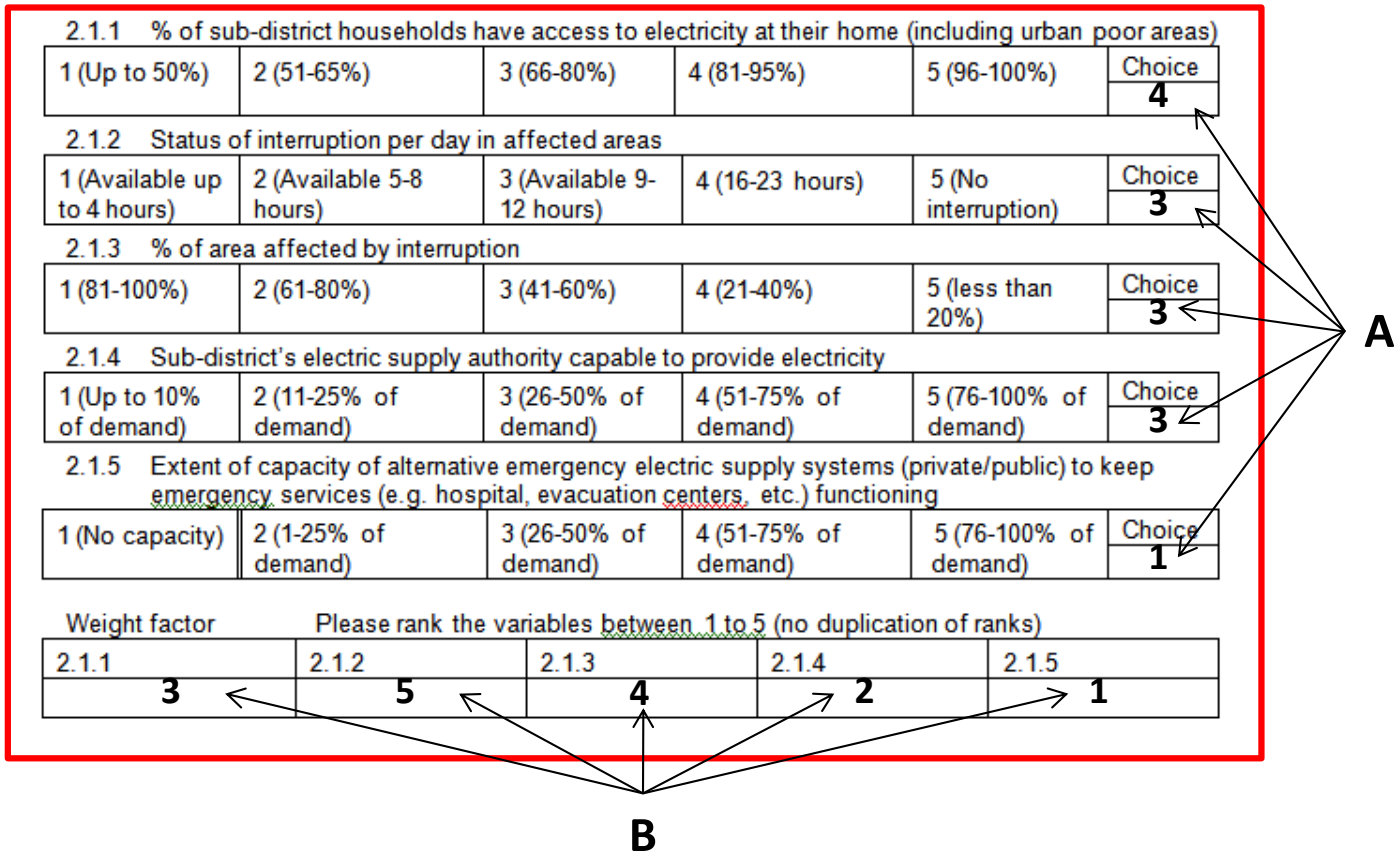
The questionnaire should be filled out step-wise, as you can see in the examples below.

First step:

A) Each dimension has 5 parameters including 5 questions/variables. For each variable a choice should be made between 1 (very poor, not available/existent) to 5 (good).

B) After a choice is made for all variables, each of them should be ranked against each other within a particular parameter. Thus, the variables should be weight according their importance within the sub-district's context between 1 (not important) to 5 (very important). A higher rank increases the weight of a particular variable. This should be done in relation to the characteristics of a particular sub-district. It is crucial that no rank is duplicated. This weighting allows the person, or group who is filling out this questionnaire, to decide which variable should be considered or weighted more than the others within a parameter.

Example, first step: dimension, physical; parameter, electricity



2.1.1 % of sub-district households have access to electricity at their home (including urban poor areas)

1 (Up to 50%)	2 (51-65%)	3 (66-80%)	4 (81-95%)	5 (96-100%)	Choice 4

2.1.2 Status of interruption per day in affected areas

1 (Available up to 4 hours)	2 (Available 5-8 hours)	3 (Available 9-12 hours)	4 (16-23 hours)	5 (No interruption)	Choice 3

2.1.3 % of area affected by interruption

1 (81-100%)	2 (61-80%)	3 (41-60%)	4 (21-40%)	5 (less than 20%)	Choice 3

2.1.4 Sub-district's electric supply authority capable to provide electricity

1 (Up to 10% of demand)	2 (11-25% of demand)	3 (26-50% of demand)	4 (51-75% of demand)	5 (76-100% of demand)	Choice 3

2.1.5 Extent of capacity of alternative emergency electric supply systems (private/public) to keep emergency services (e.g. hospital, evacuation centers, etc.) functioning

1 (No capacity)	2 (1-25% of demand)	3 (26-50% of demand)	4 (51-75% of demand)	5 (76-100% of demand)	Choice 1

A

Weight factor — Please rank the variables between 1 to 5 (no duplication of ranks)

2.1.1	2.1.2	2.1.3	2.1.4	2.1.5
3	5	4	2	1

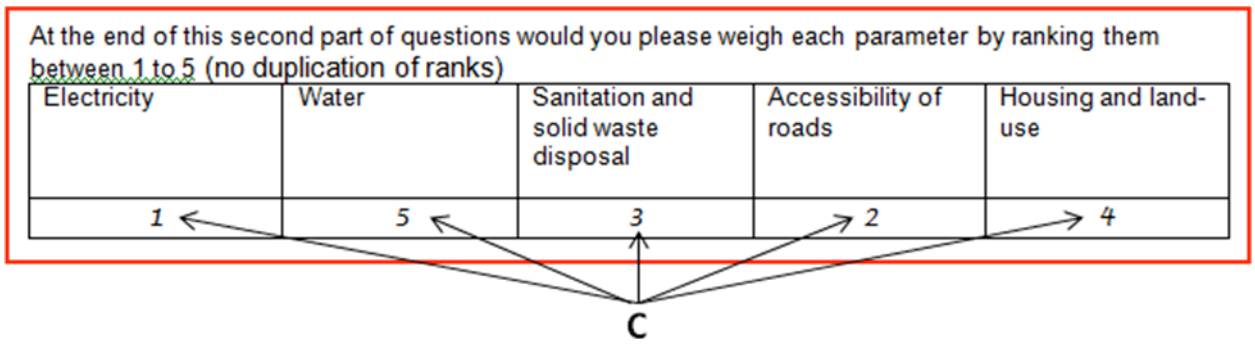
B

Second step:

Since there are five parameters for each dimension (see list above) the steps A and B should be done likewise for all parameters throughout the questionnaire.

C) Finally, each parameters, five per dimension, should also be weighted according to their importance related to the characteristics of the sub-district, in the same way as mentioned in step **B)**.

Example, second step: physical dimension



At the end of this second part of questions would you please weigh each parameter by ranking them between 1 to 5 (no duplication of ranks)

Electricity	Water	Sanitation and solid waste disposal	Accessibility of roads	Housing and land-use
1	5	3	2	4

C

Part II – Physical Condition of the Sub-district

2 Utilities and Infrastructure

2.1 Electricity

2.1.1 % of sub-district households have access to electricity at their home (including urban poor areas)

1 (Up to 50%)	2 (51-65%)	3 (66-80%)	4 (81-95%)	5 (96-100%)	Choice

2.1.2 Status of interruption per day in affected areas

1 (Available up to 4 hours)	2 (Available 5-8 hours)	3 (Available 9-12 hours)	4 (16-23 hours)	5 (No interruption)	Choice

2.1.3 % of area affected by interruption

1 (81-100%)	2 (61-80%)	3 (41-60%)	4 (21-40%)	5 (less than 20%)	Choice

2.1.4 Sub-district's electric supply authority capable to provide electricity

1 (Up to 10% of demand)	2 (11-25% of demand)	3 (26-50% of demand)	4 (51-75% of demand)	5 (76-100% of demand)	Choice

2.1.5 Extent of capacity of alternative emergency electric supply systems (private/public) to keep emergency services (e.g. hospital, evacuation centres, etc.) functioning

1 (No capacity)	2 (1-25% of demand)	3 (26-50% of demand)	4 (51-75% of demand)	5 (76-100% of demand)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

2.1.1	2.1.2	2.1.3	2.1.4	2.1.5

2.2 Water

2.2.1 % of sub-district population have access to potable water supply at home or within close proximity (10 min. walking distance)

1 (Up to 50%)	2 (51-65%)	3 (66-80%)	4 (81-95%)	5 (96-100%)	Choice

2.2.2 Status of interruption per day

1 (Available up to 1 hours)	2 (Available 1-2 hours)	3 (Available 3-5 hours)	4 (Available 6-10 hours/day)	5 (No interruption)	Choice

2.2.3 % of area affected by interruption

1 (81-100%)	2 (61-80%)	3 (41-60%)	4 (21-40%)	5 (less than 20%)	Choice

2.2.4 Sub-district's water supply authority capable to supply water

1 (Up to 10% of its demand)	2 (11-25% of its demand)	3 (26-50% of its demand)	4 (51-75% of its demand)	5 (76-100% of its demand)	Choice

2.2.5 Extent of capacity of alternative emergency safe water supply system

1 (No capacity)	2 (1-25% of its demand)	3 (26-50% of its demand)	4 (51-75% of its demand)	5 (76-100% of its demand)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

2.2.1	2.2.2	2.2.3	2.2.4	2.2.5

2.3 Sanitation and solid waste disposal

2.3.1 % of population have hygienic access to sanitation

1 (Up to 20%)	2 (11-40%)	3 (41-60%)	4 (61-75%)	5 (81-100%)	Choice

2.3.2 Collection of solid waste produced per day

1 (Up to 50%)	2 (51-65%)	3 (66-80%)	4 (81-95%)	5 (96-100%)	Choice

2.3.3 % of solid waste treated before dumping

1 (Not treated at all)	2 (Up to 25%)	3 (26-50%)	4 (51-75%)	5 (76-100%)	Choice

2.3.4 % of solid waste recycled (both formal and informal)

1 (Up to 10%)	2 (11-25%)	3 (26-50%)	4 (51-75%)	5 (76-100%)	Choice

2.3.5 Capacity of % of collected solid waste after the disaster

1 (Up to 10%)	2 (11-25%)	3 (26-50%)	4 (51-75%)	5 (76-100%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

2.3.1	2.3.2	2.3.3	2.3.4	2.3.5

2.4 Accessibility of roads

2.4.1 % of sub-district's land used as transportation network

1 (0-5%)	2 (6-10%)	3 (11-15%)	4 (15-20%)	5 (more than 20%)	Choice

2.4.2 % of sub-district accessible by paved road

1 (less than 50%)	2 (51-60%)	3 (61-70%)	4 (71-80%)	5 (81-100%)	Choice

2.4.3 % of roads remained accessible during normal flooding* in affected areas

1 (less than 40%)	2 (41-50%)	3 (51-60%)	4 (61-70%)	5 (more than 71%)	Choice

2.4.4 Status of interruption after heavy rainfall in affected areas

1 (more than 12 hours)	2 (9-12 hours)	3 (5-8 hours)	4 (3-4 hours)	5 (up to 2 hours)	Choice

2.4.5 % of roads have roadside covered drain

1 (less than 15%)	2 (16-30%)	3 (31-45%)	4 (46-60%)	5 (more than 60%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

2.4.1	2.4.2	2.4.3	2.4.4	2.4.5

2.5 Housing and land-use

2.5.1 % of buildings constructed following building code

1 (less than 10%)	2 (11-20%)	3 (21-30%)	4 (31-50%)	5 (more than 50%)	Choice

2.5.2 Type: % of non-permanent structure

1 (100%)	2 (more than 30%)	3 (20-29%)	4 (10-19%)	5 (less than 10%)	Choice

2.5.3 Plinth level: % of houses above normal/flood water logging

1 (0%)	2 (less than 50%)	3 (51-60%)	4 (61-70%)	5 (more than 71%)	Choice

2.5.4 % of houses with ownership

1 (0%)	2 (31-40%)	3 (41-50%)	4 (51-60%)	5 (more than 60%)	Choice

2.5.5 Total % sub-district's population live in the proximity to polluted industry/dumping ground

1 (more than 50%)	2 (37.5-49%)	3 (25-37.4%)	4 (12.5-24.9%)	5 (0-12.4%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

2.5.1	2.5.2	2.5.3	2.5.4	2.5.5

At the end of this second part of questions would you please weigh each parameter by ranking them between 1 to 5 (no duplication of ranks)

Electricity	**Water**	**Sanitation and solid waste disposal**	**Accessibility of roads**	**Housing and land-use**

Part III – Social Condition of the Sub-district

3 Social Issues of the Sub-district

3.1 Population

3.1.1 % of sub-district's population growth per year

1 (more than 6%)	2 (4-5.9%)	3 (2-3.9%)	4 (1-1.9%)	5 (<0-0.9%)	Choice

3.1.2 % of sub-district's population under 14 and over 64

1 (more than 45%)	2 (40-46%)	3 (33-39%)	4 (26-32%)	5 (less than 25%)	Choice

3.1.3 % of sub-district's population live in slum area/urban informal settlement/urban poor areas

1 (more than 50%)	2 (37.5-49.9%)	3 (25-37.4%)	4 (12.5-24.9%)	5 (0-12.4%)	Choice

3.1.4 Maximum urban population density (**day**) per square kilometre, weighted throughout the sub-district

1 (more than 15,000)	2 (10,000-14,999)	3 (5,000-9,999)	4 (2,000-4,999)	5 (less than 1999)	Choice

3.1.5 Maximum urban population density (**night**) per square kilometre, weighted throughout the sub-district

1 (more than 15,000)	2 (10,000-14,999)	3 (5,000-9,999)	4 (2,000-4,999)	5 (less than 1999)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

3.1.1	3.1.2	3.1.3	3.1.4	3.1.5

3.2 Health

3.2.1 % of population suffer from waterborne diseases every year

1 (more than 24%)	2 (18-23%)	3 (12-17%)	4 (6-11%)	5 (0-5%)	Choice

3.2.2 % of population suffer from vector-borne diseases every year

1 (more than 24%)	2 (18-23%)	3 (12-17%)	4 (6-11%)	5 (0-5%)	Choice

3.2.3 % of population suffer from waterborne diseases after a disaster*

1 (more than 24%)	2 (18-23%)	3 (12-17%)	4 (6-11%)	5 (0-5%)	Choice

3.2.4 % of population having access to primary health care facility

1 (0%)	2 (50-75%)	3 (76-90%)	4 (91-95%)	5 (96-100%)	Choice

3.2.5 Capacity of sub-district's health facility to face emergency/hazardous situation

1 (Not capable)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

3.2.1	3.2.2	3.2.3	3.2.4	3.2.5

3.3 Education and awareness

3.3.1 Literacy rate of sub-district's population

1 (less than 50%)	2 (50.1-62.5%)	3 (62.6-75%)	4 (75.1-87.5%)	5 (87.6-100%)	Choice

3.3.2 Awareness or knowledge of population about the threat and impacts of disasters

1 (No awareness)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.3.3 How often does the sub-district authority organize public awareness program/disaster drills

1 (Never so far)	2 (once every five years or less)	3 (once every 2 years)	4 (once every year)	5 (more than once per year)	Choice

3.3.4 Sub-district's average population has access to internet

1 (No access)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.3.5 Functionality of schools after a disaster*

1 (Not functional)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

3.3.1	3.3.2	3.3.3	3.3.4	3.3.5

3.4 Social capital

3.4.1 Extent of sub-district's population participate in community activities

1 (less than 10%)	2 (11-20%)	3 (21-30%)	4 (31-40%)	5 (more than 41%)	Choice

3.4.2 Acceptance level of community leader (in ward)

1 (No acceptance)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.4.3 Ability of sub-district's communities to build consensus and deliver shared interest

1 (No ability)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.4.4 Level of democracy: sub-district's communities have the opportunity to participate in the sub-district's decision making process (e.g. making of development plans, workshops)

1 (No opportunity)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.4.5 Extent of different ethnic groups (religious groups mixed and interlinked with other ethnic groups (opposite: ethnic segregation)

1 (Not mixed)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

3.4.1	3.4.2	3.4.3	3.4.4	3.4.5

3.5 Community preparedness during a disaster

3.5.1 Extent of households are prepared for a disaster in terms of logistics, materials, and management

1 (Not prepared)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.5.2 Extent of affected people evacuate voluntarily after a disaster

1 (Not existing)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.5.3 Extent of sub-district's population provide shelter or emergency support for affected people after a disaster

1 (No support)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.5.4 Extent of support from NGOs/CSOs or religious organisations after a disaster

1 (No support)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

3.5.5 Extent of sub-district's population participate in relief works after a disaster (volunteering)

1 (No participation)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

3.5.1	3.5.2	3.5.3	3.5.4	3.5.5

At the end of this third part of questions would you please weigh each parameter by ranking them between 1 to 5 (no duplication of ranks)

Population	**Health**	**Education and awareness**	**Social capital**	**Community preparedness during a disaster**

Part IV – Economic Condition of the Sub-district

4 Economic Issues of the Sub-district

4.1 Income

4.1.1 % of sub-district's population live below the poverty line (Rp.939,000 per capita/per month)

1 (more than 40%)	2 (31-40%)	3 (21-30%)	4 (11-20%)	5 (less than 11%)	Choice

4.1.2 Average number of sources of income per household

1 (No source/ income)	2 (1 source)	3 (2 sources)	4 (3 sources)	5 (more than 3 sources)	Choice

4.1.3 % of households depend on only one income source

1 (100%)	2 (75-99%)	3 (50-74%)	4 (25-49%)	5 (less than 24%)	Choice

4.1.4 % of households depend on income from activities derived in the informal sector

1 (more than 40%)	2 (31-40%)	3 (21-30%)	4 (11-20%)	5 (less than 11%)	Choice

4.1.5 % of reduced income due to a disaster* for affected households

1 (more than 40%)	2 (31-40%)	3 (21-30%)	4 (11-20%)	5 (less than 11%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

4.1.1	4.1.2	4.1.3	4.1.4	4.1.5

4.2 Employment

4.2.1 % of labour unemployed in formal sector

1 (more than 25%)	2 (19-24%)	3 (13-18%)	4 (7-12%)	5 (less than 6%)	Choice

4.2.2 % of youth unemployed in formal sector

1 (more than 25%)	2 (19-24%)	3 (13-18%)	4 (7-12%)	5 (less than 6%)	Choice

4.2.3 % of all women employed in formal sector

1 (less than 20%)	2 (21-35%)	3 (36-50%)	4 (51-65%)	5 (more than 66%)	Choice

4.2.4 % of employees in formal sector comes from outside the city (night/day population)

1 (More than 80%)	2 (60-79%)	3 (40-59%)	4 (20-39%)	5 (less than 19%)	Choice

4.2.5 % of child labour existing in sub-district

1 (more than 40%)	2 (31-40%)	3 (21-30%)	4 (11-20%)	5 (less than 11%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

4.2.1	4.2.2	4.2.3	4.2.4	4.2.5

4.3 Household assets

4.3.1 % of sub-district's households have television

1 (less than 50%)	2 (51-60%)	3 (61-70%)	4 (71-80%)	5 (more than 80%)	Choice

4.3.2 % of sub-district's population has mobile phone/telecommunication

1 (less than 50%)	2 (51-60%)	3 (61-70%)	4 (71-80%)	5 (more than 80%)	Choice

4.3.3 % of sub-district's households have motorized vehicle

1 (less than 20%)	2 (21-30%)	3 (31-40%)	4 (41-50%)	5 (more than 50%)	Choice

4.3.4 % of sub-district's households have non-motorized vehicle

1 (less than 30%)	2 (31-45%)	3 (46-60%)	4 (61-75%)	5 (more than 75%)	Choice

4.3.5 % of sub-district's households has furniture to secure key items (e.g. emergency food, money, important documents, medicine) during a disaster*

1 (less than 50%)	2 (51-60%)	3 (61-70%)	4 (71-80%)	5 (more than 80%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

4.3.1	4.3.2	4.3.3	4.3.4	4.3.5

4.4 Finance and savings

4.4.1 Availability of credit facility in the sub-district's financial institutions to face/prevent disaster

1 (No availability)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

4.4.2 Access of credit facility in the sub-district's financial institutions to face/prevent disaster

1 (No access)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

4.4.3 Effectiveness of credit facility during disaster for urban poor or low-income groups

1 (No support or access)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

4.4.4 % of households having saving practice

1 (up to 10%)	2 (11-20%)	3 (21-30%)	4 (31-50%)	5 (more than 50%)	Choice

4.4.5 % of residential houses under any sort of insurance scheme

1 (up to 10%)	2 (11-16%)	3 (17-24%)	4 (25-32%)	5 (more than 33%)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

4.4.1	4.4.2	4.4.3	4.4.4	4.4.5

4.5 Budget and subsidy

4.5.1 % of sub-district's annual budget targeting disaster risk management

1 (0%)	2 (less than 1%)	3 (1.1-2%)	4 (2.1-3%)	5 (more than 3%)	Choice

4.5.2 Budget for climate change related disaster risk reduction measures sufficient

1 (No funds)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

4.5.3 Availability of subsidies/incentives for residents/institutions to rebuild houses after a disaster

1 (Not available)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

4.5.4 Availability of subsidies/incentives for residents/institutions to receive/provide alternative livelihood during a disaster

1 (Not available)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

4.5.5 Availability of subsidies/incentives for residents/institutions to receive/provide health care

1 (Not available)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

4.5.1	4.5.2	4.5.3	4.5.4	4.5.5

At the end of this fourth part of questions would you please weigh each parameter by ranking them between 1 to 5 (no duplication of ranks)

Income	**Employment**	**Household assets**	**Finance and savings**	**Budget and subsidy**

Part V – Institutional Condition of the Sub-district

5 Institutional Issues of the Sub-district

5.1 Mainstreaming of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA)

5.1.1 Incorporation of DRR and CCA measures in sub-district development plans

1 (Not incorporated)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.1.2 Ability (manpower) to produce development plans

1 (No ability)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.1.3 Capacity (logistics, materials (technical)) to produce development plans

1 (No capacity)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.1.4 Extent of community participation in development plan preparation process

1 (Not participation)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.1.5 Incorporation of disaster management plan

1 (Not existent)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

5.1.1	5.1.2	5.1.3	5.1.4	5.1.5

5.2 Effectiveness of sub-district's crisis management framework

5.2.1 Existence of emergency team during a disaster

1 (Not existent)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.2.1 Effectiveness of emergency team during a disaster (leadership/competence)

1 (Not existent)	2 (Poor)	3 (Slightly effective)	4 (Good)	5 (Fully effective)	Choice

5.2.3 Availability of sufficient evacuation centres (e.g. community centres, schools)

1 (No availability)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.2.4 Efficiency of trained emergency workers during a disaster*

1 (Not existent)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.2.5 Existence and readiness of alternative decision making personnel during a disaster

1 (Not existent)	2 (Poor)	3 (Limited)	4 (Good)	5 (Fully ready)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

5.2.1	5.2.2	5.2.3	5.2.4	5.2.5

5.3 Knowledge dissemination and management

5.3.1 Effectiveness to learn from previous disasters*

1 (Not effective)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.3.2 Availability and frequency of regular disaster training programmes for emergency workers

1 (Not available)	2 (less than once every two years)	3 (Once every two years)	4 (Once or twice a year)	5 (More than twice a year)	Choice

5.3.3 Existence of disaster awareness programmes (disaster education) for communities

1 (Not effective)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.3.4 Capacity (books, leaflets, manpower, campaigns) for dissemination of disaster awareness programmes (disaster education)

1 (No capacity)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.3.5 Extent of community satisfaction from disaster awareness programmes (disaster education)

1 (Not satisfied)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

5.3.1	5.3.2	5.3.3	5.3.4	5.3.5

5.4 Institutional collaboration with other organisations and stakeholders

5.4.1 Extent of dependency to external institutions/support during a disaster

1 (Fully dependent)	2 (Heavily dependent)	3 (Dependent)	4 (Slightly dependent)	5 (Independent)	Choice

5.4.2 Interconnectedness (network)/collaboration with neighbouring sub-districts for emergency managementduring a disaster

1 (No network)	2 (Poor network)	3 (Medium network)	4 (Good network)	5 (Strong network)	Choice

5.4.3 Sub-district's Cooperation (support) for emergency management during a disaster* with sub-district corporation

1 (No collaboration)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.4.4 Cooperation of Sub-districts' ward officials for emergency management during a disaster*

1 (No collaboration)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.4.5 Sub-district's institutional collaboration with NGOs and private organisations during a disaster*

1 (No collaboration)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

5.4.1	5.4.2	5.4.3	5.4.4	5.4.5

5.5 Good Governance

5.5.1 Effectiveness of early warning systems led by sub-district body

1 (Not existent)	2 (Poor)	3 (Slightly effective)	4 (Good)	5 (Fully effective)	Choice

5.5.2 Existence of disaster drills at sub-district level

1 (Not existent)	2 (less than once every two years)	3 (Once every two years)	4 (Once every year)	5 (More than once a year)	Choice

5.5.3 Promptness of sub-district body to disseminate emergency information during a disaster to communities

1 (No dissemination)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.5.4 Transparency of sub-district body to disseminate accurate emergency information during a disaster* to communities

1 (No transparency)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

5.5.5 Capability of sub-district body to lead recovery process (relief work, reconstruction, and rehabilitation)

1 (Not available)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

5.5.1	5.5.2	5.5.3	5.5.4	5.5.5

At the end of this fifth part of questions would you please weigh each parameter by ranking them between 1 to 5 (no duplication of ranks)

Mainstreaming of DRR and CCA	**Effectiveness of sub-district's crisis management framework**	**Knowledge dissemination and management**	**Institutional collaboration with other organisations and stakeholders**	**Good governance**

Part VI – Natural Condition of the Sub-district

6 Natural Issues of the Sub-district

6.1 Intensity/severity of natural hazards

6.1.1 Inundation Floods

1 (Very severe)	2 (Severe)	3 (Medium)	4 (Normal)	5 (No floods)	Choice

6.1.2 Riverine Floods

1 (Very severe)	2 (Severe)	3 (Medium)	4 (Normal)	5 (No floods)	Choice

6.1.3 Rainfall-induced landslides

1 (Very severe)	2 (Severe)	3 (Medium)	4 (Normal)	5 (No landslides)	Choice

6.1.4 Storms

1 (Very severe)	2 (Severe)	3 (Medium)	4 (Normal)	5 (No storms)	Choice

6.1.5 Droughts (water scarcity)

1 (Very severe)	2 (Severe)	3 (Medium)	4 (Normal)	5 (No droughts)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

6.1.1	6.1.2	6.1.3	6.1.4	6.1.5

6.2 Frequency of natural hazards

6.2.1 Inundation Floods

1 (more than once per year)	2 (once per year)	3 (once every 5 years)	4 (less than every 5 years)	5 (No floods)	Choice

6.2.2 Riverine Floods

1 (more than once per year)	2 (once per year)	3 (once every 5 years)	4 (less than every 5 years)	5 (No floods)	Choice

6.2.3 Rainfall-induced landslides

1 (more than once per year)	2 (once per year)	3 (once every 5 years)	4 (less than every 5 years)	5 (No landsides)	Choice

6.2.4 Storms

1 (more than once per year)	2 (once per year)	3 (once every 5 years)	4 (less than every 5 years)	5 (No Storms)	Choice

6.1.5 Droughts (water scarcity)

1 (more than once per year)	2 (once per year)	3 (once every 5 years)	4 (less than every 5 years)	5 (No droughts)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

6.2.1	6.2.2	6.2.3	6.2.4	6.2.5

6.3 Ecosystem services

6.3.1 Average quality of urban biodiversity (e.g. endangered species)

1 (Very poor)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.3.2 Average urban soil quality – degraded land, derelict land (industrial contamination)

1 (Very poor)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.3.3 Average urban air quality during the day – problems of urban heat (island effect)

1 (Very poor)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.3.4 Average urban water quality in lakes, rivers, etc. (e.g. contaminated water)

1 (Very poor)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.3.5 Average level of urban groundwater quality affected

1 (Very poor)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

6.3.1	6.3.2	6.3.3	6.3.4	6.3.5

6.4 Land-use in natural terms

6.4.1 Amount of sub-district area vulnerable to climate-related hazards

1 (100-76%)	2 (75-51%)	3 (50-26%)	4 (25-1%)	5 (0%)	Choice

6.4.2 Average intensity of land-use – urban morphology (built area)

1 (more than 90%)	2 (71-90%)	3 (51-70%)	4 (31-50%)	5 (less than 31%)	Choice

6.4.3 Settlements located on hazardous ground (e.g. steep slope, flood prone area) – vulnerable exposure

1 (more than 50%)	2 (26-50%)	3 (10-25%)	4 (less than 10%)	5 (No settlem. on haz. gr.)	Choice

6.4.4 % total area urban green space (parks, trees, forests, etc.)

1 (less than 1%)	2 (2-5%)	3 (6-10%)	4 (11-15%)	5 (more than 16%)	Choice

6.4.5 Loss of urban green space (parks, trees, forests) due to development of infrastructure, housing, etc. over the last 50 years

1 (more than 40%)	2 (21-40%)	3 (11-20%)	4 (less than 11%)	5 (No loss)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

6.4.1	6.4.2	6.4.3	6.4.4	6.4.5

6.5 Environmental policies

6.5.1 Extent of use of sub-district level hazard maps in development activities

1 (up to 10%)	2 (Poor, 11-20%)	3 (Medium, 21-30%)	4 (Good, 31-50%)	5 (Best, more than 50%)	Choice

6.5.2 Extent of environmental conservation regulations reflected in development plans

1 (Not reflected)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.5.3 Extent of implementation of environmental conservation policies

1 (Not implemented)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.5.4 Extent of implementation of efficient waste management system (Reduce, Reuse, Recycle)

1 (Not implemented)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

6.5.5 Extent of implementation of mitigation policies to reduce air pollution (e.g. CO2), for example from traffic or household emissions

1 (No existence)	2 (Poor)	3 (Medium)	4 (Good)	5 (Best)	Choice

Weight factor Please rank the variables between 1 to 5 **(no duplication of ranks)**

6.5.1	6.5.2	6.5.3	6.5.4	6.5.5

At the end of this sixth part of questions would you please weigh each parameter by ranking them between 1 to 5 (no duplication of ranks)

Intensity/severity of natural hazards	**Frequency of natural hazards**	**Ecosystem services**	**Land-use in natural terms**	**Environmental policies**

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2.1.1 % of sub-district households have access to electricity at their home (including urban poor areas) 5
2.1.2 Status of interruption per day in affected areas 5
2.1.3 % of area affected by interruption 5
2.1.4 Sub-district's electric supply authority capable to provide electricity 5
2.1.5 Extent of capacity of alternative emergency electric supply systems (private/public) to keep emergency services (e.g. hospital, evacuation centers, etc.) functioning 5
2.2 Water 5
2.2.1 % of sub-district population have access to potable water supply at home or within close proximity (10min. walking distance) 5
2.2.2 Status of interruption per day 5
2.2.3 % of area affected by interruption 5
2.2.4 Sub-district's water supply authority capable to supply water 5
2.2.5 Extent of capacity of alternative emergency safe water supply system 5
2.3 Sanitation and solid waste disposal 6
2.3.1 % of population have hygienic access to sanitation 6
2.3.2 Collection of solid waste produced per day 6
2.3.3 % of solid waste treated before dumping 6
2.3.4 % of solid waste recycled (both formal and informal) 6
2.3.5 Capacity of % collected solid waste after the disaster 6
2.4 Accessibility of roads 6
2.4.1 % of sub-district's land used as transportation network 6
2.4.2 % of sub-district accessible by paved road 6
2.4.3 % of roads remained accessible during normal flooding* in affected areas 6
2.4.4 Status of interruption after heavy rainfall in affected areas 6
2.4.5 % of roads have roadside covered drain 6
2.5 Housing and land-use 7
2.5.1 % of buildings constructed following building code 7
2.5.2 Type: % of non-permanent structure 7
2.5.3 Plinth level: % of houses above normal/flood water logging 7
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3.1.2 % of sub-district's population under 14 and over 64 8
3.1.3 % of sub-district's population live in slum area/urban informal settlement/urban poor areas 8
3.1.4 Maximum urban population density (**day**) per square kilometre, weighted throughout the sub-district 8
3.1.5 Maximum urban population density (**night**) per square kilometre, weighted throughout the sub-district 8
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3.2.1 % of population suffer from waterborne diseases every year 8
3.2.2 % of population suffer from vector-borne diseases every year 8
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3.2.5 Capacity of sub-district's health facility to face emergency/hazardous situation 8
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3.3.2 Awareness or knowledge of population about the threat and impacts of disasters 9
3.3.3 How often does the sub-district authority organize public awareness program/disaster drills 9
3.3.4 Sub-district's average population has access to internet 9
3.3.5 Functionality of schools after a disaster* 9

3.4 Social capital 9
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3.4.3 Ability of sub-district's communities to build consensus and deliver shared interest 9
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3.5.2 Extent of affected people evacuate voluntarily after a disaster 10
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6.4.4 % total area urban green space (parks, trees, forests, etc.) 18

6.4.5 Loss of urban green space (parks, trees, forests) due to development of infrastructure, housing, etc. over the last 50 years 18
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6.5.5 Extent of implementation of mitigation policies to reduce air pollution (e.g. CO2), for example from traffic or household emissions 19

Definition:

***Criteria for declaring a particular environmental stage a Disaster, from EM-DAT (2009):**

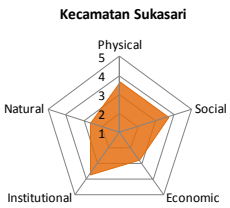
- Ten (10) or more people reported killed.
- Hundred (100) people reported affected.
- Declaration of a state of emergency.
- Call for international assistance.

CDRI, Dimension, and Parameter Values for Sub-district

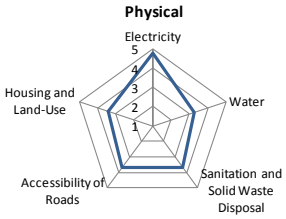
No.	Sub-District/Kecamatan	CDRI	Physical	Social	Economic	Institutional	Natural	Electricity	Water	Sanitation and solid waste diposal	Accessbility of roads	Housing and Land use	Population	Health	Education and Awareness	Social Capital	Community preparedness	Income	Employement	Household assets	Finance and savings	Budget and subsidy	Mainstreaming DRR and CCA	Crisis Management	Konwledge Dissemination and Management	Institutional Collaboration	Good Governance	Intensity / Severity of Hazards	Frequency of Hazards	Ecosystem Services	Land use in Natural terms	Environmental Policies
I	Sukasari	3.28	3.67	3.69	3.72	3.68	2.66	4.8	3.27	3.67	3.67	3.4	4.67	4.13	3.47	3.73	3.2	3.6	3.47	2.53	3	1.93	3.93	3.53	3.2	3.47	3.73	3.13	2.6	3.27	2.6	2.27
II	Sukajadi	3.73	4.23	4.17	3.4	3.63	3.19	4.67	4.2	3.4	4.47	4.67	3.73	5	5	4.47	3.33	3.73	3.33	4.2	3.73	1.33	3.53	3.13	3.6	3.93	3.73	2.67	1.4	2.87	3.73	3.47
III	Cicendo	3.14	3.68	3.78	2.39	3.56	2.3	4.33	4.53	2.2	4.47	4.27	3.13	4.47	3.4	4.33	3.67	2.4	3	4.73	1.53	1.53	3.4	3	2.87	3.87	3.87	2.33	1.53	1.6	2.13	3
IV	Andir	3.28	3.36	3.14	3.05	3.52	3.32	4.4	3.8	2.47	3.67	3.27	1.93	3	3.4	3.8	3	2.33	2.13	3.13	4.2	4.13	3	3.33	3.33	4.27	3.27	3.07	1.87	2.73	3.73	3.67
V	Cidadap	2.73	3.37	2.79	2.35	2.52	2.62	4.33	3.2	3.27	3.93	2.67	3.47	3.4	2.2	3.73	2.33	3.53	3	3.07	1.4	2	3.07	2.47	2.27	2.53	2.27	2.4	2.8	2.07	2.8	2.73
VI	Coblong	3.57	3.48	3.69	3.32	3.91	3.46	4.87	3.33	2.87	2.6	2.47	4.6	3.87	3.13	3.67	3.67	3.33	4.2	2	3.47	3.4	3.93	3.8	4	3.93	4	4.2	4.2	3.4	3.33	3
VII	Bandung Wetan	3.24	4.14	3.14	3.26	2.78	2.89	4.8	3.4	3.27	4.6	4.93	3.47	4.47	2.07	3.8	3	3.2	3.67	4	2.07	3.2	3.2	3.13	2.87	3.6	3.4	3.13	2.67	3	3	2.73
VIII	Sumur Bandung	3.89	4.25	4.03	3.81	4.01	3.34	5	4.67	3	3.73	3.93	3.73	5	3.07	4.07	4.4	4.53	4.27	4.67	3.07	3.13	3.47	5	3.67	4	3.93	3.53	2.87	2.8	3.27	3.53
IX	Cibeunying Kaler	3.4	3.37	3.48	3.62	3.99	2.53	3.67	4.27	2.53	3.73	3.07	2.4	4.4	3.6	4	3.67	3.4	4.73	2.07	4.13	3.93	3.93	3.47	4	4.53	4.33	2.33	1.87	3.67	2.8	3.6
X	Cibeunying Kidul	3.19	3.68	3.45	2.96	3.31	2.55	4.13	3.87	2.53	2.73	3.07	3.4	4.27	2.8	3.67	3.33	3.4	3.27	2.47	2.93	1.27	3.93	2.47	2.6	3.6	2.93	3	1.6	3	3.4	2.33
XI	Astanaanyar	3.27	4.07	3.78	2.57	3.16	2.76	4.47	3.27	3.67	4.47	4.6	3.73	4.4	2.53	4.47	4.13	3.47	4.47	2.87	1.8	1	3.07	3.07	4.07	2.67	3.73	3	1.73	3.07	3.67	3.33
XII	Bojongloa Kaler	3.34	4.08	3.73	2.44	3.4	2.75	4.2	4.67	2.8	4.53	4.27	3.87	4.27	3.47	4	3	1.93	2.27	3.33	2.53	2.67	4.47	3.93	2.07	3.33	3.67	2.4	2.2	2.87	2.13	3.47
XIII	Babakan Ciparay	3.86	3.48	4.07	3.6	4.2	3.96	4.47	2.73	3.07	3.53	4.4	4.8	4.53	3.2	4.4	4	4.87	4	4.27	1.67	1	4.73	4	3.2	4.33	3.8	4.53	4.67	3.33	4.07	3.8
XIV	Bojongloa Kidul	3.81	4.21	4.18	3.04	4.32	3.29	4.4	4.53	4.2	3.8	4	3.53	4.2	3.93	5	3.87	3.73	3.13	2.93	3.47	2.4	3.87	4.4	4.4	4.6	4.4	3.13	2.47	2.93	4.2	3
XV	Bandung Kulon	3.03	3.1	3.28	3.04	3.24	2.48	3.27	3.4	2.87	2.67	2.47	4.33	3.33	3.13	4.27	2.73	3.8	3.53	2.8	1.8	1.27	3.07	3.47	3	3.33	2.93	2.6	1.53	2.13	3.73	2.27
XVI	Regol	3.68	3.58	4.14	3.48	3.61	2.59	4.73	4.73	2.87	2.93	3.13	3.87	4.87	3.07	4.87	4	4.13	3.67	4.2	2.2	2.27	3.67	4	3.27	3.93	3.27	3	4.2	2.87	3.53	3.93
XVII	Lengkong	3.16	3.4	3.36	2.72	3.52	2.79	4.4	3.73	2.73	3.67	2.8	4.47	3.53	3	3.93	3	3.07	2.87	4.13	1.47	2.53	3	3.87	3.33	4.4	3.73	3.13	1.8	2.47	3.27	2.53
XVIII	Batununggal	3.47	3.81	4.03	3.16	3.41	2.93	3.67	4.53	2.87	4.87	3.93	2.53	5	3.87	4.27	4.33	2.93	4.53	2.33	2.2	1.67	2.6	3.87	2.93	3.93	3.27	3.6	1.87	3.13	2.53	2.73
XIX	Kiaracondong	3.55	3.4	3.99	3.33	3.36	3.65	3.93	3.53	2.8	4.13	3.27	3.4	4.47	4.13	4.6	3.47	4.4	2.53	4.13	3.6	3	3.47	3.53	3.13	3.27	3	4.07	3.2	3	4	3.47
X	Arcamanik	3.29	3	4.11	3.06	3.8	2.47	3.8	1.8	2.27	3.13	3.87	4.53	4.47	3.47	3.87	4	4.73	2.53	2.47	2.53	2.33	3.93	3.53	3.93	3.87	3.93	3.4	1	2.27	2.6	3.73
XXI	Cibiru	2.91	2.98	3.18	2.39	2.66	3.32	4.6	4.27	2.2	2.53	3.07	3.67	2.8	3.67	3.67	2.67	2.8	2	3.53	2.67	2.13	2.4	3.4	2.33	2.4	2.4	2.4	2.27	3.13	4.13	3.2
XXII	Antapani	3.61	3.92	3.85	3.09	3.76	3.43	4.6	4.07	2.13	4	3.73	3.4	4.53	3.27	4.33	3.73	2.93	3.6	2.4	2.2	1	3.13	4	3.47	4	3.87	3.73	3.4	3.47	3.2	3.53
XXIII	Ujung Berung	3.24	3.66	3.34	2.25	3.74	3.2	4.8	5	3	3.33	2.53	4.67	4.4	2.6	3	3	3	1.8	3.53	2.53	1.8	3.4	4.2	2.6	4	4.13	2.67	3.2	3.13	3.33	3.4
XXIV	Rancasari	3.08	3.24	3.46	2.64	3.62	2.45	3.27	4.53	2.73	3.47	3.07	3.6	4.33	2	4.33	3.73	3	3.07	2.87	2.33	2.07	3.87	3.53	2.87	3.93	3.4	2.67	1.6	2.07	1.93	3.07
XXV	Buahbatu	3.24	3.61	3.37	2.31	2.95	3.97	4.4	4.4	3.4	2.47	4.6	3.07	4.87	3.93	4	2.33	4.33	4	2.6	2.2	1	3.4	2.8	1.13	3.47	3	4.87	4.73	2.93	3.6	2.33
XXIV	Bandung Kidul	2.89	3.45	3.16	2.48	2.77	2.58	3.73	3.53	2.8	4.07	4.33	4.13	4	2.8	3.33	2.67	3.6	3.13	2.93	2.4	1.27	3.33	2.67	2.2	2.67	2.47	2.4	1.73	2.93	3.2	2.6
XXVII	Panyileukan	3.44	3.7	3.92	3.08	3.73	2.77	3.93	3.73	3.47	4	3.53	3.4	4.8	3.6	4	3.47	3.27	3.6	3.07	2.13	2.4	3.87	4	3.73	3.4	4	3	2.6	2.8	1.93	3.4
XXVIII	Cinambo	3.4	3.61	3.62	3.2	3.6	2.98	4.67	4.27	2.87	3.13	3.47	3	4.87	3.4	3.67	3.2	3.47	3.2	4	1.53	2.8	3.87	3	3.13	3.93	3.6	4.07	3.73	2	2.8	3.2
XXIX	Mandalajati	3.13	3	4.29	2.65	3.31	2.4	2.73	2.67	3.07	3.2	3.73	3.67	4.73	4.07	4.6	4	3.73	3.27	2.4	1.13	3.2	3.33	4	2.27	3.73	2.53	2.6	2	2.53	2.33	3.4
XXX	Gedebage	3.94	3.4	4.31	4.23	4.52	3.26	4.2	4.47	2.87	3.13	3.33	4.47	5	4.13	4.33	3.73	4.87	4.2	3.93	2.8	4.2	4.47	4.8	4.27	4.8	4.33	2.27	1.27	2.93	3.4	4.13
	AVERAGE	**3.36**	**3.60**	**3.68**	**3.02**	**3.52**	**2.96**	**4.24**	**3.88**	**2.93**	**3.62**	**3.60**	**3.69**	**4.31**	**3.31**	**4.07**	**3.42**	**3.52**	**3.35**	**3.25**	**2.49**	**2.26**	**3.54**	**3.58**	**3.12**	**3.72**	**3.50**	**3.11**	**2.49**	**2.81**	**3.15**	**3.16**

Note: 1=very poor, 2=poor, 3=medium, 4=good, 5= best

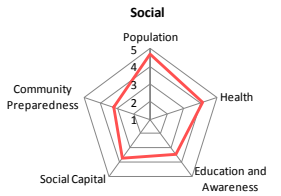
Sub-district I: Sukasari



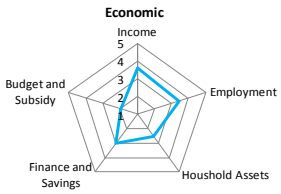
Kecamatan Sukasari, has 4 wards and is located at the highland on northern-and western end of Bandung City with an area size of 6.27 km^2 and a population of around 77,218 in 2008. The population density is 12,315.47/km^2, which is quite dense compared to other sub-districts. This area is characterized by a main river (Cikapundung) flowing at its eastern border. A prominent private university is located in this area, where as the majority of the houses are used as dormitories for students, even a high stories apartment is built next to the university. But less than 10% of the buildings are constructed following the building code. The overall resilience indicates in the diagram is below the average, distinguished from the economic and natural dimension.



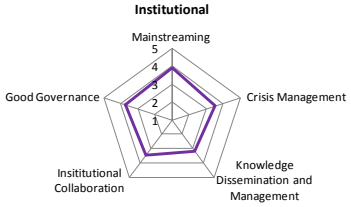
Up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 50% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road. A slightly more than half of roads remained accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



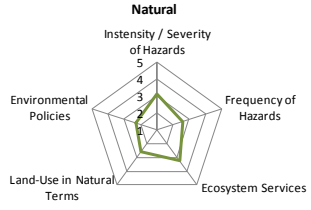
The population growth is less than 0.9%, however this area is occupied by 77,218 people with a density of 12.315 people live on one sq/km. A slightly above one third of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities; however they might face some difficulties in the social ethnic integration. Although the people are prepared for a disaster (logistics, materials, and management), there is no support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line, but the income only came from one source. Unemployment in the formal sector is up to 18%, which is the same percentage for the youth employed as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) during disaster. Although more than 50% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. And there is no available annual budget targeting disaster risk management, no availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.

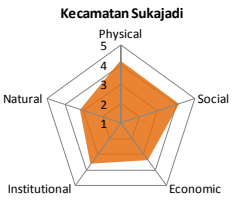


Although this area has a good mainstreaming of DRR/CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; there is no capacity for dissemination of disaster awareness programs (books, leaflets, manpower, and campaigns for disaster education).

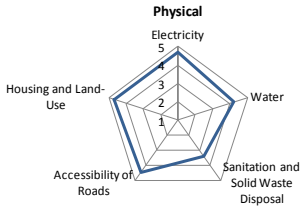


Since this sub-district is bordered by the main river; during and after a heavy rainfall, a severe riverine floods are occurring in this area. And since this area has hilly and steep slope morphology, almost half of settlement is exposed to vulnerable zones. The amount of green spaces and the use of sub-district level hazard maps in development activities are up to 10% as well as poor in the implementation of mitigation policies to reduce air pollution (e.g. CO_2 from traffic or household emissions).

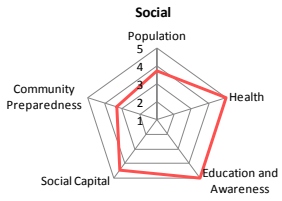
Sub-district II: Sukajadi



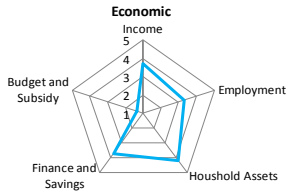
Kecamatan Sukajadi, has 5 wards and is located at the north-west of Bandung City with an area size of 4.23 km^2 and a population of around 101, 065 in 2008. The population density is 23,503.49/km^2, which is quite dense compared to other sub-districts. This sub-district is composed mainly for residential with a slightly mix of service and commercial purposes. One of the service purposes that could be distinguished in this sub-district is a well-known public hospital. The overall resilience indicates in the diagram is slightly above the average, mainly in the physical, social, and institutional dimension.



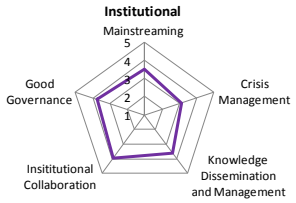
Up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 75% of the population has access to sanitation, but only up to 25% of the solid waste is treated before dumping and recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network and almost 100% of the area is accessible by paved road. More than 70% of roads remained are accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure and more than 50% of the buildings are constructed following the building code. Although this area is not a hazardous area, almost a quarter of the population is living in the proximity to dumping grounds.



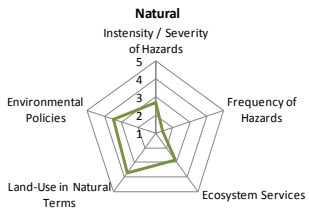
The population growth is ranged between 1-1.9%, however this area is occupied by 101.065 people with a density of 23,503.49 people is living on one sq/km. Less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 100% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are very well provided and able to serve the community. The literacy rate is ranged between 80-100% and sub-district authority organizes once a year a disaster drill. Up to 40% of the population is participated in community activities and they could blend well with other ethnics for social integration. The people are prepared for a disaster (in terms of logistics, materials, and management) and have a support from the NGOs/CSOs after a disaster.



The majority of the population lives below the poverty line and have 3 sources of income, only less than 25% of the households depend on only one source of income. Unemployment in the formal sector is up to 18%, same as for the youth employed as well. Female labor is noted up to 65% in this sub-district. Almost all the population have television and telecommunication device as well as motorized vehicle. One third of community has non-motorized vehicle. However, less than 50% of the households have furniture to secure the key items (money, important documents, etc.) for during disaster. Although up to 50% of the people are practicing saving, only up to 16% of the households are under any sort of insurance scheme. There is a support or access of credit facility during disaster for urban poor or low-income groups. However, annual budget targeting disaster risk management, subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster are not available.

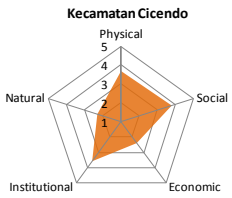


Although this area has a good community participation in their development plans and preparation process, as well as incorporation of disaster management plan; the effectiveness of emergency team during a disaster (in terms of leadership and competence) is poor. This is not reflected in their institutional collaboration with other organizations and stakeholders.

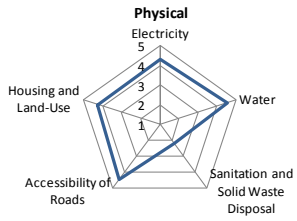


Since the main river flows from north to south; during and after a heavy rainfall, a severe riverine floods are occurring in this area. The frequency of the inundations, riverine floods, as well as rainfall-induced landslides and storms, are occurring more than once per year. And the natural condition become worse as the average of urban water quality in lakes, rivers is poor in line with almost 90% of the average intensity of land-use/urban morphology area is built-up. That is why the amount of green spaces is up to 15%. Regarding the environmental policies, the implementation of efficient waste management system (reduce, reuse, and recycle) is poor in this area.

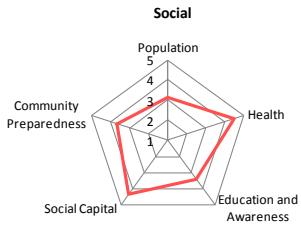
Sub-district III: Cicendo



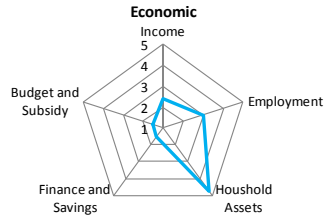
Sub-district 3, Cicendo is consisted from 6 wards and located at the western end of Bandung City with an area size of 6.86 km^2 and a population of around 103,353 in 2008. The population density is 15,092.49/km^2, which is quite dense compared to other sub-districts. Two rivers (Citepus and Ciwaruga) are flowing through. This area is characterized by mixed land-use, an international airport is marked and serves as service purposes for the whole city. The overall resilience indicates in the diagram is below the average, mainly in the economic and natural the dimension.



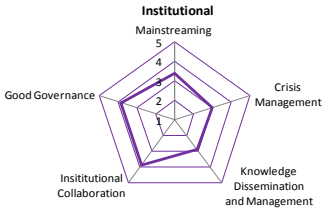
Although up to 40% of the area is affected by interruption, up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 60% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to only 10% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. And 100% of the area is accessible by paved road and more than 71% of roads remained are accessible during normal flooding in affected areas, but only up to 60% of the roads have roadside covered drain. Up to 19% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area as none of the population are living in the proximity to polluted industries or dumping grounds.



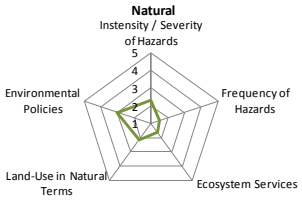
The population growth is less than 0.9%, however this area is occupied by 103,353 people with a density of 15,092 people is living on one sq/km. More than 45% its population is under age 14 or over 64 years old. There is a chance that up to 11% of the population suffer from water-and vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once a year a disaster drills. Almost half of the population is participated in community activities; and among different ethnics the blending process is well and has a good social integration. The people are prepared for a disaster (logistics, materials, and management), there is a good support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line, but the income is only came from one source. Unemployment in the formal sector is only up 7%, although the youth unemployment is up to 24%. Almost all the population have television and telecommunication device, motorized vehicle, and more than 80% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. More than 50% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. And there are no available annual budget targeting disaster risk management, no availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.

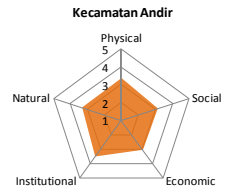


The mainstreaming of DRR and CCA, the effectiveness of sub-district's crisis management framework, and the institutional collaboration with other organizations and stakeholders are good and slightly effective. But there is no effectiveness in learning from previous disasters and heavily dependent on external institutions or support during a disaster.

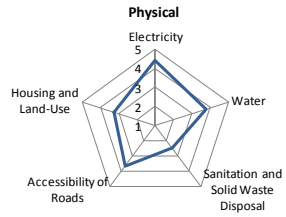


Since this sub-district has 2 rivers flowing through it; during and after a heavy rainfall, a severe riverine floods are occurring in this area. The frequency of the floods is more than once per year during the rainy season and suffers from water scarcity more than once per year as well. The ecosystem service, particular in this area, such as the average of urban air quality during the day and water, are poor. It reflects in the poor implementation of mitigation policies to reduce air pollution (e.g. CO_2 from traffic or household emissions).

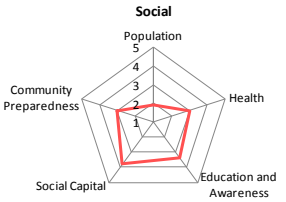
Sub-district XIV: Andir



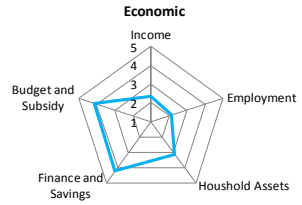
Sub-district 4, Andir has 6 wards and is located at western end of Bandung City with an area size of 3, 71 km^2 and a population of around 106,201 in 2008. The population density is 28,625.61/km^2, which is very dense regarding its small size of the area. More than 50% of the area is occupied for commercial purposes, where lots of shops and trading markets can be found. The water level rose about 200cm of the river Cibeureum and marked as the worst riverine flood case in year 2010. The overall resilience indicates in the diagram is below the average, with social and natural dimension are marked the weakest.



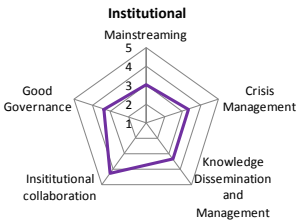
Up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 60% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. All of the area is accessible by paved road and only up to 50% of roads remained are accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Up to 29% of the houses are built with non-permanent structure, and more than 50% of the buildings are constructed following the building code. This area is not a hazardous area, however, up to 49% of the population are living in the proximity to polluted areas (due to everyday heavy traffic flow).



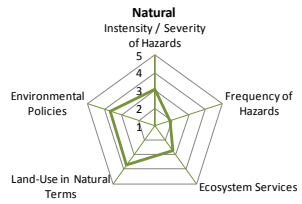
The population growth is quite high, up to 3.9%, however, slightly above one third of its population is under age 14 or over 64 years old. Almost 17% of its population suffer from water-and vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are quite moderate provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes more than once per year a disaster drill. Almost half of the population is participated in community activities; and among different ethnics, the social integration process runs quite smoothly. The people are prepared for a disaster (logistics, materials, and management) and there is a quite few support from the NGOs/CSOs after a disaster.



Up to 30% of the population lives below the poverty line and the income comes from two sources. Unemployment in the formal sector is more than 25%, which is the same percentage for the youth unemployment as well. Up to 70% of the population have television and telecommunication device, however only up to 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. More than 50% of the people are practicing saving and more than 33% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And more than 3% of the budget is available for disaster risk management. There is availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster, although the sum is quite small.

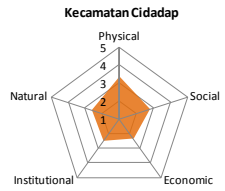


This area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster. The cooperation of sub-district's ward officials for emergency management and institutional collaboration with NGOs as well as private organizations during a disaster are at its best.

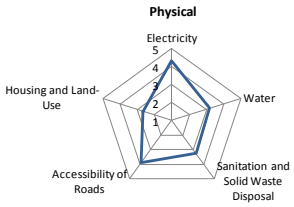


The intensity and severity of the floods are severe and occurring more than once per year in this area. In term of the ecosystem service; the average of urban water quality is poor. Almost 70% of this area is built-up, where the loss of green spaces is up to 20%, thus the implementation of the environmental policies is quite poor for this area.

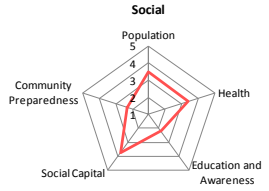
Sub-district V: Cidadap



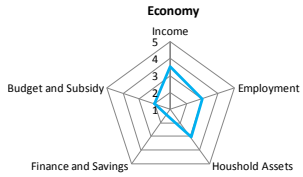
Sub-district 5, Cidadap has only 3 wards and is located at the highland on northern-and western end of Bandung City with an area size of 6,11 km^2 and a population of around 53,934 in 2008. The population density is 8,827.17/km^2, which is not dense at all compared to other sub-districts. Almost half of the total area is occupied by green spaces and forest, where a major river (Cipaganti) is flowing through this sub-district. The overall resilience indicates in the diagram is below the average, marked for the economic, institutional and natural dimension.



Up to 100% of the households have access to electricity and up to 88% have access to potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 50% of the solid waste is recycled; both in formal and informal ways. Only up to 15% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road and remained accessible during normal flooding in affected areas, and more than 60% of the roads have roadside covered drain. Up to 19% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



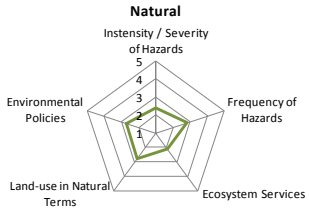
The population growth is ranged between 1-1.9%, however this area is occupied up to 46% by under age 14 or over 64 years old. Up to 11% of the population suffer from water-and vector borne diseases every year and up to 90% of the population has access to primary health care facility. But in case of emergency and before disaster, the health facilities are poorly provided and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once in two year a disaster drill. Up to 40% of the population is participated in community activities and could integrate well with each other (between ethnics). The households are not prepared for a disaster (logistics, materials, and management) and the support from the NGOs/CSOs after a disaster is quite small.



Less than 11% of the population lives below the poverty line, but the income is only came from one source. Unemployment in the formal sector is up to 18%, which is the same percentage for the youth unemployment as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Only up to 20% of the people are practicing saving and only up to 10% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. And there are no available annual budget targeting disaster risk management. The availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster is poor.

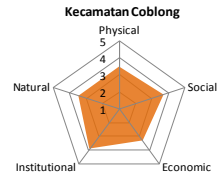


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, but the inclusion of disaster management into development planning is poor, as well as the existence of emergency team during a disaster. There is no existence of disaster awareness programs (disaster education) for the communities. The extent of institutional collaboration with other organizations and stakeholders is heavily dependent and in case of an emergency; the network with other sub-districts is poor.

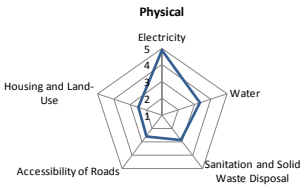


Since a major river is flowing through this area, during and after a heavy rainfall, a severe riverine floods are occurring. And since this area has hilly and steep slope morphology, the rainfall-induced landslides are occurring once per year. Although the amount of green spaces are half of the total area, the urban biodiversity, average urban soil, air and water quality are poor. It is reflected in poor implementation of mitigation policies to reduce air pollution (e.g CO_2 from traffic and household emissions).

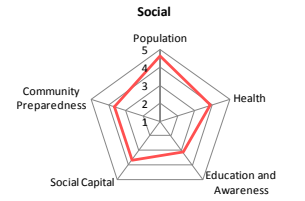
Sub-district XVI: Coblong



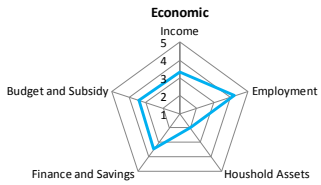
Sub-district 6, Coblong has 6 wards and is located at the highland on northern part of Bandung City with an area size of 7.35 km^2 and a population of around 126,450 in 2008. The population density is 17,204.08/km^2, which is quite dense compared to other sub-districts. This area is well known for the best state institute of technology in country, many factories fashion outlets, famous culinary places, as well as high-end residential areas. The overall resilience indicates in the diagram is slightly above the average, especially in the physical and institutional dimension.



Up to 100% of the households have access to electricity, but only up to 50% have access to potable water supply. Up to 60% of the population has access to sanitation, but up to 50% of the solid waste is treated before dumping and up to 75% of the solid waste is recycled; both in formal and informal ways. Only up to 10% of the area's land is used as transportation network, and up to 60% of the area is accessible by paved road. More than 71% of roads remained are accessible during normal flooding in affected areas, but only up to 30% of the roads have roadside covered drain. Up to 19% of the houses are built with non-permanent structure, however less than 20% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



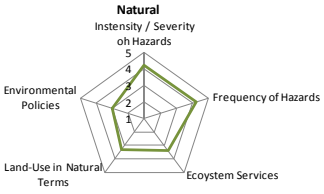
The population growth is ranged between 1-1.9% and less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 75% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once a year a disaster drills. Almost half of the population is participated in community activities; and could integrate nicely among different ethnics. The people are prepared for a disaster (logistics, materials, and management), there is few support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and it comes only from one source. Unemployment in the formal sector is up to 12%, which is the same percentage for the youth unemployment as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although 30% of the people are practicing saving, only up to 32% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups, but more than 5% is available for annual budget targeting disaster risk management. Subsidies/incentives of small amount are available for residents to receive an alternative livelihood and health care during a disaster.

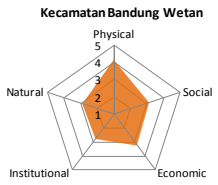


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; the efficiency of trained emergency workers during a disaster is quite fair. This area is independent on external institutions/support during a disaster.

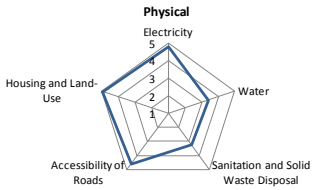


In terms of intensity and frequency of natural disasters, severe floods are occurring less than 5 years. The ecosystem service, such as urban water quality is mainly poor as it reflected the 20% total area of urban green space, of which the environmental policies are quite well enforced.

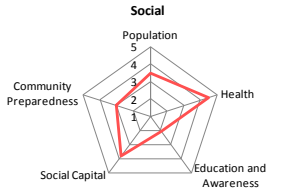
Sub-district XVII: Bandung Wetan



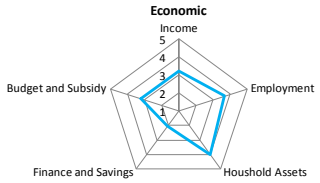
Sub-district 7, Bandung Wetan is consisted of 3 wards an located at the heart of Bandung City with an area size of 3.39 km^2 and a population of around 31,741 in 2008. The population density is 9,363.13/km^2, which is not dense compared to other sub-districts. This area is characterized by mix land-use of settlement, governmental offices, and services. A major river (Cikapundung) is flowing through this area. The overall resilience indicates in the diagram is slightly below the average, especially in the social, economic, institutional dimension.



Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 75% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Whole area is accessible by paved road and accessible during normal flooding in affected areas, but only up to 60% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure and more than 50% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



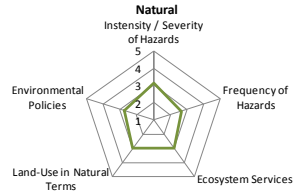
The population growth is ranged between 1-1.9%, with up to 32% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate, but the sub-district authority has not yet organizes disaster drill so far. Almost half of the population is participated in community activities and could integrate well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line with 2 sources of income. Unemployment in the formal sector is up to 12%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although more than 50% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. Annual budget targeting disaster risk management is available up to 3%, and some small amount of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster is provided.

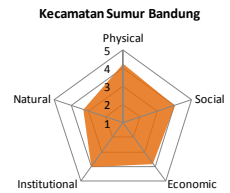


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; the efficiency of trained emergency workers during disaster is poor. The same applies for good governance issues. The effectiveness of early warning systems led by sub-district body and the existence of disaster drills could not be found so far.

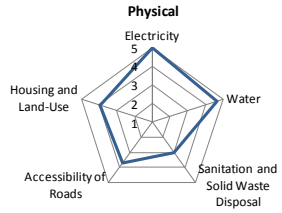


Since a major river is flowing through this area (Cikapundung), a riverine floods occurs more than once every year, and during the dry season some water scarcity is experienced in this area. From the environmental perspective, the average intensity of land-use or built up area is up to 90%, this in turn gives a loss of green space almost up to 40%. One major issue that has not been solved yet is the poor implementation of efficient waste management system (reduce, reuse, recycle).

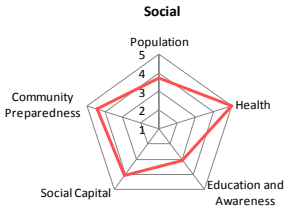
Sub-district XVIII: Sumur Bandung



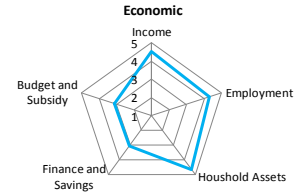
Sub-district 8, Sumur Bandung is consisted of 4 wards and located at the heart of Bandung City with an area size of 3.40 km^2 and a population of around 40,035 in 2008. The population density is 11,755.00/km^2, which is quite dense compared to other sub-districts. This area is composed mainly for commercial, governmental offices, and services. Important governmental offices such as city hall and a national level military based are located in this area. The overall resilience indicates in the diagram is above the average with a good score for almost all dimensions, except for the natural one.



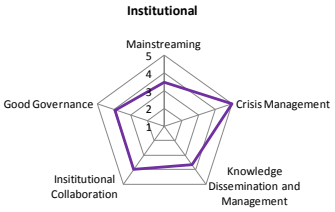
Up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping but only up to 10% of the solid waste is recycled; both in formal and informal ways. Up to 20% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road. A slightly more than half of total roads remain accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, and up to 50% of the buildings are constructed following the building code. Although this area is not a hazardous area, but 25% of the population are living in the proximity to polluted dumping grounds, which is reflected in the small amount of treated waste before dumping.



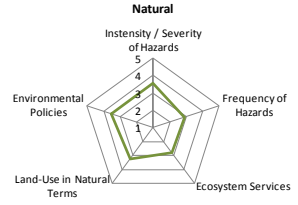
The population growth is between 1-1.9%, with less than 45% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water- nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once every two years disaster drills. Almost half of the population is participated in community activities; however they might face some difficulties in the social ethnic integration. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line with more than 3 sources of income. Unemployment in the formal sector is less than 6%, which is the same percentage for the youth unemployment as well. Almost all the population have television and telecommunication device, and up to 80% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Up to 50% of the people are practicing saving, and up to 32% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups, but no annual budget targeting disaster risk management available. There are some subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.

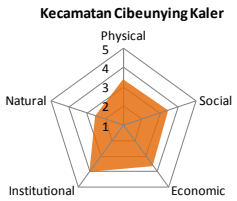


In overall, the institutional issues, such as mainstreaming of DRR and CCA, effectiveness of sub-district's crisis management framework, knowledge dissemination and management, institutional collaboration with other organizations and stakeholders, and good governance are scored best for this area. Though, they weighted the institutional collaboration is the most important issue for the institutionalization of climate-disaster resilience efforts.

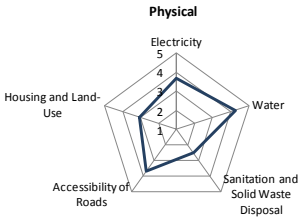


In natural term, this area has not faced any difficulties in coping with climate-related hazards, even the riverine floods occur more than once during the rainy season. Since this area is densely populated, some informal settlements can be found near the river bank and gives a poor average for the urban water quality. Almost 90% of the land is built up, but they maintain the green space up to 70% to increase city oxygen.

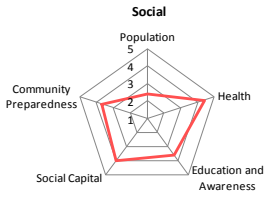
Sub-district IX: Cibeunying Kaler



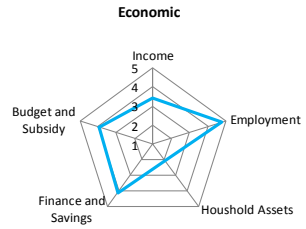
Sub-district 9, Cibeunying Kaler is consisted of 4 wards and located at the northern part of Bandung City with an area size of 4.50 km^2 and a population of around 69,011 in 2008. The population density is 15,355.78/km^2, which is quite dense compared to other sub-districts. This area is composed mainly of residential areas with one private prominent university and a large compound of national hero cemetery. Two rivers are identified (Cidurian and Cikapayang), which are flowing through this area. The overall resilience indicates in the diagram is slightly above the average, except for the natural dimension.



Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up and recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only 60% of the area is accessible by paved road during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



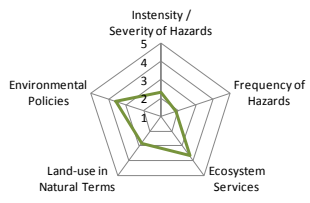
The population growth is fast compared to other sub-district, which is more than 6%, with up to32% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once in every two years disaster drills. Almost half of the population is participated in community activities and they could integrate well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Up to 30% of the population lives below the poverty line, with three sources of income. Unemployment in the formal sector is less than 6%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. More than 50% of the people are practicing saving, and only up to 32% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And they have more than 3% annual budget targeting disaster risk management available. In addition, there some subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.

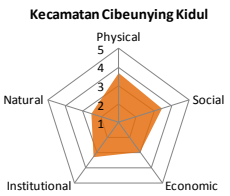


In overall, the institutional issues, such as mainstreaming of DRR and CCA, effectiveness of sub-district's crisis management framework, knowledge dissemination and management, institutional collaboration with other organizations and stakeholders, and good governance are scored best for this area. Though, they weighted the mainstreaming of DRR and CCA is most important as an effort towards climate-related disasters in their area.

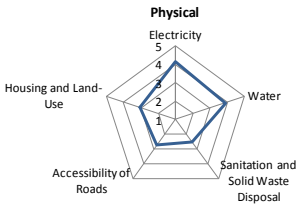


In natural term, the most affected natural hazards are riverine floods and rainfall-induced landslides. They are occurring more than once or once per year, however significant loss is not recorded, although up to 50% land of this area is located in prone areas.

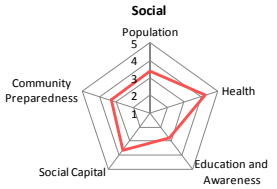
Sub-district X: Cibeunying Kidul



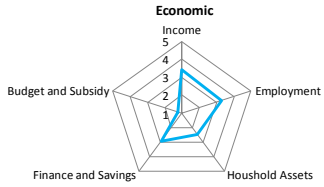
Sub-district 10, Cibeunying Kidul is consisted of 6 wards and located at the northern part of Bandung City with an area size of 5.25 km^2 and a population of around 111,094 in 2008. The population density is 21,160.76/km^2, which is quite dense compared to other sub-districts. This area is composed mainly of residential areas and some governmental offices and services. A military training camp or institution is located as well in this area. The overall resilience indicates in the diagram is below the average, especially in the economic, institutional and natural dimension.



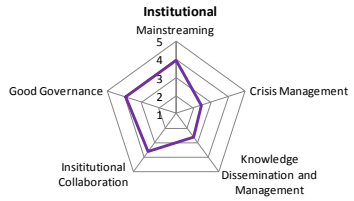
Up to 95% of the households have access to electricity and up to 80% have access to potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 10% of the solid waste is recycled; both in formal and informal ways. Up to 20% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road. A slightly more than half of roads remained are accessible during normal flooding in affected areas, and up to 60% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, however up to 20% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



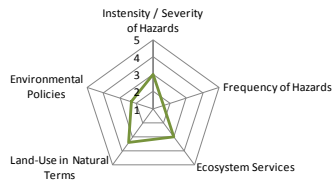
The population growth is less than 0.9%, with more than 45% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water- nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and they could integrate well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Up to 30% of the population lives below the poverty line, with two sources of income. Unemployment in the formal sector is up to 24%, which is more than the percentage for the youth unemployment rate (up to 18%). Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Up to 50% of the people are practicing saving, and only up to 16% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is available annual budget targeting disaster risk management for less than 2%. However, no availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.

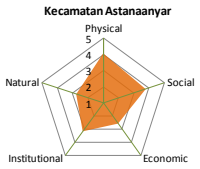


Although this area has a good mainstreaming of DRR and CCA and institutional collaboration with other organizations and stakeholders; this area has not yet have the efficiency trained emergency workers during a disaster and the readiness of alternative decision making personnel during a disaster. In term of knowledge dissemination and management; there is no regular disaster training programs for emergency workers and no capacity for dissemination of disaster awareness programs. For the good governance issue; the early warning systems are not yet established and they do not have the capability yet to lead the recovery process.

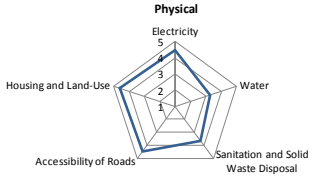


In natural term, this area experienced floods (inundated and riverine) more than once per year. And during the dry season, water scarcity occurred more than once per year as well. Additionally, this area is still weak in enforcing the environmental policies, such as poor in implementation of environmental conservation policies, waste management system, and in mitigation policies to reduce air pollution (CO_2 from traffic emission).

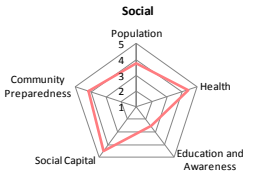
Sub-district XI: Astanaanyar



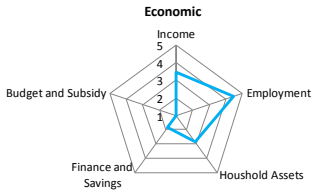
Sub-district 11, Astanaanyar is consisted of 6 wards and located at the lowland of western part Bandung City with an area size of 2.89 km^2 and a population of around 70,554 in 2008. The population density is 24,409.69/km^2, which are the fourth most dense sub-districts. This area is currently purposed for the commercial use, where shops and markets are located. Some residential areas could be spotted with high population density. Three tributaries are flowing through this area (Citepus, Cikakal, and Ciroyom). The overall resilience indicates in the diagram is below the average, mainly in the economic, institutional and natural dimension.



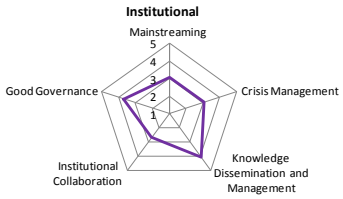
Up to 100% of the households have access to electricity and only up to 95% have access to potable water supply. Up to 75% of the population has access to sanitation and only up to 25% of solid waste is treated before dumping and almost all of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network, and up to 80% of the area is accessible by paved road. More than half of roads remained are accessible during normal flooding in affected areas and up to 60% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure and more than 50% of the buildings are constructed following the building code. This area is not a hazardous, thus none of the population are living in the proximity to polluted industries or dumping grounds.



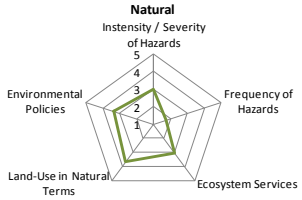
The population growth is the highest (more than 6%) and up to 39% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and there is no awareness or knowledge of population about the threat and impacts of disasters, thus the sub-district authority organizes once a year a disaster drills. Almost half of the population is participated in community activities and they have good social integration among different ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and the majority of the people have only 1 source of income. The unemployment rate in the formal sector is less than 6%%, which is the same for the percentage for the youth unemployment as well. The women who are working in the formal sector are just a few (less than 20%). Almost all the population have television and telecommunication device, however less than 50% of the households does not has furniture to secure the key items (money, important documents, etc.) for during disaster. Although more than 50% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups, neither sub-district's annual budget targeting disaster risk management available. Subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster are not available.

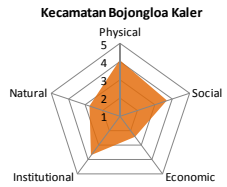


The effectiveness of sub-district's crisis management framework, knowledge dissemination and management, as well as good governance is running properly in this area. Except for the mainstreaming of DRR and CCA; there no capacity yet in this area to produce development plans (logistics, materials/technical). In addition, for the institutional collaboration with other organizations and stakeholders; this area is heavily dependent on external institutions/support during a disaster.

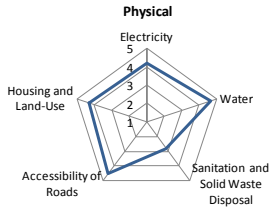


The floods, both inundated and riverine have severe impacts to this area and are occurring frequently (more than once per year). The land-use in natural terms, especially in the average intensity of land-use-urban morphology (built area) has occupied almost up to 90% of this area.

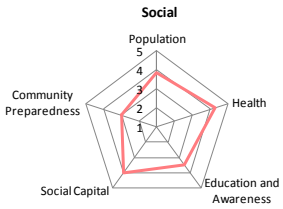
Sub-district XII: Bojongloa Kaler



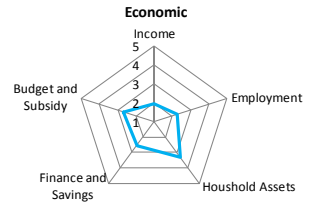
Sub-district 12, Bojongloa Kaler is consisted of 5 wards and located at the south- western end of Bandung City with an area size of 3.03 km2 and a population of around 120,894 in 2008. The population density is 39,899.01/km2, which is the most dense sub-districts among Bandung City. This area is well-known for its settlement areas. Almost 90% of the land is occupied for the residential purpose. Some shops could be found along the major roads. The overall resilience indicates in the diagram is slightly below the average, particularly in the economic and natural dimension.



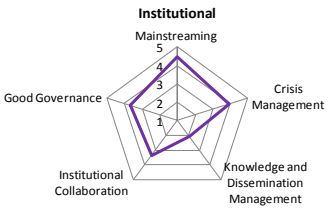
Up to 100% of the households have access to electricity and potable water supply. Only up to 60% of the population has access to sanitation and only up to 25% of solid waste is treated before dumping and only up to 10% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network, and up to 80% of the area is accessible by paved road. Up to 70% of roads remained are accessible during normal flooding in affected areas and only up to 45% of the roads have roadside covered drain. Up to 19% of the houses are built with non-permanent structure and more than 50% of the buildings are constructed following the building code. This area is not a hazardous, thus none of the population are living in the proximity to polluted industries or dumping grounds.



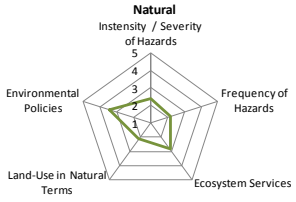
The population growth is ranged between 1-1.9% and more than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and there is a good awareness or knowledge of the population about the threat and impacts of disasters and the sub-district authority organizes once in every two years a disaster drills. Almost half of the population is participated in community activities and they are trying to integrate socially among different ethnic groups. The people put an effort to be prepared for a disaster (logistics, materials, and management) and some support from the NGOs/CSOs after a disaster is available.



The population lives below the poverty line is ranged between 21-30% and the majority of the people have only 1 source of income. The unemployment rate in the formal sector is more than 25%, more than youth unemployment rate (19-24%). The women who are working in the formal sector are up to 50% and almost all the population have television and telecommunication devices; however only up to 60% of the households does not has furniture to secure the key items (money, important documents, etc.) for during disaster. Only up to 20% of the people are practicing saving and only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups and sub-district's annual budget targeting disaster risk management is available for less than 1%. There are no subsidies/incentives for residents to receive an alternative livelihood after disaster; however subsidies and support for a health care after a disaster is provided.

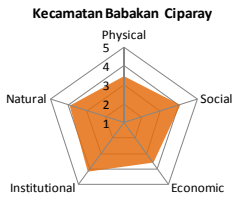


The institutional issues such as mainstreaming DRR and CCA, effectiveness of sub-district's crisis management framework are running well in this area. However for the knowledge dissemination and management, the regular disaster training programs for emergency workers is not yet available as well as the disaster awareness programs for communities. Therefore, the community is not satisfied yet with the disaster awareness programs, such as disaster education in the sub-district. Additionally, in term of good governance, the disaster drills at sub-district level is not yet existed.

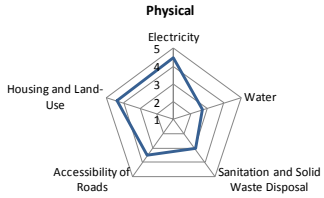


The frequency of floods (inundated and riverine) in this area is more than once every year and cause severe impacts to the area, such as causing the poor average of urban water quality. For the land-use in natural term issue, more than 90% of the land is built and left only up to 5% for urban green spaces.

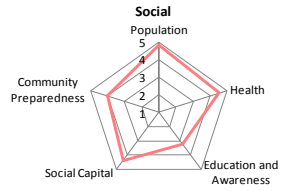
Sub-district XIII: Babakan Ciparay



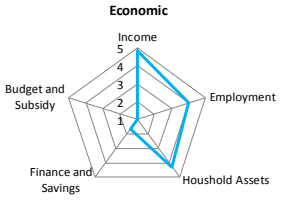
Sub-district 13, Babakan Ciparay has 6 wards and is located at the south- western end of Bandung City with an area size of 7.45 km^2 and a population of around 142,309 in 2008. The population density is about 19,101.88/km^2, which is quite dense compared to other sub-districts. This area is mainly composed of residential areas and industries, which are mostly textile industries, such as garments. The overall resilience indicates in the diagram is above the average, except for the economic dimension.



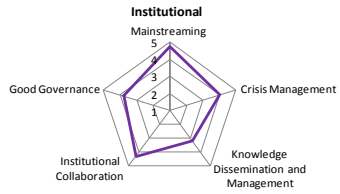
Up to 100% of the households have access to electricity and potable water supply. Additionally, up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and recycled; both in formal and informal ways. Up to 15% of the area's land is used as transportation network and almost whole area is accessible by paved road, but only less than 40% of roads remained accessible during normal flooding in affected areas. Additionally, up to 60% of the roads have roadside covered drain. There is only 10% of the houses are built with non-permanent structure, but only up to 30% of the buildings are constructed following the building code. Although quite amount of garment industries are located in this area, none of the population are living in the proximity to polluted industries or dumping grounds.



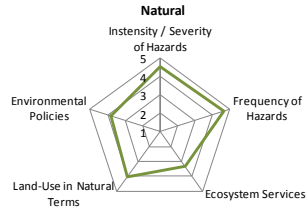
The population growth in this area is only up to 0.9% and less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 75% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once a year disaster drill. However, the schools could not be used or have a function after a disaster. Almost half of the population is participated in community activities; and they could integrate well in term of the social ethnics. People are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and having more than three sources of income. Unemployment in the formal sector is less than 6%, which is the same percentage for the youth unemployment rate as well. Almost all the population has television and telecommunication device, however only up to 60% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. There is only up to 30% of the people are practicing saving and only less than 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups, but there is no annual budget available in targeting disaster risk management. In addition, there are no subsidies/incentives available for residents to receive an alternative livelihood and health care during a disaster as well.

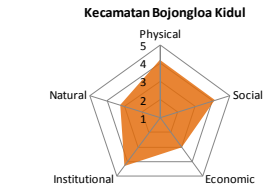


Almost all institutional issues, such as: mainstreaming the DRR and CCA, effectiveness of sub-district's crisis management framework, knowledge dissemination and management, institutional collaboration with other organizations and stakeholders as well as good governance; are fulfilled by this sub-district.

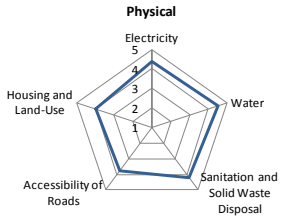


The natural hazards that frequently struck this area are mostly riverine floods, which occur once a year, especially during the rainy season. The loss of the urban green space due to development of infrastructure is up to 20%. Although some industries are settled in this sub-district, the implementation of efficient waste management system and mitigation policies to reduce air pollution (mostly due to CO_2 traffic emissions) are moderate, no harm violation is so far reported. It reflects in their good implementation of environmental conservation policies

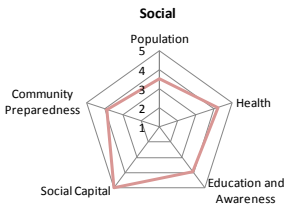
Sub-district XIV: Bojongloa Kidul



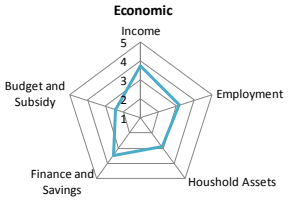
Sub-district 14, Bojongloa Kidul has 6 wards and is located at the southern- west end of Bandung City with an area size of 6.26 km^2 and a population of around 81,045 in 2008. The population density is 12,946.49/km^2, which is quite dense compared to other sub-districts. Only settlements could be found in this area, with some shops along the major roads. Famous national shoes industries are located in this area and being a landmark as well as source of income for this area. Unfortunately, this area is located on the lowland and some of the major roads are subsided, during the rainy season, most of the roads are heavily inundated. The overall resilience indicates in the diagram is above the average, of which less resilient can be distinguished in the economic and natural dimension.



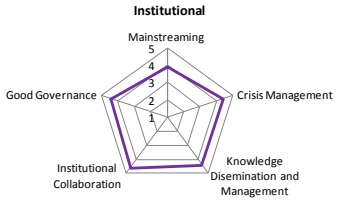
Almost all of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 75% are recycled; both in formal and informal ways. Up to 20% of the area's land is used as transportation network and more than 80% of the area is accessible by paved road. Up to 70% of roads remained accessible during normal flooding in affected areas, but less than 15% of the roads have roadside covered drain. There is only 10% of the houses are built with non-permanent structure and more than 50% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



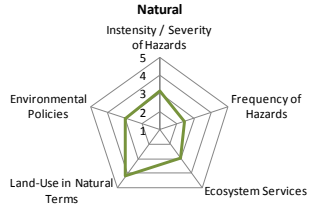
The population growth is ranged between 4-5.9% and less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once a year disaster drill. Almost half of the population is participated in community activities; and they could integrate well in term of the social ethnics. People are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line with only one source of income. Unemployment in the formal sector is less than 16%, which is lesser than the percentage for the youth unemployment rate (ranged between 19-24%). Almost all the population has television and telecommunication device, however only up to 10% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Up to 50% of the people are practicing saving but only up to 32%of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is small budget available less than 1% of the annual budget targeting disaster risk management. There are no subsidies/incentives available for residents to receive an alternative livelihood but they provide some support for a health care after a disaster.

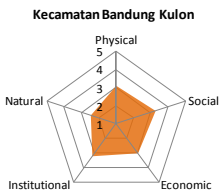


In term of institutional issues such as: mainstreaming the DRR and CCA, effectiveness of sub-district's crisis management, knowledge dissemination and management, institutional collaboration with other organizations and stakeholders, as well as good governance; this sub-district has applied and covered those issues. In particular, the capability of sub-district body to lead recovery process (relief work, reconstruction, and rehabilitation) after a disaster is at its best.

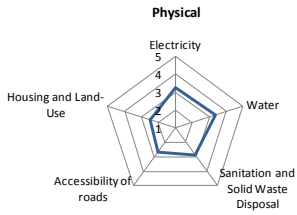


During the rainy season, this area experiences inundation more than once a year and during the dry season, water scarcity is occurring once in a year. Rainfall-induced landslides at the river banks (Citepus) are occurring once a year as well. Due to heavy traffic flow, the average of urban air quality is poor. In addition, poor implementations of efficient waste management system (reduce, reuse, and recycle) hamper the sound of environmental policies.

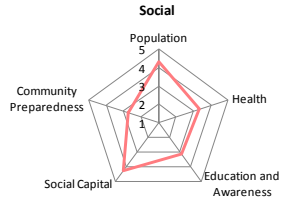
Sub-district XV: Bandung Kulon



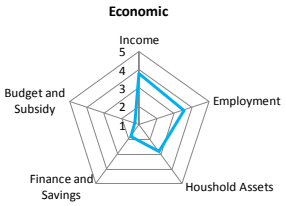
Sub-district 15, Bandung Kulon has the most wards (8 wards) and is located at the western end of Bandung City, bordered with Cimahi, with an area size of 6.46 km^2 and a population of around 123,350 in 2008. The population density is 19,404.02/km^2, which is dense compared to other sub-districts. This area is characterized mostly by the settlements and industries. The overall resilience indicates in the diagram is below the average, of which all five dimensions have low resilience index score.



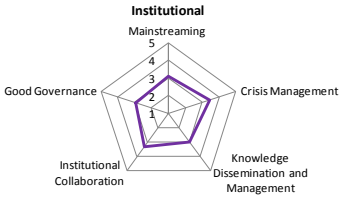
Up to 95% of the households have access to electricity and up to 80% to potable water supply. Only up to 75% of the population has access to sanitation, but only up to 25% of the solid waste is treated before dumping and 50% of them are recycled; both in formal and informal ways. Almost 20% of the area's land is used as transportation network. But only up to 60% of the area is accessible by paved road and less than 40% of roads remained accessible during normal flooding in affected areas and up to 30% of the roads have roadside covered drain. More than 30% of the houses are built with non-permanent structure and up to 30% of the buildings are constructed following the building code. Seeing they are living between the industrial areas, almost 49% of the population lives on the hazardous area (industry pollutions).



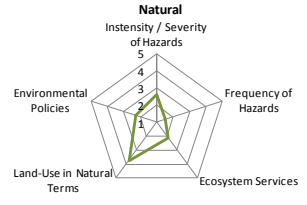
The population growth is less than 0.9%, with less than 25% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and only up to 95% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are quite provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once every two years a disasters drills. Almost half of the population is participated in community activities and they could integrate well with other ethnic groups. The people are quite prepared for a disaster (logistics, materials, and management) there is limited support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line with 2 (two) income sources. Unemployment in the formal sector is up to 24%, which is more than the youth unemployment rate as well. Almost all the population has television and telecommunication device, however only up to 60% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Only up to 20% of the people are practicing saving and only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups; however they do not have an annual budget targeting disaster risk management available up. There are some subsidies/incentives available for residents to receive an alternative livelihood but they do not provide it for the health care during a disaster.

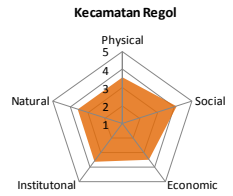


In term of institutional issues, this area has a quite good performance on the effectiveness of sub-district's crisis management and the institutional collaboration with other organizations and stakeholders. However, on the mainstreaming the DRR and CCA aspect, this area has a poor capacity (logistics, materials/technical issues) to produce development plans. Additionally, on the knowledge dissemination and management aspect, this area has a poor capacity (books, leaflets, manpower, and campaigns) for dissemination of disaster awareness programs (disaster education). In addition, on the good governance aspect, the transparency of sub-district body to lead recovery process (relief work, reconstruction, and rehabilitation) is poor as well.

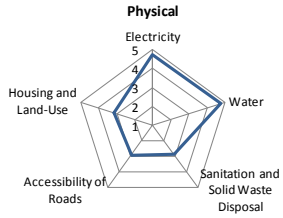


Floods (inundated as well as riverine type) occur often, which count more than once a year and give a severe impact to the people and environment. Other climate-related hazards that threatened this area once a year are rainfall-induced landslides, storms, and water scarcity (during the dry season). These are reflected on its ecosystem service, such as very poor average of urban water quality and poor urban air quality during the day. These factors are existed due to poor implementation of environmental conservation policies and environmental conservation regulations reflected in development plans.

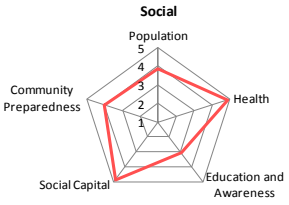
Sub-district XVI: Regol



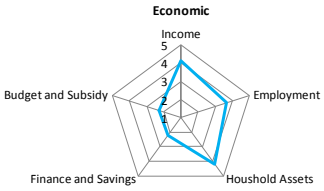
Sub-district 16, Regol has 7 wards and is located at the lowland on southern-west of Bandung City with an area size of 4.30 km^2 and a population of around 86,500 in 2008. The population density is 20, 116,29 /km^2, which dense compared to other sub-districts. This area was previously be the center of the City and marked with the city garden and mosque. A historical building back from Dutch colonialism heritage can be found, which currently has the function of holding International Conferences, such as the Non-Align Asia-Africa Movement. Beside the historical buildings and city green space services, international and local banking buildings are existed. A major river (Cikapundung) is flowing through this area as well. The overall resilience indicates in the diagram is above the average, particularly in the physical, social, and institutional dimension.



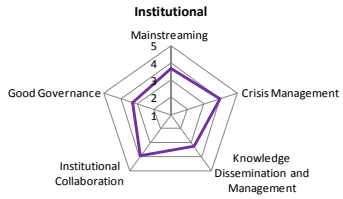
Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and recycled; both in formal and informal ways. Up to 15% of the area's land is used as transportation network and more than 80% of the area is accessible by paved road. More than 71%of roads remained accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. There is only 10% of the houses are built with non-permanent structure, however less than 20% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



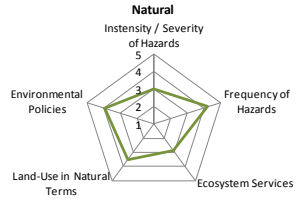
The population growth is up to 5.9%, much more compare to other sub-districts and less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once a year disaster drill. Almost half of the population is participated in community activities; and they could integrate well in term of the social ethnics. People are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and the income come from two sources. Unemployment in the formal sector is up to 24%, which is the same percentage for the youth unemployment as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. There is only up to 30% of the people are practicing saving and the same percentage of the households is under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. And there is small budget available up to 3% for annual budget targeting disaster risk management. There are no subsidies/incentives available for residents to receive an alternative livelihood and health care during a disaster.

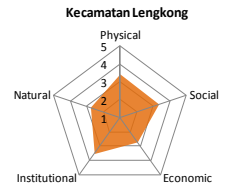


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the inclusion of disaster management plan into development planning; the frequency of regular disaster training programs for emergency workers is less than once in every two years. Additionally, this area is dependent on external institutions/support during a disaster and the existence of disaster drills at sub-district level is as well less than one in every two years.

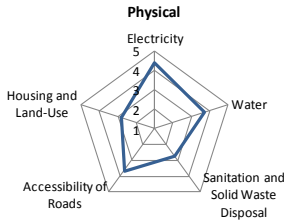


Even this sub-district has a major river (Cikapundung) flowing through it, the intensity and the severity of the floods have not heavily impacted the area and people. The average intensity of land-use-urban morphology (built area) is up to 90% and they implement mitigation policies to reduce air pollution (mainly CO_2 from the traffic emissions).

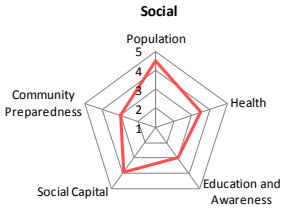
Sub-district XVII: Lengkong



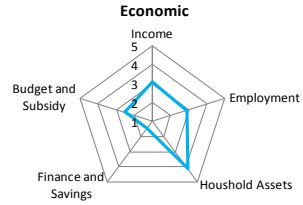
Sub-district 17, Lengkong has 7 wards and is located at the highland at the central part of Bandung City with an area size of 5.90 km^2 and a population of around 71,983 in 2008. The population density is 12,200.51/km^2, which is quite dense compared to other sub-districts. This area is characterized by a main river (Cikapundung) flowing from north to south and two other tributaries channels. This area is mainly composed from residential areas. The overall resilience indicates in the diagram is below the average, marked for the economic and natural dimension.



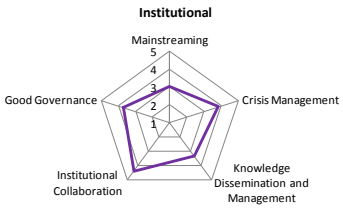
Up to 100% of the households have access to electricity and potable water supply. However, the sub-district's water supply authority is only capable to provide water supply up to 10% of its demand. Up to 75% of the population has access to sanitation, and only half of the collected solid waste is treated before dumping and recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network and 100% of the area is accessible by paved road. A slightly more than half of roads remained are accessible during normal flooding in affected areas, but only less than 15% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



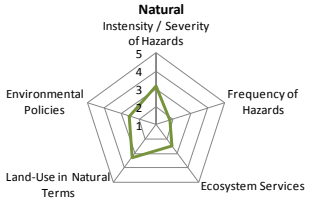
The population growth is less than 0.9%, and less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water- nor vector borne diseases every year , but only up to 75% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are quite good equipped and able to serve the community. Less than 50% of the people are illiterate and the sub-district authority organizes once a year a disaster drills. Almost half of the population is participated in community activities and could blend well with other social ethnic groups. However, the level of democracy, which the sub-district's community has the opportunity to participate in the sub-district's decision making process, is poor. The people are prepared for a disaster (logistics, materials, and management) and there is little support from the NGOs/CSOs after a disaster.



Up to 20% of the population lives below the poverty line, but the income is only come from one source. Unemployment in the formal sector is up to 18%, which it accounts more for the youth employment rate (less than 25%). Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although more than 50% of the people are practicing saving, only up to 16% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. Additionally, the available annual budget targeting disaster risk management is up to 3%, but no availability of subsidies/incentives for residents to receive an alternative livelihood.

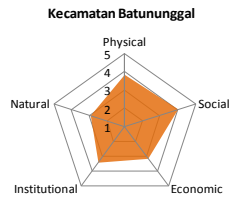


Although this area is quite good in mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the efficiency of trained emergency workers during a disaster; in term of good governance, the sub-district authority organizes disaster drills at this level only less than once every two years.

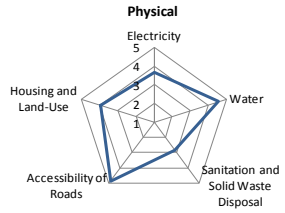


In term of intensity and frequency of the natural hazards, this area is most suffered from the impacts of floods, storms and water scarcity (during dry season). Those can be occurred more than once per year. The ecosystem service in this sub-district has scored less in the average of urban air quality during the day and water quality. It is reflected in poor implementation of mitigation policies to reduce air pollution (mostly CO_2 from the traffic emissions).

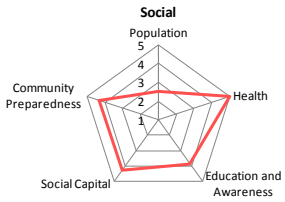
Sub-district XVIII: Batununggal



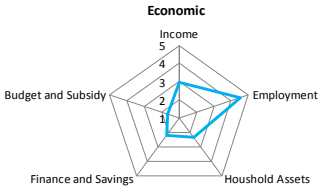
Sub-district 18, Batununggal has the most wards of all (8) and is located at the central part of Bandung City with an area size of 5.03 km^2 and a population of around 123,392 in 2008. The population density is 24,531.21/km^2, which very dense compared to other sub-districts. This area is mainly for residential purposes with some commercial and service functions in between. A military-academy compound is well-known for this area. Initially, 40 years ago, this area was an agricultural field. The overall resilience indicates in the diagram is below the average, especially in the economic and natural dimension.



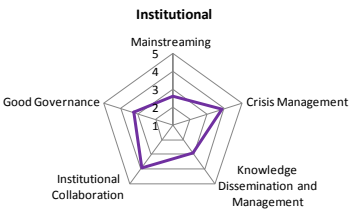
Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 75% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road and more than half of roads remained are accessible during normal flooding in affected areas. Almost all the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



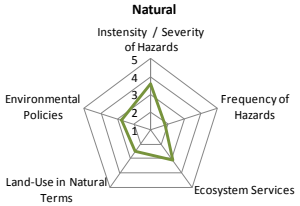
The population growth is ranged between 1-1.9%, and less than 25% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and could blend well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is support from the NGOs/CSOs after a disaster.



Up to 20% of the population lives below the poverty line, but the income is only come from one source. Unemployment in the formal sector is less than 6%, which is the same percentage for the youth unemployment rate as well. Almost all the population has television but only up to 60% has the telecommunication devices. However, less than 50% of the households have furniture to secure the key items (money, important documents, etc.) for during disaster. Only up to 10% of the people are practicing saving and only up to 10% of the households are under any sort of insurance scheme. There is few support or access of credit facility during disaster for urban poor or low-income group. There is no annual budget available targeting disaster risk management, neither subsidies/incentives for residents to receive an alternative livelihood and health care that are available during a disaster.

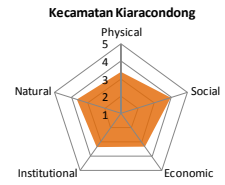


The mainstreaming of DRR and CCA in this area is not yet established, the same applies for the community participation in their development plans and preparation process, as well as the inclusion of disaster management plan into their development planning. Additionally, the capacity for dissemination of disaster awareness programs (books, leaflets, manpower, campaigns, etc. for disaster education) is poor. This sub-district depends on external institutions/support during a disaster.

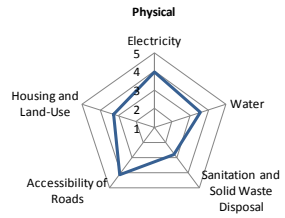


The natural aspects of this area are focusing on the frequency of occurring natural hazards, although it was not severe according to the records. The floods are occurring more than once per year. Due to maximum urban population density at day time and the occupation of motorized vehicles, the average of urban air quality is poor. It was reflected in the poor environmental conservations regulations reflected in development plans, efficient waste management system, as well as poor implementation of mitigation policies to reduce air pollution (mainly CO_2 from the traffic emissions).

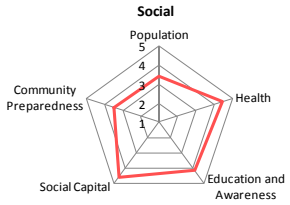
Sub-district XIX: Kiaracondong



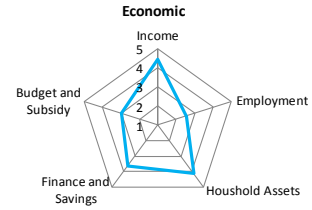
Sub-district 19, Kiaracondong has 6 wards and is located at the central part of Bandung City with an area size of 6.12 km^2 and a population of around 129,623 in 2008. The population density is 21,180.23/km^2, which is dense compared to other sub-districts. Although this area is mainly for settlements purpose, however a large gun industry for military purpose is established since two decades ago. The overall resilience indicates in the diagram is above the average, mainly in the social dimension.



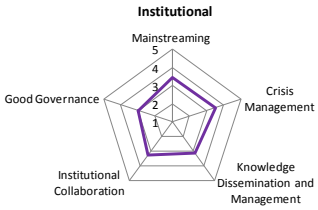
Up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 60% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 50% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road. A slightly more than half of roads remained are accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Up to 29% of the houses are built with non-permanent structure, however only up to 20% of the buildings are constructed following the building code. Since a large gun industry is existed in this area and all the population is living in the proximity to polluted industry and dumping ground, thus they are exposed to hazardous substances.



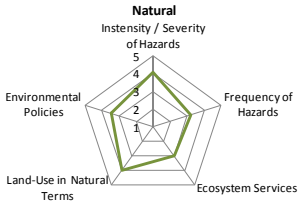
The population growth is quite high, up to 3.9% and up to 46% of the population is under age 14 or over 64 years old. On the contrary, there are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and could blend well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and they have more than 3 sources of income. Unemployment in the formal sector is up to 18%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, and up to 80% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. More than 50% of the people are practicing saving and half of households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is some annual budget targeting disaster risk management available up to 3%. In addition, some subsidies/incentives for residents to receive an alternative livelihood and health care are available during a disaster.

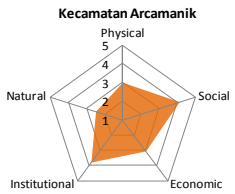


The institutional issues; such as mainstreaming DRR and CCA, effectiveness of sub-district's crisis management framework, knowledge dissemination and management, as well as institutional collaboration with other organizations and stakeholders, and good governance are running properly. Except the availability and frequency of regular disaster training programs for emergency workers is not available. In addition, the existence of disaster drills at the sub-district's level is only held less than once every two years.

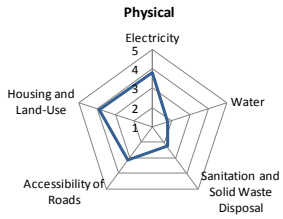


The frequencies of the natural hazards, such as floods are occurring more than once per year. The ecosystem service of this area, such as the average of urban water quality is poor, although the implementation of mitigation policies to reduce air pollution (such as CO_2 from the traffic emissions) is good.

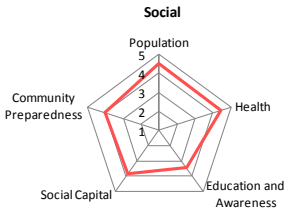
Sub-district XX: Arcamanik



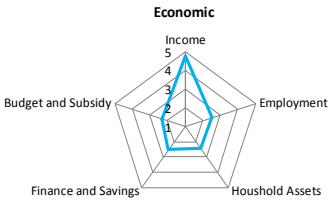
Sub-district 20, Arcamanik is consisted from 4 wards and located at the eastern part of Bandung City with an area size of 5.87 km^2 and a population of around 57,869 in 2008. The population density is 9,858.43/km^2, which is not dense compared to other sub-districts. This area is mainly composed for residential purpose, with green spaces in between. This area could be distinguished from the large horse racing tracks in the city and a large compound of state prisoner facilities. The overall resilience indicates in the diagram is below the average, mainly in the physical, economic, and natural dimension.



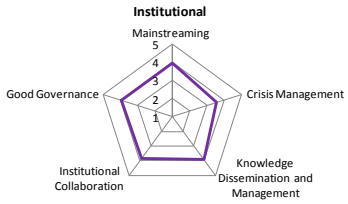
Up to 95% of the households have access to electricity and only up to 50% have access to potable water supply. Up to 75% of the population has access to sanitation and the solid waste is not treated at all before dumping and only up to 25% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only up to 60% of the area is accessible by paved road. A half of roads remained are accessible during normal flooding in affected areas, but only up to 30% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure, however up to 30% of the buildings are constructed following the building code. Although this area is not a hazardous area, up to 12.5% of the population are living in the proximity to polluted industries or dumping grounds.



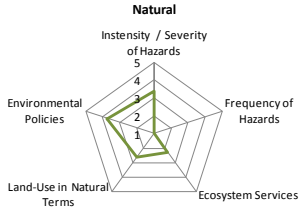
The population growth is quite high, up to 5.9 and up to 32% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water- nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and they have good social integration among different ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and the majority of the people have 2 sources of income. The unemployment rate in the formal sector is less than 6%%, which is less than the percentage for the youth unemployment (up to 12%). The women who are working in the formal sector are just a few (less than 20%). Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although more than 50% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is also annual budget targeting disaster risk management available less than 1%. Subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster are uncertain.

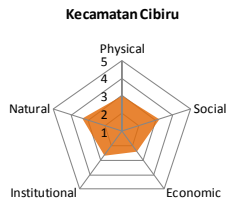


The institutional issues; such as mainstreaming DRR and CCA, effectiveness of sub-district's crisis management framework, knowledge dissemination and management, as well as institutional collaboration with other organizations and stakeholders, and good governance are running properly. Except when it comes to a disaster, this sub-district is still dependent on external institutions/support.

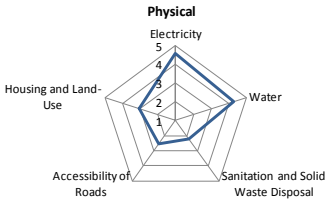


The floods, both inundated and riverine as well as storms and drought or water scarcity (during the dry season) occurred frequently (more than once per year). The ecosystem services, such as the average of urban air and water quality as well as urban groundwater are in poor condition. It is reflected in the large loss of urban green spaces due to development of infrastructure and housing over the last 50 years.

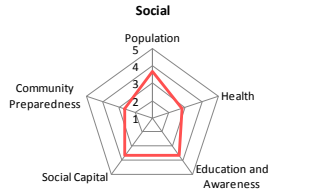
Sub-district XXI: Cibiru



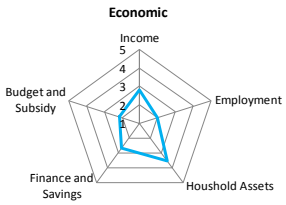
Sub-district 21, Cibiru is consisted of 4 wards and located at the eastern end and forms a border of Bandung City with an area size of 6.32 km^2 and a population of around 60,001 in 2008. The population density is 9,394.82/km^2, which is not dense compared to other sub-districts. This area is located on the slope of a mountain (Manglayang) and is prone to landslides. The landuse is mostly composed by settlement with a provincial largest Islamic state university mix within the area. The overall resilience indicates in the diagram is below the average, particularly in the institutional, economic and natural dimension.



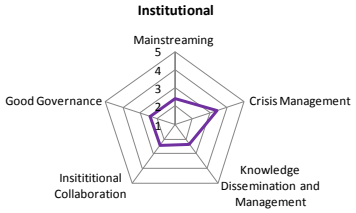
Up to 100% of the households have access to electricity and up to 95% have access to potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and only up to 10% of the solid waste is recycled; both in formal and informal ways. Up to 20% of the area's land is used as transportation network. Only 60% of the area is accessible by paved road. A slightly more than half of roads remained are accessible during normal flooding in affected areas, but only up to 30% of the roads have roadside covered drain. Less than 19% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. Although this area is not a hazardous area, up to a quarter of the population are living in the proximity to polluted industries or dumping grounds.



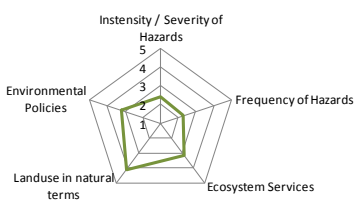
The population growth is ranged between 2-3.9% and less than 25% of the population is under age 14 or over 64 years old. Up to population 17% suffer from water-and vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Only up to 30% of the population is participated in community activities and they could blend among different ethnic groups. The people are poor in preparing disaster preparedness (logistics, materials, and management), although there is some support from the NGOs/CSOs after a disaster.



Up to 30% of the population lives below the poverty line, although the income comes from two sources. Unemployment in the formal sector is more than 25%, which is the same percentage for the youth unemployment as well. Almost all the population have television and telecommunication device, and up to 70% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although up to 20% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is annual budget targeting disaster risk management available for less than 1%. But there are no funds for climate change related DRR measures.

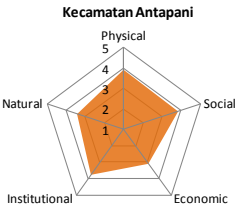


Up to 30% of the population lives below the poverty line, although the income comes from two sources. Unemployment in the formal sector is more than 25%, which is the same percentage for the youth unemployment as well. Almost all the population have television and telecommunication device, and up to 70% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although up to 20% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is annual budget targeting disaster risk management available for less than 1%. But there are no funds for climate change related DRR measures.

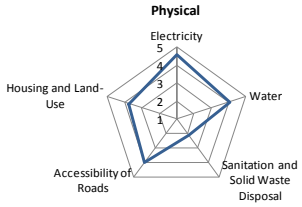


There is no significant intensity and frequency from the natural hazards, such as floods, only the drought or water scarcity occurred often, mostly more than once per year. The ecosystem service for this area scored a quite good condition.

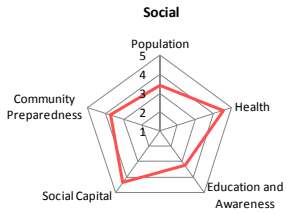
Sub-district XXII: Antapani



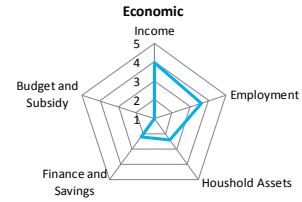
Sub-district 22, Antapani is consisted from 4 wards and located at the central part of Bandung City with an area size of 3.79 km^2 and a population of around 59,929 in 2008. The population density is 15,812.40/km^2, which is quite dense compared to other sub-districts. This area is mainly a residential area only, with some area is used for commercial purpose, such as shopping mall and shops. The overall resilience indicates in the diagram is above the average, although in the economic dimension, this sub-district tends weaker as the other.



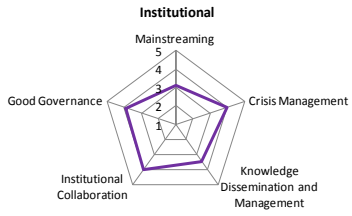
Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but the solid waste is not treated at all before dumping and only up to 10% of the solid waste is recycled; both in formal and informal ways. Up to 15% of the area's land is used as transportation network. All the area is accessible by paved road and up to 70% of roads remained accessible during normal flooding in affected areas. But only up to 45% of the roads have roadside covered drain. More than 30% of the houses are built with non-permanent structure, however only up to 20% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



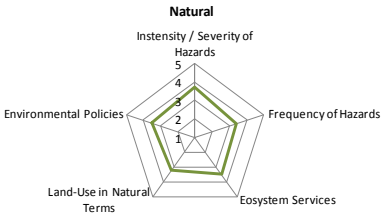
The population growth is less than 0.9%, and more than 45% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water- nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once in every 5 years disaster drill. Almost half of the population is participated in community activities and the social ethnic integration runs smoothly. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line and the income is coming from 2 sources. Unemployment in the formal sector is up to 24%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Only 30% of the people are practicing saving and up to 24% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. And there are no available annual budget targeting disaster risk management, nor the availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.

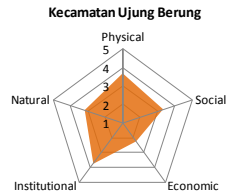


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; the capacity (logistics, materials/technical issues) to produce development plans is poor.

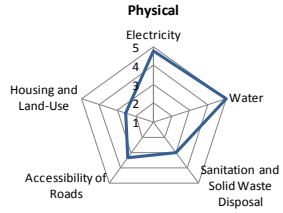


From the natural dimension point of view, significant effects on the intensity and frequency of the natural hazards are not available. The ecosystem service and environmental policies are in good condition. However, for the land-use in natural term, the average intensity of land-use-urban morphology (built area) has consumed up to 90% of land. This is in line with the 40% loss of urban green spaces.

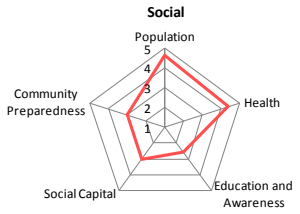
Sub-district XXIII: Ujung Berung



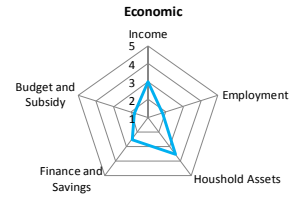
Sub-district 23, Ujung Berung is consisted of 5 wards and is located at the north-east of Bandung City with an area size of 6,40 km^2 and a population of around 61,579 in 2008. The population density is 9,621.72/km^2, which is not dense compared to other sub-districts. This area is lying on the foot of a mountain (Manglayang), the same as for the sub-district no. 21 (Cibiru). This area is for residential purpose only. The overall resilience indicates in the diagram is below the average, especially in the economic and natural dimension.



Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but the solid waste is not treated at all before dumping and up to 75% of the solid waste is recycled; both in formal and informal ways. Only up to 10% of the area's land is used as transportation network and 80% of the area is accessible by paved road. Less than 40% of roads remained accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Up to 29% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



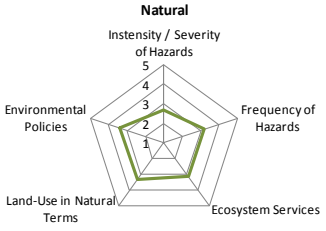
The population growth is less than 0.9% and less than 25% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once in every two years a disaster drills. Only up to 30% of the population is participated in community activities; however they might face some difficulties in the social ethnic integration. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line, but the income is only came from one source. Unemployment in the formal sector is more than 25%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Only up to 20% of the people are practicing saving and only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. In addition, there is annual budget targeting disaster risk management available less than 1%. But there are no subsidies/incentives available for residents to receive an alternative livelihood and house renovation incentives after a disaster.

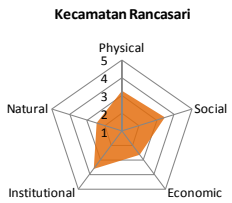


The institutional issues; such as mainstreaming DRR and CCA, effectiveness of sub-district's crisis management framework, institutional collaboration with other organizations and stakeholders, and good governance are running properly. Except when it comes to knowledge dissemination and management; a disaster training programs for emergency workers is not available yet.

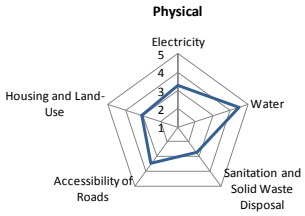


Since this area is lying on the mountain's foot, it is prone to rainfall-induced landslides, which occurs more than once a year. The ecosystem service, such as the average of urban water quality is poor and up to 90% of the land is built up. It caused a huge amount loss (40%) of green spaces in this area.

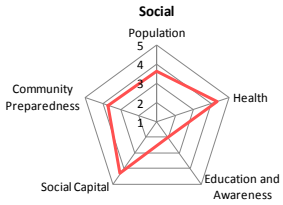
Sub-district XXIV: Rancasari



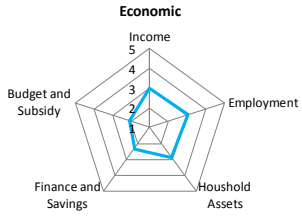
Sub-district 24, Rancasari is consisted from 4 wards and located at the south-east of Bandung City with an area size of 7.33 km^2 and a population of around 68,864 in 2008. The population density is 9,394.82/km^2, which is not dense compared to other sub-districts. There are two rivers flowing through this area (Cidurian and Cipamokolan). This area was previously agricultural land and since more than 2 decades ago changed it functions to residential area with health and shopping facilities. The overall resilience indicates in the diagram is below the average, mainly in the economic and natural dimension.



Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 100% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network, with up to 80% of the area is accessible by paved road. However, less than 40% of roads remained accessible during normal flooding in affected areas, and up to 60% of the roads have roadside covered drain. More than 30% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



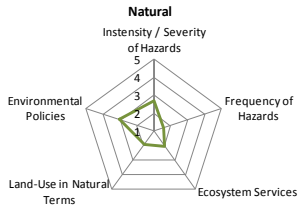
The population growth is up to 5.9% with up to 32% of the population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority has not yet organizes disaster drills until now. Almost half of the population is participated in community activities and does not face difficulties in the social ethnic integration. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Up to 30% of the population lives below the poverty line, with one source of income only. Unemployment in the formal sector is up to 18%, which less in percentage compared to the youth unemployment rate (up to 24%). Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although more than 50% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. Although there is no credit facility in the sub-district's financial institutions to prevent or face disaster, some support or access of credit facility during disaster for urban poor or low-income groups is available. But there is no available annual budget targeting disaster risk management. However, there are some subsidies/incentives available for residents to receive an alternative livelihood and health care during a disaster.

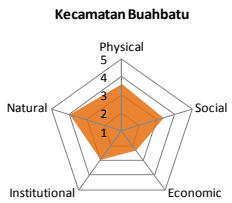


The institutional issues; such as mainstreaming DRR and CCA, effectiveness of sub-district's crisis management framework, institutional collaboration with other organizations and stakeholders, and good governance are running properly. Except when it comes to knowledge dissemination and management; a disaster training programs for emergency workers is not available yet. The same applies for disaster drills at the sub-district's level.

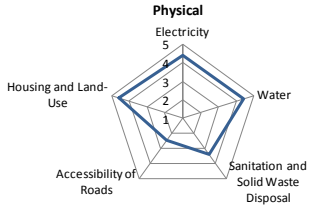


The frequency of natural hazards, such as floods (inundated and riverine floods) is occurring more than once year, as the intensities become severe. All the ecosystem services, such as the average of qualities of urban biodiversity, soil, air, water and groundwater are poor. In addition, more than 50% of the settlements are located on flood prone areas. It is reflected in the minimum usage of sub-district level hazard maps in development activities.

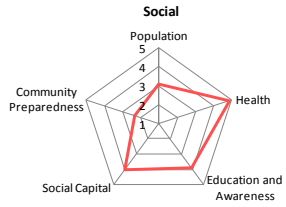
Sub-district XXV: Buahbatu



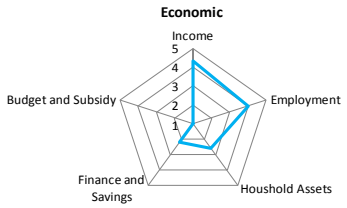
Sub-district 25, Buahbatu is consisted of 4 wards and located at the southern part of Bandung City with an area size of 7.93 km^2 and a population of around 95,256 in 2008. The population density is 12,012.11/km^2, which is quite dense compared to other sub-districts. This area is fully settlements area for middle and low income families. The overall resilience indicates in the diagram is below the average, particularly in the economic, institutional and natural dimension.



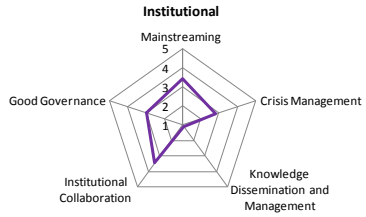
Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping recycled; both in formal and informal ways. Up to 15% of the area's land is used as transportation network and less than 50% of the area is accessible by paved road as well as remained accessible during normal flooding in affected areas. But only up to 30% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent structure with more than 50% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



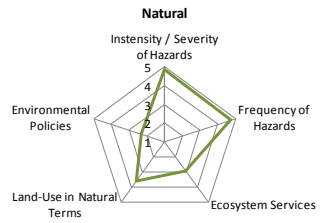
The population growth is up to 5.9%, with less than 25% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities; however they might face some difficulties in the social ethnic integration. The people are prepared for a disaster (logistics, materials, and management).



Less than 11% of the population lives below the poverty line, with the income coming from 2 sources. Unemployment in the formal sector is up to 18%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although up to 30% of the people are practicing saving, only up to 24% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. And there is no annual budget targeting disaster risk management available, nor availability of subsidies/incentives for residents to receive an alternative livelihood and health care during a disaster.



The institutional issues; such as mainstreaming DRR and CCA, effectiveness of sub-district's crisis management framework, institutional collaboration with other organizations and stakeholders, and good governance are running properly. Except when it comes to knowledge dissemination, there is no capacity for carrying the disaster education programs; because there is no feedback on the satisfaction level of disaster awareness programs from the community. In addition, there are no evacuation centers available, since this area has not been yet experienced disasters.

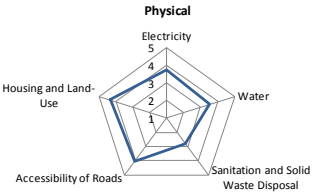


In term of natural dimension, the intensity/severity and frequency of natural hazards have not significantly affected this area. Only in the environmental policies, especially the minimum usage of sub-district level hazard maps in sub-district development activities.

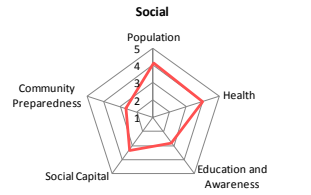
Sub-district XXVI: Bandung Kidul



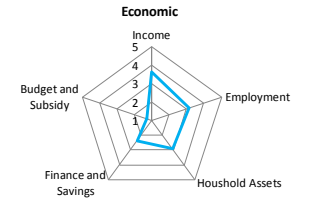
Sub-district 26, Bandung Kidul is consisted of 4 wards and located at the southern part of Bandung City with an area size of 6.06 km^2 and a population of around 51,968 in 2008. The population density is 8,575.58/km^2, which is not dense compared to other sub-districts. This area was previously agricultural land and swamps back 20 years ago and turn recently into settlement areas for middle and low income families. One main river (Cikapundung) and two others (Cikapundung Kolot and Citepus) are flowing through this area. The overall resilience indicates in the diagram is below the average, mainly in the economic, institutional and natural dimension.



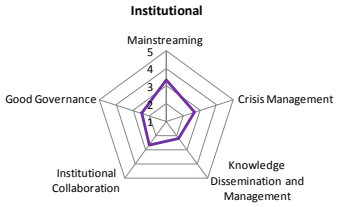
Up to 100% of the households have access to electricity and up to 80% have access to potable water supply. Up to 60% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 10% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only 70% of the area is accessible by paved road. A slightly more than half of roads remained are accessible during normal flooding in affected areas, but only up to 45% of the roads have roadside covered drain. Up to 29% of the houses are built with non-permanent structure and more than 50% of houses are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



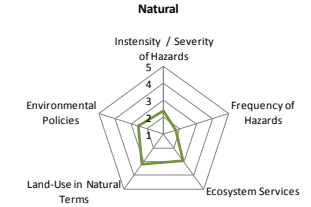
The population growth is ranged between 2-3.9%, with less than 25% of its population is under age 14 or over 64 years old. Up to 11% of the population suffer from water-and vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once in two years disaster drill. Almost half of the population is participated in community activities and could blend well with other ethnic groups. The people are not yet prepared for a disaster (logistics, materials, and management), but there is some support from the NGOs/CSOs in case of a disaster.



Up to 20% of the population lives below the poverty line, with the 2 sources of income. Unemployment in the formal sector is up to 24%, which is the same percentage for the youth unemployment rate as well. Almost all the population have television and telecommunication device, only up to 70% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. More than 50% of the people are practicing saving and up to 24% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there is no annual budget targeting disaster risk management and no subsidies/incentives for residents to receive an alternative. However, there are some incentives for health care during a disaster.

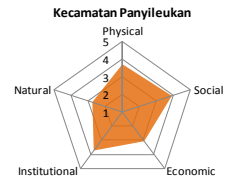


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; the emergency team during disaster is poor. In addition, the dissemination of knowledge and management issues is poor as well (disaster education programs and sub-district's capacity). The same applies for the institutional collaboration with other organizations and stakeholders; the sub-district is heavily dependent on external institutions/support during a disaster.

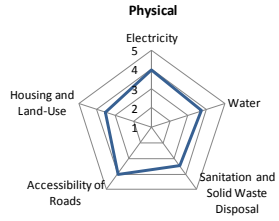


In term of natural hazard, this area suffers from rainfall-induced landslides and storms, which are occurring more than once per year. In addition, the impacts of riverine floods and landslides are severe, making this sub-district vulnerable to disasters. This leads to poor average of urban water quality, adding up that the implementation of efficient waste management system (reduce, reuse, recycle) is poor as well.

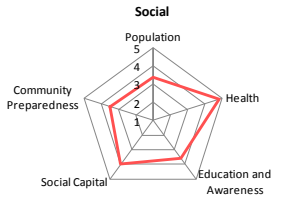
Sub-district XXVII: Panyileukan



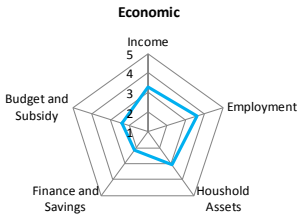
Sub-district 27, Panyileukan is consisted of 4 wards and located at the eastern of Bandung City with an area size of 5.10 km^2 and a population of around 34,621 in 2008. The population density is 6,788.43/km^2, which is not dense compared to other sub-districts. Four rivers are flowing through this area. In addition, this area is the expansion of the settlement area, of which the city government intended to distribute the residential areas equally through Bandung City. Previously, this area was a large agricultural land, where some parts are still visible and cultivated. The overall resilience indicates in the diagram is slightly above the average, especially marked by the high score in the physical, social, and institutional dimension.



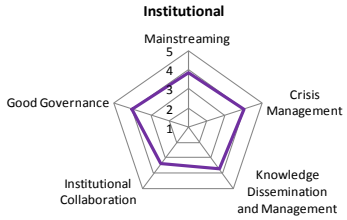
Up to 100% of the households have access to electricity and up to 80% have access to potable water supply. Up to 75% of the population has access to sanitation, but up to 25% of the solid waste is treated before dumping and up to 75% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network and up to 80% of the area is accessible by paved road. A slightly more than half of roads remained accessible during normal flooding in affected areas and more than 60% of the roads have roadside covered drain. Up to 19% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. This area is not a hazardous area, whereas none of the population are living in the proximity to polluted industries or dumping grounds.



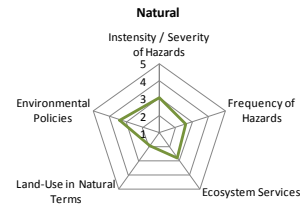
The population growth is ranged between 2-3.9%, with less than 45% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and they integrated well with different ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line, with the income coming from 4 sources. Unemployment in the formal sector is up to 18%, more than the percentage of youth unemployment rate (up to 12%). Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Only up to 20% of the people are practicing saving and up to 32% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups as well as an annual budget targeting disaster risk management and subsidies/incentives for residents to receive an alternative livelihood, but there are some subsidies for health care during a disaster.

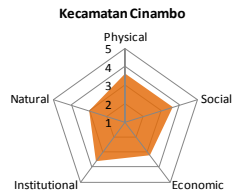


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; but there is no network yet established for a collaboration with neighboring sub-district, in case a disaster occurs, which make them heavily dependent on external institutions/support during a disaster.

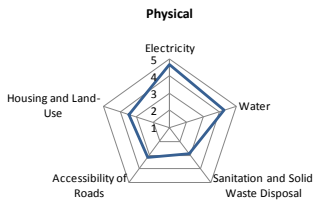


Since many rivers are flowing through this area, floods (inundation and riverine) are occurring more than once per year, with severe impacts. This reflects in the poor average of urban water and groundwater quality. Additionally, the land-use in natural term has shifted, such as large loss of green spaces due to intensive use of built area.

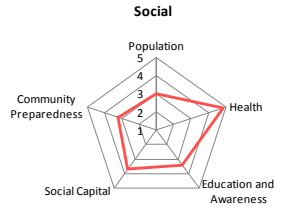
Sub-district XXVIII: Cinambo



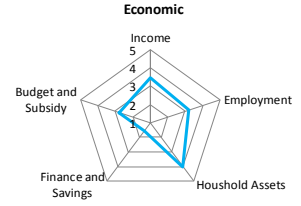
Sub-district 28, Cinambo is consisted of 4 wards and located at the eastern part of Bandung City with an area size of 3.68 km^2 and a population of around 23,695 in 2008. The population density is 6,438.86/km^2, which is not dense compared to other sub-districts. This area is characterized by the existence of industries as well as storehouses and some containers depot. The overall resilience indicates in the diagram is just on the average, of which all the resilience of the dimension could be equally enhanced.



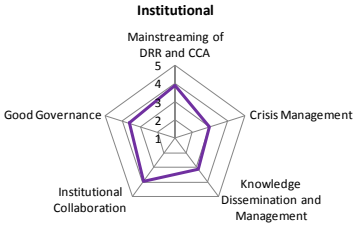
Up to 100% of the households have access to electricity and potable water supply. Up to 60% of the population has access to sanitation, but none of the solid waste is treated before dumping and only up to 50% of the solid waste is recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. Only 10% of the area is accessible by paved road. More than half of roads remained accessible during normal flooding in affected areas, but only up to 60% of the roads have roadside covered drain. Up to 19% of the houses are built with non-permanent structure, however less than 10% of the buildings are constructed following the building code. Only up to 60% are built above the plinth level. It might due to industries, up to 25% of the population live on polluted grounds.



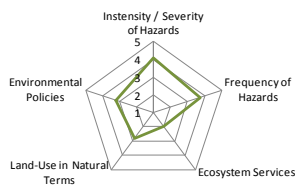
The population growth is up to 1.9%, with up to 39% of its population is under age 14 or over 64 years old. There are still people up to 49% are living in informal settlement. However, there are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and they integrate very well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Up to 20% of the population lives below the poverty line, with 2 sources of income. Unemployment in the formal sector is up to 18%, which is the same percentage for the youth unemployment rate as well. Almost all the population has television and telecommunication device, however up to 60% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although more than 20% of the people are practicing saving, only up to 16% of the households are under any sort of insurance scheme. The support or access of credit facility during disaster for urban poor or low-income groups is poor. But there are some available annual budget targeting disaster risk management up to 1.2%. There are no subsidies/incentives available for residents to receive an alternative livelihood but for subsidies health care during a disaster.

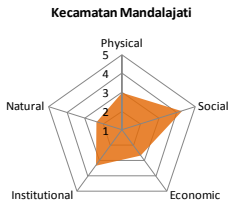


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; there is limited number of regular disaster training programs for emergency workers.

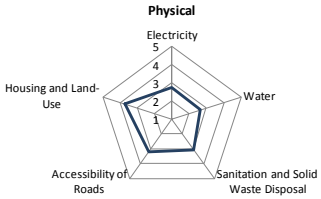


Natural issue that is pointed out for this sub-district is the ecosystem service, of which the average of urban water quality and air and groundwater quality are very poor. The loss of the green space is almost 40% from the total land-use. In addition, the implementation of efficient waste management system (reduce, reuse, recycle) is poor.

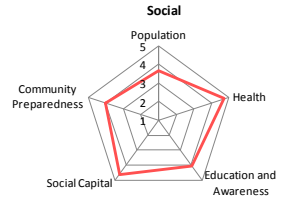
Sub-district XXIX: Mandalajati



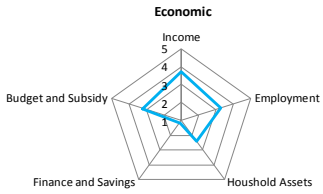
Sub-district 29, Mandalajati is consisted of 4 wards and located at the north-east of Bandung City with an area size of 6.67 km^2 and a population of around 57,265 in 2008. The population density is 8,585.46/km^2, which is not dense compared to other sub-districts. This area is located on the highland and has 3 rivers flowing through it (Cisanggarung, Cikilay, and Cipamolakan). This area is located on the steep slope and mainly for settlement only. Some small amount of land is deforested, thus is prone to floods and rainfall-induced landslides. The overall resilience indicates in the diagram is below the average, mainly in the physical, economic and natural dimension.



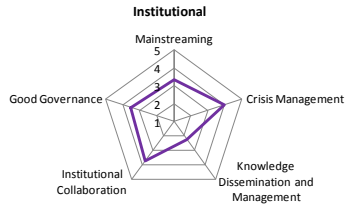
Up to 100% of the households have access to electricity and up to 80% have access to potable water supply. Up to 75% of the population has access to sanitation, but none of the solid waste is treated before dumping and only up to 10% of the solid waste is recycled; both in formal and informal ways. Up to 20% of the area's land is used as transportation network and less than 25% of the area is accessible by paved road. A slightly more than half of roads remained accessible during normal flooding in affected areas, but only less than 15% of the roads have roadside covered drain. Less than 10% of the houses are built with non-permanent, and up to 50% of the buildings are constructed following the building code. Almost half of the population is living on hazardous ground (waste dumping ground).



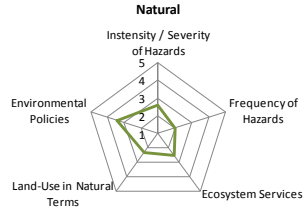
The population growth is ranged between 1-1.9%, with up to 32% of its population is under age 14 or over 64 years old. There are up to 11% of the population suffer from water-and vector borne diseases every year, however, up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once a year a disaster drill. Almost half of the population is participated in community activities and blend very well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) and there is some support from the NGOs/CSOs after a disaster.



Up to 20% of the population lives below the poverty line, but the income is only come from one source. Unemployment in the formal sector is up to 18%, which is less compared to the youth unemployment (more than 25%). Almost all the population have television and telecommunication device, however less than 50% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Only 20% of the people are practicing saving and only up to 10% of the households are under any sort of insurance scheme. There is no support or access of credit facility during disaster for urban poor or low-income groups. But there is annual budget targeting disaster risk management available up to 3%. There are no subsidies/incentives available for residents to receive an alternative livelihood; however, there are some incentives for health care during a disaster.

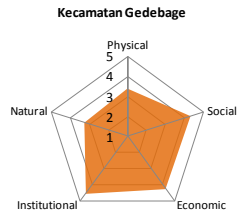


Although this area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster; there capacity for dissemination of disaster awareness programs (books, leaflets, manpower, and campaigns for disaster education) is poor. In addition, there is no regular disaster training programs for emergency workers. In addition, in term of institutional collaboration with other organizations and stakeholders, this sub-district is heavily dependent on external institutions/supports during a disaster.

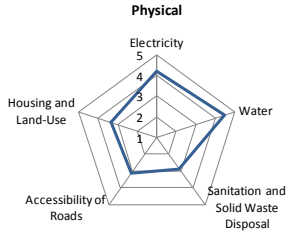


This area suffers from severe rainfall-induced landslides and storms, where they occur at least once a year. During the dry season, water scarcity is occurring. In term of ecosystem service, the average of urban water and groundwater quality of this sub-district is poor and experiences almost 40% land loss of the green spaces.

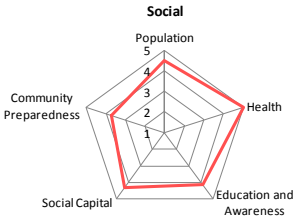
Sub-district XXX: Gedebage



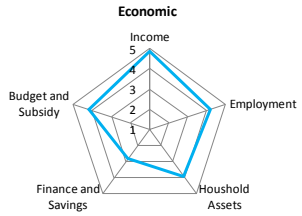
Sub-district 30, Gedebage is the youngest sub-district among all, consisted of 4 wards and located at south-eastern end of Bandung City with an area size of 9.58 km^2 and a population of around 31,230 in 2008. The population density is 3,259.92/km^2, which is not dense compared to other sub-districts. This area entails 70% of land for agricultural activities and the rest is divided into the settlement and containers depot. A main by-pass road heading west-east is through this area, making more accessible for shipping goods to and outside Bandung City. The overall resilience indicates in the diagram is above the average, especially in the social, economic, and institutional dimension.



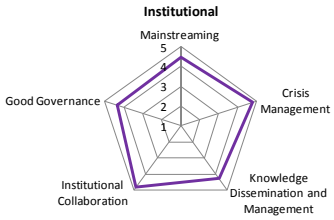
Up to 100% of the households have access to electricity and potable water supply. Up to 75% of the population has access to sanitation, but none of the solid waste is treated before dumping and recycled; both in formal and informal ways. More than 20% of the area's land is used as transportation network. But less than 50% of the area is accessible by paved road and less than 40% of roads remained accessible during normal flooding in affected areas, but less than 15% of the roads have roadside covered drain. More than 30% of the houses are built with non-permanent structure and more than 50% of the buildings are constructed following the building code. And more than half of the sub-district population lives on the hazardous area (dumping ground).



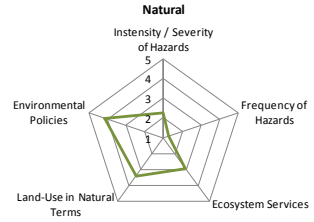
The population growth is ranged between 1-1.9%, with less than 25% of its population is under age 14 or over 64 years old. There are almost no population suffer from neither water-nor vector borne diseases every year and up to 90% of the population has access to primary health care facility. In case of emergency and before disaster, the health facilities are well provided and able to serve the community. Less than 50% of the people are illiterate and sub-district authority organizes once every two years a disasters drills. Almost half of the population is participated in community activities and they could integrate well with other ethnic groups. The people are prepared for a disaster (logistics, materials, and management) there is some support from the NGOs/CSOs after a disaster.



Less than 11% of the population lives below the poverty line with 3 income sources. Unemployment in the formal sector is up to 12%, which is the same percentage for the youth unemployment as well. Almost all the population has television and telecommunication device, however only up to 70% of the households has furniture to secure the key items (money, important documents, etc.) for during disaster. Although up to 30% of the people are practicing saving, only up to 10% of the households are under any sort of insurance scheme. There is some support or access of credit facility during disaster for urban poor or low-income groups. And there are some annual budget targeting disaster risk management available up to 1.2%. There are subsidies/incentives available for residents to receive an alternative livelihood and health care during a disaster.



This area has a good mainstreaming of DRR and CCA and community participation in their development plans and preparation process, as well as the promptness of the sub-district's body in disseminating emergency information during a disaster. In addition, the good governance and the institutional collaboration with other organizations and stakeholders are in good shape.



In natural term, the frequency of the floods, storms and water scarcity (during dry season) occurring more than once per year with sometimes severe impacts. It leads to poor average of groundwater quality of this sub-district.

Appendix 3

Questionnaire Survey on
Role of Women Welfare Associations as Risk Communicators in Enhancing Climate-related Disaster Resilience of Bandung City, Indonesia

The study is conducted by
International Environment and Disaster Management (IEDM) Laboratory,
Graduate School of Global Environment Studies (GSGES), Kyoto University, Japan
Center for Disaster Mitigation-Institut Teknologi Bandung (CDM-ITB), Indonesia

This questionnaire aims to analyse the role of women's and women welfare associations' position in the community at the ward level. The leader of Women Welfare Associations of the 151 wards in Bandung Municipality are seen as ideal representatives for this type of study where the feasibility and appropriateness of proposed action measures to enhance the resilience to disaster have to be understood by the government of Bandung Municipality and its people. The Women Welfare Association's leaders at ward level are also seen as good representatives in advocating the view of the majority of women and communities within their ward. By conducting Women Welfare Associations' analysis allows a deeper understanding of women relations in disaster and points the way for preparedness and mitigation, emergency response, as well as reconstruction and assistance in the future for Bandung Municipality, Indonesia. This questionnaire survey is the collaboration of Kyoto University, Japan with Institut Teknologi Bandung (ITB), and Women Welfare Associations of Bandung City (TP PKK Kota Bandung).
All information will be strictly used for academic purposes and kept confidential. Thank you very much for your cooperation.

Farah Mulyasari, PhD candidate, IEDM- GSGES, Kyoto University
Email: farah.mulyasari@fx7.ecs.kyoto-u.ac.jp, farah@pmb.itb.ac.id
Phone: +81-80-4234-2276 (Japan), +62-813-2189-2276 (Indonesia)

NOTE:
This questionnaire should preferably be completed by the leader of women society organization at the ward level. Answers should not be personal but representing the condition of women and women PKK organization's activities within the ward areas. There is a total page of 8 pages in this questionnaire. Please kindly make sure that all questions are answered properly. Thank you very much for the cooperation.

RESPONDENT INFORMATION		
1	**Name of Ward**	
2	**Name of Respondent**	
3	**Contact Details**	
4	**Date and No. Questionnaire** *(to be filled up by Kyoto University)*	

How to fill out the Questionnaire

Step 1:
Tick the boxes provided in each column of the disaster phase to address your choice of opinion of the proposed actions, which is feasible to implement in the ward according to you, as the leader of Women PKK Organization at ward level.
EXAMPLE

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S1. Population	S1.B Conducting campaign on family planning	S1.D Protecting pregnant, lactating women population, children, elderly, and disabled	S1.A Enhancing of shelter provision for reproductive age of women population, children, elderly, and disabled
Priority level	*Short-* ☐ *Medium-* ☑ *Long-term* ☐	*Short-* ☑ *Medium-* ☐ *Long-term* ☐	*Short-* ☐ *Medium-* ☑ *Long-term* ☐
Comments:			

Step 2:
Prioritize the parameters of proposed actions for each resilience from 1 (1st priority) to 5 (last priority).
EXAMPLE

Population	Health	Education and Awareness	Social Capital	Community Preparedness
5	3	1	2	4

Step 3:
Prioritize the resilience from 1 (1st priority) until 3 (last priority).
EXAMPLE

SOCIAL	2	**ECONOMIC**	1	**INSTITUTIONAL**	3

Step 4:
Tick in the appropriate periodicity column (monthly/quarterly/annually) for each given disaster risk reduction activities, in providing the current status of the activities within your ward.
EXAMPLE

No.	Activities	Periodicity		
		Monthly	**Quarterly**	**Annually**
S1.B	Conducting campaign on family planning		✓	
S1.D	Protecting pregnant, lactating women population, children, elderly, and disabled	✓		
S1.A	Enhancing of shelter provision for reproductive age of women population, children, elderly, and disabled			

1. Actions in Enhancing the Social Resilience

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S1. Population	S1.B Conducting campaign on family planning	S1.D Protecting pregnant, lactating women population, children, elderly, and disabled	S1.A Enhancing of shelter provision for reproductive age of women population, children, elderly, and disabled
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S2. Health	S2.B Conducting health concerns campaign at the community level to raise hygiene's awareness (e.g. waterborne diseases, dengue fever, etc.)	S2.D Provision of reproductive health care during disaster to prevent and reduce illnesses and disabilities during pregnancy and labour	S2.A Designing care packages for women, children, and elderly in providing their health and nutritional need
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S3. Education and Awareness	S3.B Disseminating climate-disaster awareness and conducting disaster drill at ward level for women	S3.D Being attentive to emergency warnings and preparedness and communicating the information of status effectively	S3.A Empowering and conducting trainings for women to have better access to resources and finding an alternative livelihood for them
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S4. Social Capital	S4.B Encouraging the women and community to be involved in decision-making process of ward development plans, projects, etc	S4.D Mobilizing the women and community to be actively involved in the provision of refugees' basic needs	S4.A Organizing and engaging from all community groups within ward to participate in the cultural events
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S5. Community preparedness	S5.B Provision of training courses on disaster mitigation and programming awareness campaign for the community	S5.D Organizing the vulnerable group (women, children, elderly, and disabled) to safer place for evacuation purpose	S5.A Responding to women's and community's on-going needs in the extended recovery period following a major disaster
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Prioritize the parameters of the proposed action from the Social Resilience, ranking from 1 until 5 (no duplication)

Population	Health	Education and Awareness	Social Capital	Community Preparedness
.....	.....	.....	.....	.....

2. Actions in Enhancing the Economic Resilience

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E1. Income	E1.B Conducting courses and trainings for women and other members of the community to have skills and ability of generating income to family	E1.D Ensuring the income sources	E1.A Enhancing the finding of alternative livelihood/source of income for community, especially for women-headed households
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E2. Employment	E2.B Exploring and provision of securing alternative livelihood to women-headed households	E2.D Securing and encouraging the access to resources to women and community	E2.A Economic empowerment: Supporting and equipping women with ability to have access to resources in formal and informal sectors (generating employment)
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E3. Household assets	E3.B Securing the household assets of the community, especially women-headed households by introducing small-scale insurance	E3.D Maintaining the community's household assets by inventorying and registering the non-/and destroyed ones	E3.A Mobilizing the community power to restore and enhance of the household assets
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E4. Finance and Savings	E4.B Initiating an affordable saving schemes in the form of collective cooperative to be used if a disaster occur	E4.D Monitoring the use of the funds to be allocated in prioritizing the vulnerable group (women-headed households, elderly, and disabled)	E4.A Setting up a micro-credits or soft-loans system for households at ward level
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E5. Budget and Subsidy	E5.B Sensitizing the local government ward level to allocate budget for disaster risk management	E5.D Raising fund and ensuring the obtained funds from government and outside stakeholders distributed equally	E5.A Linking the local government to give a subsidy for financing the reconstruction in education sector
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Prioritize the parameters of the proposed action from the Economic Resilience, ranking from 1 until 5 (no duplication)

Income	Employment	Household assets	Finance and Savings	Budget and Subsidy
.....	.....	.....	.....	.....

3. Actions in Enhancing the Institutional Resilience

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I1. Mainstreaming of DRR and CCA	I1.B Sensitizing the local government at ward level to develop disaster management plan for all hazard types	I1.D Ensuring the local government uses the disaster management plan	I1.A Evaluating the developed disaster management plan, once it has been made, with ward and sub-district officers
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I2. Effectiveness of ward crisis management framework	I2.B Organizing training courses for ward officer and community's volunteers for emergency teams	I2.D Cooperating with government to set up disaster unit office and updating the condition of refugees to emergency teams in this office	I2.A Collecting and communicating data of vulnerable groups to emergency teams and ward government
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I3. Knowledge dissemination and management	I3.B Networking and engaging the experts from government and academician, schools, local NGOs in transferring the knowledge of disasters and climate change	I3.D Engaging the community leaders in disseminating the current and future status/condition for possible future warnings	I3.A Enhancing awareness materials and developing non-formal education learning for women and community
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I4. Institutional collaboration with other organizations and stakeholders	I4.B Sensitizing and developing stronger relation with the government at higher level and cross-institutions for disaster preparedness and management	I4.D Networking with neighbouring wards and sub-districts for collaboration on emergency response and allocating resources	I4.A Organizing meetings and forums within ward and inviting the outside stakeholders for effective disaster management
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Parameter	Actions of Women PKK Organization for Climate-related Disaster Phases in enhancing the Resilience		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I5. Good governance	I5.B Advocating and cooperating with the ward and sub-district government in establishing early warning system	I5.D Conducting systematic information gathering and dissemination of disaster losses to be shared with officials	I5.A Participating in developing the reconstruction and rehabilitation plan
Priority level	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐	***Short-*** ☐ ***Medium-*** ☐ ***Long-term*** ☐
Comments:			

Prioritize the parameters of the proposed action from the Institutional Resilience, ranking from 1 until 5 (no duplication)

Mainstreaming of DRR and CCA	Effectiveness of ward crisis management framework	Knowledge dissemination and management	Institutional collaboration with other organizations and stakeholders	Good governance
.....	.....	.....	.....	.....

4. Prioritizing the Resilience

SOCIAL	.....	ECONOMIC	.....	INSTITUTIONAL	.....

5. Women Welfare Association On going Activities

Tick in the appropriate regularity column (monthly/quarterly/annually) for each given disaster risk reduction activities, in providing the current status of the women welfare association activities within your ward.

No.	Activities	Periodicity		
		Monthly	Quarterly	Annually
S1.B	Conducting campaign on family planning			
S1.D	Protecting pregnant, lactating women population, children, elderly, and disabled			
S1.A	Enhancing of shelter provision for reproductive age of women population, children, elderly, and disabled			
S2.B	Conducting health concerns campaign at the community level to raise hygiene's awareness (e.g. waterborne diseases, dengue fever, etc.)			
S2.D	Provision of reproductive health care during disaster to prevent and reduce illnesses and disabilities during pregnancy and labour			
S2.A	Designing care packages for women, children, and elderly in providing their health and nutritional need			
S3.B	Disseminating climate-disaster awareness and conducting disaster drill at ward level for women			
S3.D	Being attentive to emergency warnings and preparedness and communicating the information of status effectively			
S3.A	Empowering and conducting trainings for women to have better access to resources and finding an alternative livelihood for them			
S4.B	Encouraging the women and community to be involved in decision-making process of ward development plans, projects, etc			
S4.D	Mobilizing the women and community to be actively involved in the provision of refugees' basic needs			
S4.A	Organizing and engaging from all community groups within ward to participate in the cultural events			
S5.B	Provision of training courses on disaster mitigation and programming awareness campaign for the community			
S5.D	Organizing the vulnerable group (women, children, elderly, and disabled) to safer place for evacuation purpose			
S5.A	Responding to women's and community's on-going needs in the extended recovery period following a major disaster			
E1.B	Conducting courses and trainings for women and other members of the community to have skills and ability of generating income to family			
E1.D	Ensuring the income sources			
E1.A	Enhancing the finding of alternative livelihood/source of income for community, especially for women-headed households			
E2.B	Exploring and provision of securing alternative livelihood to women-headed households			
E2.D	Securing and encouraging the access to resources to women and community			
E2.A	Mobilizing the community power to restore and enhance of the household assets			
E3.B	Securing the household assets of the community, especially women-headed households by introducing small-scale insurance			
E3.D	Maintaining the community's household assets by inventorying and registering the non-/and destroyed ones			

No.	Activities	Periodicity		
		Monthly	Quarterly	Annually
E3.A	Mobilizing the community power to restore and enhance of the household assets			
E4.B	Initiating an affordable saving schemes in the form of collective cooperative to be used if a disaster occur			
E4.D	Monitoring the use of the funds to be allocated in prioritizing the vulnerable group (women-headed households, elderly, and disabled)			
E4.A	Setting up a micro-credits or soft-loans system for households at ward level			
E5.B	Sensitizing the local government ward level to allocate budget for disaster risk management			
E5.D	Raising fund and ensuring the obtained funds from government and outside stakeholders distributed equally			
E5.A	Linking the local government to give a subsidy for financing the reconstruction in education sector			
I1.B	Sensitizing the local government at ward level to develop disaster management plan for all hazard types			
I1.D	Ensuring the local government uses the disaster management plan			
I1.A	Evaluating the developed disaster management plan, once it has been made, with ward and sub-district officers			
I2.B	Organizing training courses for ward officer and community's volunteers for emergency teams			
I2.D	Cooperating with government to set up disaster unit office and updating the condition of refugees to emergency teams in this office			
I2.A	Collecting and communicating data of vulnerable groups to emergency teams and ward government			
I3.B	Networking and engaging the experts from government and academician, schools, local NGOs in transferring the knowledge of disasters and climate change			
I3.D	Engaging the community leaders in disseminating the current and future status/condition for possible future warnings			
I3.A	Enhancing awareness materials and developing non-formal education learning for women and community			
I4.B	Sensitizing and developing stronger relation with the government at higher level and cross-institutions for disaster preparedness and management			
I4.D	Networking with neighbouring wards and sub-districts for collaboration on emergency response and allocating resources			
I4.A	Organizing meetings and forums within ward and inviting the outside stakeholders for effective disaster management			
I5.B	Advocating and cooperating with the ward and sub-district government in establishing early warning system			
I5.D	Conducting systematic information gathering and dissemination of disaster losses to be shared with officials			
I5.A	Participating in developing the reconstruction and rehabilitation plan			

+++ Thank you very much for your cooperation! +++

Appendix 4

Questionnaire Survey on
Role of Youth Unions as Risk Communicators in Enhancing Climate-related Disaster Resilience of Bandung City, Indonesia

The study is conducted by
International Environment and Disaster Management (IEDM) Laboratory,
Graduate School of Global Environment Studies (GSGES), Kyoto University, Japan
Bandung Disaster Study Group, Bandung, Indonesia

This questionnaire aims to analyse the role of youth within youth unions in perceiving the disaster risk in their community and their role in disaster risk reduction in implementing their character's activities, which can eventually enhance theirs and community resilience. The questionnaire aims also to analyse the potential role of youth within youth unions as potential informants within informal risk communication networks to the community. This questionnaire survey is the collaboration of Kyoto University, Japan with Institut Teknologi Bandung (ITB), Bandung Disaster Study Group (BDSG), Youth Unions of Bandung City *(Karang Taruna Kota Bandung),* and Youth Disaster Preparedness Unit of Bandung City *(TAGANA Kota Bandung).*

All information will be strictly used for academic purposes and kept confidential. Thank you very much for your cooperation.

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Phone: +81-80-4234-2276 (Japan), +62-813-2189-2276 (Indonesia)

NOTE:
This questionnaire should preferably be completed by the leader/representative of youth in Bandung City. Please kindly make sure that all questions are answered properly. Thank you very much for the cooperation.

RESPONDENT INFORMATION		
1	**Name of Institution**	
2	**Name of Respondent**	
3	**Contact Details**	
4	**Date and No. Questionnaire** *(to be filled up by Kyoto University)*	

How to fill out the Questionnaire

Part I.

Step 1:

Tick the boxes provided in each column of the disaster phase to address your choice of opinion of the importance of the proposed actions to be implemented according to you, as the youth leader/representative in ward of Bandung City. Should you have any other activities that are not stated in the questionnaire, kindly write them in the "Comments" box.

EXAMPLE

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S1. Population	S1.B Identifying and listing the most vulnerable households in the community	S1.D Collecting used clothes, goods, foods for donation to refugees	S1.A Gathering and recording the fatalities data to be handed over to authority
Priority Level	Very Important ☐ Important ☑ Less Important ☐ Not Important ☐	Very Important ☑ Important ☐ Less Important ☐ Not Important ☐	Very Important ☐ Important ☐ Less Important ☑ Not Important ☐
Comments:			

Step 2:

Prioritize the parameters of proposed actions for each resilience from 1 (1st priority) to 5 (last priority).

EXAMPLE

Population	Health	Education and Awareness	Social Capital	Community Preparedness
2	4	3	1	5

Step 3:

Prioritize the resilience from 1 (1st priority) until 3 (last priority).

EXAMPLE

SOCIAL	2	**ECONOMIC**	1	**INSTITUTIONAL**	3

Step 4:

Tick in the appropriate periodicity column (monthly/quarterly/annually) for each given disaster risk reduction activities, in providing the current status of the activities within your ward.

EXAMPLE

No.	Activities	Regularity		
		Monthly	Quarterly	Annually
S1.B	Identifying and listing the most vulnerable households in the community			✔
S1.D	Collecting used clothes, goods, foods for donation to refugees	✔		
S1.A	Gathering and recording the fatalities data to be handed over to authority		✔	

Part II.

Thick and fill in the appropriate answers according to you as the youth leader/representative in ward. Multiple answers are allowed.

Part I.

1. Actions in Enhancing the Social Resilience

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S1. Population	S1.B Identifying and listing the most vulnerable households in the community	S1.D Collecting used clothes, goods, foods for donation to refugees	S1.A Gathering and recording the fatalities data to be handed over to authority
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S2. Health	S2.B Planting trees to enhance healthy environment for community	S2.D Checking-u, recording, and reporting the health condition of vulnerable groups to authority	S2.A Cleaning the debris/waste from rivers in setting-up healthy environment for community
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S3. Disaster and Awareness	S3.B Disseminating disaster and risk awareness and conducting drills for youth and community	S3.D Being attentive to emergency warnings and communicating the warnings status effectively	S3.A Organizing regular safety campaigns to children, youths, and community
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S4. Social Capital	S4.B Participation in community meetings/gatherings to be involved in decision making process	S4.D Mobilization of youth to be actively involved in the distribution aids/support from government, donors	S4.A Organizing and engaging all community groups and youths in participating cultural events
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S5. Community Preparedness	S5.B Community mapping (identifying hazard-prone areas, safe-areas, and evacuation routes and locations)	S5.D Organizing the vulnerable groups in guiding to safe-areas	S5.A Identifying the logistics needs of vulnerable groups and households
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Prioritize the parameters of the proposed action from the Social Resilience, ranking from 1 until 5 (no duplication)

Population	Health	Education and Awareness	Social Capital	Community Preparedness
.....	.....	.....	.....	.....

2. Actions in Enhancing the Economic Resilience

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
E1. Income	E1.B Facilitating the formation of youth in business associations and networks	E1.D	E1.A Engaging outside experts in providing youth skills in setting-up home industries
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
E2. Employement	E2.B Engaging private sector in giving youth training in for young entrepreneur	E2.D	E2.A Facilitating private sector in building capacity of youth in vocational skills (ICT, e-commerce, and specific tailored programs)
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
E3. Household assets	E3.B Informing community members about ways in securing the household assets in case of a disaster	E3.D Inventorying the destroyed and non-destroyed household assets	E3.A Mobilizing the youth and other community members in restoring communities' household assets
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
E4. Finance and savings	E4.B Encouraging households to practice saving money to bank as part of disaster preparedness	E4.D Supporting local government in distributing the financial aids for community	E4.A Campaigning for setting-up youth cooperative unit
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
E5. Budget and subsidy	E5.B Sensitizing local government for disaster management budget allocation	E5.D Fund raising and identifying the needed ones among the community	E5.A Linking the government to give subsidy in rehabilitation of schools, prayer sites, and community gathering halls
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Prioritize the parameters of the proposed action from the Economic Resilience, ranking from 1 until 5 (no duplication)

Income	Employment	Household assets	Finance and Savings	Budget and Subsidy
.....	.....	.....	.....	.....

3. Actions in Enhancing the Institutional Resilience

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
I1. Mainstreaming of DRR and CCA	I1.B Sensitizing the local government and community to develop disaster management plan	I1.D Ensuring the disaster management plan is used by the local government and community	I1.A Mobilizing of youth in the participation of disaster management plan review
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
I2. Effectiveness of ward crisis management framework	I2.B Mobilizing the youth in volunteering trainings and first aid	I2.D Mobilizing the youth and communities for neighbourhood watching	I2.A Coordinating youth in gathering and communication data of vulnerable groups/displaced persons to emergency teams
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
I3. Knowledge dissemination and management	I3.B Dissemination of disaster and risk knowledge to community	I3.D Collaborating with community leaders for warnings dissemination	I3.A Enhancing awareness campaign materials and media
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Scope of Youth Activities		
	BEFORE Disaster	**DURING Disasters**	**AFTER Disaster**
I4. Institutional collaboration with other organizations and stakeholders	I4.B Membentuk jejaring dengan pemerintah pusat, pemerintah daerah, institusi pendidikan, dan organisasi non-pemerintah untuk kesiapsiagaan dan pengelolaan bencana bagi masyarakat sekitar	I4.D Bekerja sama dengan stakeholder yang lain, seperti PMI dan institusi pemerintah lainnya dalam membantu pengungsi	I4.A Menarik ahl[i2] dan praktisi kebencanaan dalam mengorganisir forum[2]/pertemuan[2] kuliah kebencanaan bagi pemuda dan masyarakat sekitar
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Parameter	Cakupan Kegiatan Pemuda		
	SEBELUM Bencana	**SAAT Bencana**	**SESUDAH Bencana**
I5. Good governance	I5.B Partisipasi dan kerjasama dengan pemerintah daerah dalam membangun sistem peringatan dini bagi masyarakat sekitar	I5.D Melakukan pengumpulan keterangan yang sistematis dan melaporkan kerugian akibat bencana pada aparat pemerintah	I5.A Mengusung pemuda untuk berpartisipasi dalam penyusunan rencana rehabilitasi dan rekonstruksi di lingkungan masyarakat sekitar
Priority Level	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐	*Very Important* ☐ *Important* ☐ *Less Important* ☐ *Not Important* ☐
Comments:			

Prioritize the parameters of the proposed action from the Institutional Resilience, ranking from 1 until 5 (no duplication)

Mainstreaming of DRR and CCA	Effectiveness of ward crisis management framework	Knowledge dissemination and management	Institutional collaboration with other organizations and stakeholders	Good governance
.....	.....	.....	.....	.....

4. Prioritizing the Resilience

SOCIAL	.....	ECONOMIC	.....	INSTITUTIONAL	.....

5. Youth Unions On going Activities

Tick in the appropriate regularity column (monthly/quarterly/annually) for each given disaster risk reduction activities, in providing the current status of the youth unions' activities within your ward.

No.	Activities	Regularity		
		Monthly	Quarterly	Annually
S1.B	Identifying and listing the most vulnerable households in the community			
S1.D	Collecting used clothes, goods, foods for donation to refugees			
S1.A	Gathering and recording the fatalities data to be handed over to authority			
S2.B	Planting trees to enhance healthy environment for community			
S2.D	Checking-up, recording, and reporting the health condition of vulnerable groups to authority			
S2.A	Cleaning the debris/waste from rivers in setting-up healthy environment for community			
S3.B	Disseminating disaster and risk awareness and conducting drills for youth and community			
S3.D	Being attentive to emergency warnings and communicating the warnings status effectively			
S3.A	Organizing regular safety campaigns to children, youths, and community			
S4.B	Participation in community meetings/gatherings to be involved in decision making process			
S4.D	Mobilization of youth to be actively involved in the distribution aids/support from government and donors			
S4.A	Organizing and engaging all community groups and youths in participating cultural events			
S5.B	Community mapping (identifying hazard-prone areas and evacuation routes/locations)			
S5.D	Organizing the vulnerable groups in guiding to safe areas			
S5.A	Identifying the logistics needs of vulnerable groups and households			
E1.B	Facilitating the formation of youth in business associations and networks			
E1.D				
E1.A	Engaging outside experts in providing youth skills in setting-up home industries			
E2.B	Engaging private sector in giving youth training in young entrepreneurship			
E2.D				
E2.A	Facilitating private sector in building capacity of youth in vocational skills (ICT, e-commerce, and specific tailored programs)			
E3.B	Informing community members about ways in securing the household assets in case of a disaster			
E3.D	Inventorying the destroyed and non-destroyed household assets			
E3.A	Mobilizing the youth and other community members in restoring communities' household assets			
E4.B	Encouraging households to practice saving money to the bank as part of disaster preparedness			
E4.D	Supporting local government in distributing the financial aids for community			

No.	Activities	Regularity		
		Monthly	Quarterly	Annually
E4.A	Campaigning for setting-up youth cooperative unit			
E5.B	Sensitizing local government for disaster management budget allocation			
E5.D	Fund raising and identifying the needed ones among the community			
E5.A	Linking the government to give subsidy in rehabilitation of schools, prayer sites, and community gathering halls			
I1.B	Sensitizing the local government and community to develop disaster management plan			
I1.D	Ensuring the disaster management plan is used by the local government and community			
I1.A	Mobilizing of youth in participation of disaster management review			
I2.B	Mobilizing the youth in volunteering trainings and first aid			
I2.D	Mobilizing the youth and communities for neighbourhood watching			
I2.A	Coordinating youth in gathering and communication data of vulnerable groups/displaced persons to emergency teams			
I3.B	Dissemination of disaster and risk knowledge to community			
I3.D	Collaborating with community leaders for warnings dissemination			
I3.A	Enhancing awareness campaign materials and media			
I4.B	Networking with local government, academic institutions, and non-government organizations for disaster preparedness and management of the community			
I4.D	Collaborating with other stakeholders, such as Red Cross and other government institutions in supporting the refugees			
I4.A	Engaging disaster experts and practitioners for organizing youth and community disaster forums/meetings and lectures			
I5.B	Participating and cooperating with local government in establishing early warning system for the community			
I5.D	Conducting systematic information gathering and disseminating the disaster losses to authority			
I5.A	Promoting youth in participating in the development of rehabilitation and reconstruction plan			

Part II.

Knowledge Part

For multiple-choice questions, please circle one of your answer to the responded number.

Q1.1. What is the average level of knowledge of youth in ward on climate-related hazards

1 (Poor: Up to 10% are aware)	2 (Limited: 11-25%)	3 (Moderate: 26-50%)	4 (Good: 51-75%)	5 (Very Good: 76-100%)

Q1.2. To what extent do youth in ward know about the awareness, threats, and impacts of disasters and climate-related hazards?

1 (Poor: Up to 10% are aware)	2 (Limited: 11-25%)	3 (Moderate: 26-50%)	4 (Good: 51-75%)	5 (Very Good: 76-100%)

Q1.3. To what extent are youth in ward interested in learning about disaster and disaster risk reduction?

1 Not interested	2 Limited	3 Moderate	4 Satisfactory	5 Very interested

Q1.4. To what extent is disaster risk and disaster risk reduction is incorporated in youth activities (in schools and community)?

1 Not incorporated	2 Limited	3 Moderate	4 Satisfactory	5 Very interested

Q1.5. How frequent is Youth Unions supported disaster awareness campaigns?

1 Never so far	2 Once every 3 years	3 Once every 2 years	4 Once a year	5 More than once every year

Q1.6. How much training on disaster risk reduction is given to youth? If Answered 2 or 3 or 4 or 5; who give the training? ……..

1 No trainings are given	2 Limited	3 Moderate	4 Satisfactory	5 Very satisfactory

Q1.7. Where do youth obtain information on disasters?

Tick and fill in, if appropriate

No.	From:	Tick Mark
1.	**School/University/Workplace**	
	From school books, subjects: *please name them below*	
	From school announcements	
	From field trips	
	From resource persons who visit the school (e.g., from the Red Cross, etc..)	
	From the student newsletters	
	From educational videos shown in the classroom	
	As part of extra-curricular activities	
2.	**Radio**	
3.	**Television**	
4.	**Internet**	
5.	**Mobile phone**	
6.	**Social media:** *please thick below if appropriate*	
	Blackberry message	
	Twitter	
	Facebook	
	Mailing list group	
7.	**National Government**: *please name them below*	
8.	**Local Government**: *please name them below*	
9.	**Non-Government Organizations** (e.g. Red Cross, etc..): *please name them below*	
10.	**Private/ Business Sector**: *please name them below*	
11.	**Community Society Organizations**:	
	Youth Unions	
	Faith-based Organizations	
	Women Welfare Associations	
12.	**Other**: *please specify* ……..	

Risk Information Source Part

Q2.1. Which disaster risk information sources according to the youth provide credible and trustworthy information?

Prioritize and fill in, if appropriate

No.	From:	Priority
1	**National Government:** *please name them below*	
2	**Local Government:** *please name them below*	
3	**Social Media (BBM, Twitter, Facebook, Mailing list group, etc.):** *please name them below*	
4	**Printed Media (books, leaflets, posters, booklets, etc.):** *please name them below*	
5	**Electronic Media (radio, television, internet, etc.):** *please name them below*	
6	**Experts (University, Research Centre, etc**.)**:** *please name them below*	
7	**Non-Government Organizations (e.g. Red Cross, etc.)**: *please name them below*	
	Community Society Organizations	
8	**Youth Unions**	
9	**Women Welfare Associations**	
10	**Faith-based Organizations**	

Q2.2. Which media do youth want to use in conveying the message (disaster risk information) to other youth and community?

Tick and fill in, if appropriate

No.	Media:	Tick Mark
1	**Social Media:** *please name them below*	
2	**Printed Media:** *please name them below*	
3	**Electronic Media :** *please name them below*	
4	**Community Activities:** *please name them below*	

Q2.3. When receiving the disaster information, do the youth (Youth Unions) acted upon?

Circle the answer and fill in the appropriate category

Yes	What kind of actions?
No	--

Partnership Part

Q3.1. When youth disseminate the disaster risk information, with whom are youth (do youth want) partnering?

Thick and fill in, if appropriate

No.	With:	Thick Mark
1	**Community Society Organizations**:	
	Faith-based Organizations	
	Women Welfare Associations	
	Other organization: ……	
2	**Government**: *please name them below*	
3	**Non-Government Organizations**	
4	**Private/Business Sector**	

+++ Thank you very much for your cooperation! +++

Appendix 5

Questionnaire Survey on
Role of Faith-Based Organizations as Risk Communicators in Enhancing Climate-related Disaster Resilience of Bandung City, Indonesia

The study is conducted by
International Environment and Disaster Management (IEDM) Laboratory,
Graduate School of Global Environment Studies (GSGES), Kyoto University, Japan

This questionnaire aims to analyse the role of faith-based organizations in perceiving the disaster risk in their community and their role in disaster risk reduction in implementing their character's activities, which can eventually enhance the community resilience. The questionnaire aims also to analyse the potential role of faith-based organizations as potential informants within informal risk communication networks. This questionnaire survey is the collaboration of Kyoto University, Japan with Institut Teknologi Bandung (ITB).

All information will be strictly used for academic purposes and kept confidential. Thank you very much for your cooperation.

Farah Mulyasari, PhD candidate, IEDM- GSGES, Kyoto University
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Phone: +81-80-4234-2276 (Japan), +62-813-2189-2276 (Indonesia)

NOTE:
This questionnaire should preferably be completed by the leader/representative of mosque at ward in Bandung City. Please kindly make sure that all questions are answered properly. Thank you very much for the cooperation.

RESPONDENT INFORMATION		
1	**Name of Institution**	
2	**Name of Respondent**	
3	**Contact Details**	
4	**Date and No. Questionnaire** *(to be filled up by Kyoto University)*	

How to fill out the Questionnaire

Part I.

Step 1:

Tick the boxes provided in each column of the disaster phase to address your choice of opinion of the necessity of the proposed actions to be implemented according to you, as the leader of the faith-based organizations in your vicinity.

EXAMPLE

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S1. Population	S1.B Identifying and listing the most vulnerable groups in the community	S1.D Collecting used clothes, goods, foods for donation to refugees	S1.A Coordinating with other community groups, like women associations and youth, data of disaster's affected
Priority level	Immediate ☐ Sometimes ☑ Postponed ☐	Immediate ☐ Sometimes ☐ Postponed ☑	Immediate ☑ Sometimes ☐ Postponed ☐
Comments:			

Step 2:

Prioritize the parameters of proposed actions for each resilience from 1 (1st priority) to 5 (last priority).

EXAMPLE

Population	Health	Education and Awareness	Social Capital	Community Preparedness
2	4	3	1	5

Step 3:

Prioritize the resilience from 1 (1st priority) until 3 (last priority).

EXAMPLE

SOCIAL	2	ECONOMIC	1	INSTITUTIONAL	3

Step 4:

Tick in the appropriate periodicity column (monthly/quarterly/annually) for each given disaster risk reduction activities, in providing the current status of the activities within your ward.

EXAMPLE

No.	Activities	Regularity		
		Monthly	Quarterly	Annually
S1.B	Identifying and listing the most vulnerable groups in the community	✔		
S1.D	Collecting used clothes, goods, foods for donation to refugees			✔
S1.A	Coordinating with other community groups, like women associations and youth, data of disaster's affected		✔	

Part II.

Thick and fill in the appropriate answers according to you as mosque leader in ward. Multiple answers are allowed.

Part I.

1. Actions in Enhancing the Social Resilience

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S1. Population	S1.B Identifying and listing the most vulnerable groups in the community	S1.D Collecting used clothes, goods, foods for donation to refugees	S1.A Coordinating with other community groups, like women associations and youth, data of disaster's affected
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S2. Health	S2.B Organizing health information sessions for the community	S2.D Linking the disaster affected community for medical treatment	S2.A Cleaning the debris/waste from rivers in setting-up healthy environment for community
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S3. Education and Awareness	S3.B Conducting disaster awareness campaign after praying session\s	S3.D Being attentive to emergency warnings and communicating the warnings status effectively	S3.A Linking disaster institutions for enhanced disaster awareness campaign materials for the community
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S4. Social Capital	S4.B Discussing the disaster issues among the communities' leaders in the community	S4.D Informing community who would be willing to host place for the disaster affected community members	S4.A Organizing and engaging all community groups in participating in religion and cultural events
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
S5. Community preparedness	S5.B Planning sessions to identify / pre-determine roles and responsibility in the event of a disaster	S5.D Mobilizing the community for organizing vulnerable groups to safer place	*S5.A* Mobilizing the community for organizing and distributing large amount of aids (financial and materials donation) to serve to the affected community.
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Prioritize the parameters of the proposed action from the Social Resilience, ranking from 1 until 5 (no duplication)

Population	Health	Education and Awareness	Social Capital	Community Preparedness
.....	.....	.....	.....	.....

2. Actions in Enhancing the Economic Resilience

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E1. Income	E1.B NA	E1.D NA	E1.A NA
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E2. Employment	E2.B NA	E2.D NA	E2.A NA
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E3. Household assets	E3.B Informing community members about ways in securing the household assets in case of a disaster	E3.D Inventorying the destroyed and non-destroyed household assets	E3.A Mobilizing the community members in restoring communities' household assets
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E4. Finance and Savings	E4.B Linking households to bank institutions in saving money practice as part of disaster preparedness	E4.D Supporting local government in gathering data for aid recipients within community	E4.A Campaigning for cooperative units within community
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
E5. Budget and Subsidy	E5.B Sensitizing local government for disaster management budget allocation	E5.D Fund raising in prayer sessions and distributing to the needed ones	E5.A Linking the government to give subsidy in rehabilitation of schools, prayer sites, and community gathering halls
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Prioritize the parameters of the proposed action from the Economic Resilience, ranking from 1 until 5 (no duplication)

Income	Employment	Household assets	Finance and Savings	Budget and Subsidy
.....	.....	.....	.....	.....

3. Actions in Enhancing the Institutional Resilience

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I1. Mainstreaming of DRR and CCA	I1.B Informing the community of disaster management plan after praying sessions	I1.D Confirming the local government in using the disaster management plan	I1.A Engage the community in the participation of disaster management plan review
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I2. Effectiveness of ward crisis management framework	I2.B Mobilizing the community in volunteering trainings and first aid	I2.D Mobilizing the male community members in neighbourhood watching	I2.A Coordinating selected community members in gathering and communication data of vulnerable groups/displaced persons to emergency teams
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I3. Knowledge dissemination and management	I3.B Dissemination of disaster and risk knowledge to community by distributing the printed safety materials after praying sessions	I3.D Collaborating with community leaders for warnings dissemination	I3.A Strengthening in the capacity of safety campaign materials and media
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I4. Institutional collaboration with other organizations and stakeholders	I4.B Networking with local government and government, academic institutions, and non-government organizations for disaster preparedness and management of the community	I4.D Collaborating with other stakeholders, such as Red Cross and other government institutions in supporting the refugees	I4.A Coordinating with other community groups, like women associations and youth unions in engaging disaster experts and practitioners for organizing community disaster forums/meetings and lectures
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Parameter	Scope of Faith-based organization Activities		
	BEFORE Disaster	**DURING Disaster**	**AFTER Disaster**
I5. Good governance	I5.B Participating and cooperating with local government in establishing early warning system for the community	I5.D Conducting systematic information gathering and disseminating the disaster losses to authority	I5.A Engaging neighbourhood community leaders in participating in the development of rehabilitation and reconstruction plan
Priority level	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐	**Immediate** ☐ **Sometimes** ☐ **Postponed** ☐
Comments:			

Prioritize the parameters of the proposed action from the Institutional Resilience, ranking from 1 until 5 (no duplication)

Mainstreaming of DRR and CCA	Effectiveness of ward crisis management framework	Knowledge dissemination and management	Institutional collaboration with other organizations and stakeholders	Good governance
.....	.....	.....	.....	.....

4. Prioritizing the Resilience

SOCIAL	.....	ECONOMIC	.....	INSTITUTIONAL	.....

5. Faith-Based Organization Undertaken Activities

Tick in the appropriate regularity column (monthly/quarterly/annually) for each given disaster risk reduction activities, in providing the current status of the Faith-Based Organization activities within your ward.

No.	Activities	Regularity		
		Monthly	Quarterly	Annually
S1.B	Identifying and listing the most vulnerable groups in the community			
S1.D	Collecting used clothes, goods, foods for donation to refugees			
S1.A	Coordinating with other community groups, like women associations and youth, data of disaster's affected			
S2.B	Organizing health information sessions for the community			
S2.D	Linking the disaster affected community for medical treatment			
S2.A	Cleaning the debris/waste from rivers in setting-up healthy environment for community			
S3.B	Conducting disaster awareness campaign after praying session\s			
S3.D	Being attentive to emergency warnings and communicating the warnings status effectively			
S3.A	Linking disaster institutions for enhanced disaster awareness campaign materials for the community			
S4.B	Discussing the disaster issues among the communities' leaders in the community			
S4.D	Informing community who would be willing to host place for the disaster affected community members			
S4.A	Organizing and engaging all community groups in participating in religion and cultural events			
S5.B	Planning sessions to identify / pre-determine roles and responsibility in the event of a disaster			
S5.D	Mobilizing the community for organizing vulnerable groups to safer place			
S5.A	Mobilizing the community for organizing and distributing large amount of aids (financial and materials donation) to serve to the affected community.			
E1.B	NA			
E1.D	NA			
E1.A	NA			
E2.B	NA			
E2.D	NA			
E2.A	NA			
E3.B	Informing community members about ways in securing the household assets in case of a disaster			
E3.D	Inventorying the destroyed and non-destroyed household assets			
E3.A	Mobilizing the community members in restoring communities' household assets			
E4.B	Linking households to bank institutions in saving money practice as part of disaster preparedness			
E4.D	Supporting local government in gathering data for aid recipients within community			
E4.A	Campaigning for cooperative units within community			
E5.B	Sensitizing local government for disaster management budget allocation			
E5.D	Fund raising in prayer sessions and distributing to the needed ones			

No.	Activities	Regularity		
		Monthly	Quarterly	Annually
E5.A	Linking the government to give subsidy in rehabilitation of schools, prayer sites, and community gathering halls			
I1.B	Informing the community of disaster management plan after praying sessions			
I1.D	Confirming the local government in using the disaster management plan			
I1.A	Engage the community in the participation of disaster management plan review			
I2.B	Mobilizing the community in volunteering trainings and first aid			
I2.D	Mobilizing the male community members in neighbourhood watching			
I2.A	Coordinating selected community members in gathering and communication data of vulnerable groups/displaced persons to emergency teams			
I3.B	Dissemination of disaster and risk knowledge to community by distributing the printed safety materials after praying sessions			
I3.D	Collaborating with community leaders for warnings dissemination			
I3.A	Strengthening in the capacity of safety campaign materials and media			
I4.B	Networking with local government and government, academic institutions, and non-government organizations for disaster preparedness and management of the community			
I4.D	Collaborating with other stakeholders, such as Red Cross and other government institutions in supporting the refugees			
I4.A	Coordinating with other community groups, like women associations and youth unions in engaging disaster experts and practitioners for organizing community disaster forums/meetings and lectures			
I5.B	Participating and cooperating with local government in establishing early warning system for the community			
I5.D	Conducting systematic information gathering and disseminating the disaster losses to authority			
I5.A	Engaging neighbourhood community leaders in participating in the development of rehabilitation and reconstruction plan			

Part II.

Knowledge Part

For multiple-choice questions, please circle one of your answers to the responded number.

Q1.1. To what extent do you as Faith-based leaders know about disasters and climate-related disasters?

1 (Poor: Up to 10% are aware)	2 (Limited: 11-25%)	3 (Moderate: 26-50%)	4 (Good: 51-75%)	5 (Very Good: 76-100%)

Q1.2. To what extent do you as Faith-based leaders know about the awareness, threats, and impacts of disasters and climate-related disasters?

1 (Poor: Up to 10% are aware)	2 (Limited: 11-25%)	3 (Moderate: 26-50%)	4 (Good: 51-75%)	5 (Very Good: 76-100%)

Q1.3. To what extent are the Faith-based Organizations interested in learning about disaster and disaster risk reduction?

1 Not interested	2 Limited	3 Moderate	4 Satisfactory	5 Very interested

Q1.4. To what extent is disaster risk and disaster risk reduction is incorporated in community activities

1 Not incorporated	2 Limited	3 Moderate	4 Satisfactory	5 Very interested

Q1.5. How frequent is Faith-based Organizations supported disaster awareness campaigns?

1 Never so far	2 Once every 3 years	3 Once every 2 years	4 Once a year	5 More than once every year

Q1.6. How much training on disaster risk reduction is given to community? If Answered 2 or 3 or 4 or 5; who give the training? ……..

1 No trainings are given	2 Limited	3 Moderate	4 Satisfactory	5 Very satisfactory

Q1.7. Where do Faith-based Organizations obtain information on disasters?
Thick and fill in, if appropriate

No.	From:	Thick Mark
1.	**Work**	
2.	**Radio**	
3.	**Television**	
4.	**Internet**	
5.	**Mobile phone**	
6.	**Social media:** *please thick below if appropriate*	
	Blackberry message	
	Twitter	
	Facebook	
	Mailing list group	
7.	**National Government**: *please name them below*	
8.	**Local Government**: *please name them below*	
9.	**Non-Government Organizations** (e.g. Red Cross, etc..): *please name them below*	
10.	**Private/ Business Sector**: *please name them below*	
11.	**Community Society Organizations**:	
	Youth Unions	
	Faith-based Organizations	
	Women Welfare Associations	
12.	**Other**: *please specify* ……..	

Risk Information Source Part

Q2.1. Which disaster risk information sources according to Faith-based Organizations provide credible and trustworthy information?

Thick and fill in, if appropriate

No.	From:	Thick Mark
1	**National Government:** *please name them below*	
2	**Local Government:** *please name them below*	
3	**Social Media (BBM, Twitter, Facebook, Mailing list group, etc.):** *please name them below*	
4	**Printed Media (books, leaflets, posters, booklets, etc.):** *please name them below*	
5	**Electronic Media (radio, television, internet, etc.):** *please name them below*	
6	**Experts (University, Research Centre, etc**.)**:** *please name them below*	
7	**Non-Government Organizations (e.g. Red Cross, etc.)**: *please name them below*	
8	**Community Society Organizations**:	
	Youth Unions	
	Faith-based Organizations	
	Women Welfare Associations	

Q2.2. Which media do Faith-based Organizations want to use in conveying the message (disaster risk information) to community?

Thick, if appropriate

No.	Media:	Thick Mark
1	**Social Media:** *please name them below*	
2	**Printed Media:** *please name them below*	
3	**Electronic Media :** *please name them below*	
4	**Community Activities:** *please name them below*	

Q2.3. When receiving the disaster information, do the Faith-based Organizations acted upon?

Circle the answer and fill in the appropriate category

Yes	What kind of actions?
No	--

Partnership Part

Q3.1. When Faith-based organizations (FBOs) disseminate the disaster risk information, with whom are FBOs (do FBOs want) partnering?

Thick and fill in, if appropriate

No.	With:	Thick Mark
1	**Community Society Organizations**:	
	Youth Unions	
	Women Welfare Associations	
	Other organization: ……	
2	**Government**: *please name them below*	
3	**Non-Government Organizations**	
4	**Private/Business Sector**	

+++ Thank you very much for your cooperation! +++

Appendix 6

Questionnaire Survey for Individual

Risk Communication and Community-Based Society Organizations in Bandung

Ward: .....

Please tick (☑) below questions for the correct answers

Gender ☐ Male ☐ Female

Age

15-25	26-35	36-45	46-55	55 +

How long have you been stayed in Bandung City?

Less than 5 years	5-15 years	More than 15 years

How often do you participate in community activities? *(Please tick (☑) for the correct answer)*

☐ once a month ☐ 3-4 times a year ☐ once a year ☐ only during special event
Please specify: .....

What are the major disaster risks in Bandung City? *(Please tick (☑) the correct answer according to you)*

Earthquake	Floods	Landslides

According to you, among the following community groups, please rank them as efficient risk communicators *(1, 2, 3 and no duplication)* **and tick (☑) as per importance of their risk communication activities**

Women Welfare Association	Rank No.....	Youth Union	Rank No.	Faith-Based Organization	Rank No. .....
☐ Conducting health concerns campaign at the community level		☐ Cleaning the debris/waste from rivers in setting-up healthy environment for community		☐ Collecting used clothes, goods, foods for donation to refugees	
☐ Conducting campaign on family planning		☐ Being attentive to emergency warnings and communicating the status effectively		☐ Conducting disaster awareness campaign after praying sessions	
☐ Conducting courses and trainings for women and community to have skills and ability in generating income to the family		☐ Disseminating disaster and risk awareness and conducting drills for youth and community		☐ Organizing and engaging all community groups in participating in religion and cultural events	
☐ Conducting systematic information gathering and dissemination of disaster losses to be shared with officials		☐ Engaging outside experts in providing youth skills in setting-up home industries		☐ Fund raising in prayer sessions and distributing to the needed ones	
☐ Organizing the meetings and forums within ward and inviting outside stakeholders for effective disaster management		☐ Mobilizing the youth and communities for neighboring watching		☐ Mobilizing the male community members in neighborhood watching	

How do you get the disaster risk information from the above organizations? *More than one answer is possible*

☐ Radio ☐ TV ☐ Newspaper ☐ Bulletin ☐ Poster ☐ Leaflet/Flyer ☐ Internet ☐ Mobile Phone/ SMS

☐ Blackberry Message/BBM ☐ Facebook ☐ Twitter ☐ E-mailing Group ☐ Community activities

*****Thank you very much for the cooperation*****

Appendix 7

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Semi-Structured Interview on the Role of Media in Disaster Risk Communication in Bandung City

Type of Media: Electronic Media (Radio)

Introduction Remarks

I would like to thank you in taking the time to meet with me today. My name is Farah Mulyasari. I would like to talk you about the media experiences that you are represented in the disaster risk communication process in Bandung. Specifically, how the news that is broadcast is promoting disaster risk reduction actions to the people and enhances the resilience in Bandung. And how is the role of radio in risk communication.

The interview should take less than 1 hour. I will be recording the session, because I would not like to miss any of your comments. Although I will be taking notes during the session, I cannot possibly write fast enough to record everything. Because we are on tape, please be sure to speak loud enough so that we will not miss your comments.

All responses will be kept confidential. This means that your interview responses will only be shared with the research team members of Graduate School of Global Environmental Studies, Kyoto University, Japan.

We will ensure you that any information we include in our report does not identify personally as a respondent.
Should you have any questions, you can raise them now.

Thank you very much in advance for your availability and cooperation in conducting this interview.

Part 1. General Information	
Name of Interviewee	
Name of Radio	
Designation	
Telephone No./Mobile	
Email Address	
Date of Interview	

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Part 2. Electronic Media and Disaster	**Answers**
1. Could you tell me about the focus of the media that you are representing? *(Background, aim, specialization, target community, penetration level, coverage)*	
2. Has the media that you are representing cover news about disaster? 2.1 If yes, what kinds of news? *(Casualties, injuries, hazard-prone areas, damage and loss, warning)* 2.2 In which segment does such information broadcast in the radio program? 2.3 If not, why not?	
3. How does the radio gather disaster information?	
4. What role does radio have in assisting community in following scenarios: 4.1 Before disaster? 4.2 During disaster? 4.2 After disaster?	

Part 3. Electronic Media and Disaster Risk Communication	**Answers**
Target Audience:	
1. Who are your target audiences for disaster risk communication?	

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2. How does the radio broadcast the risk information to the public? *(Mechanism of conveying risk information to the public)*	
Source of Information:	
1. What is the source of information for the radio?	
2. What kind of disaster information is the radio looking for from various sources?	
3. How does the radio validate the obtained risk information? *(Feedback/Risk Information evaluation)*	
Partnership	
Does radio partner with any stakeholders in delivering risk information to the public?	
Incentives for Radio in Risk Communication	
What is the incentive for radio in conveying disaster and risk information to the public?	
Lessons Learned	
Have the radio broadcasted past disaster events of and/or outside Bandung?	
Potential of Radio in Risk Communication	
How do you see the future role of radio in risk communication in Bandung?	
Barriers/Challenges of Radio in Risk Communication	
How do you see the challenges of radio in risk communication Bandung?	

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Semi-Structured Interview on the Role of Media in Disaster Risk Communication in Bandung City

Type of Media: Printed Media (Newspaper)

Introduction Remarks

I would like to thank you in taking the time to meet with me today. My name is Farah Mulyasari. I would like to talk you about the media experiences that you are represented in the disaster risk communication process in Bandung. Specifically, how the media article that is written is generating the knowledge of disaster risks of people and enhances the resilience in Bandung. And how is the role of newspaper in risk communication.

The interview should take less than 1 hour. I will be recording the session, because I would not like to miss any of your comments. Although I will be taking notes during the session, I cannot possibly write fast enough to record everything. Because we are on tape, please be sure to speak loud enough so that we will not miss your comments.

All responses will be kept confidential. This means that your interview responses will only be shared with the research team members of Graduate School of Global Environmental Studies, Kyoto University, Japan.

We will ensure you that any information we include in our report does not identify personally as a respondent.
Should you have any questions, you can raise them now.

Thank you very much in advance for your availability and cooperation in conducting this interview.

Part 1. General Information	
Name of Interviewee	
Name of Newspaper	
Designation	
Telephone No./Mobile	
Email Address	
Date of Interview	

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Part 2. Printed Media and Disaster	**Answers**
1. Could you tell me about the focus of the media that you are representing? *(Background, aim, specialization, target community, circulation, coverage)*	
2. Has the media that you are representing cover news about disaster? 2.1 If yes, what kinds of news? *(Casualties, injuries, hazard-prone areas, damage and loss, warning)* 2.2 In which segment does such information feature in the newspaper? 2.3 If not, why not?	
3. How does the newspaper gather disaster information?	
4. What role does newspaper have in assisting community in following scenarios: 4.1 Before disaster? 4.2 During disaster? 4.2 After disaster?	

Part 3. Printed Media and Disaster Risk Communication	**Answers**
Target Audience:	
1. Who are your target audiences for disaster risk communication?	

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2. How does the newspaper publish the risk information to the public? *(Mechanism of conveying risk information to the public)*	
Source of Information:	
1. What is the source of information for the newspaper?	
2. What kind of disaster information is the newspaper looking for from various sources?	
3. How does the newspaper validate the obtained risk information? *(Feedback/Risk Information evaluation)*	
Partnership	
Does newspaper partner with any stakeholders in delivering risk information to the public?	
Incentives for Radio in Risk Communication	
What is the incentive for newspaper in conveying disaster and risk information to the public?	
Lessons Learned	
Have the newspaper published past disaster events of and/or outside Bandung?	
Potential of Newspaper in Risk Communication	
How do you see the future role of newspaper in risk communication in Bandung?	
Barriers/Challenges of Newspaper in Risk Communication	
How do you see the challenges of newspaper in risk communication Bandung?	

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Semi-Structured Interview on the Role of Media in Disaster Risk Communication in Bandung City

Type of Media: Electronic Media (Television)

Introduction Remarks

I would like to thank you in taking the time to meet with me today. My name is Farah Mulyasari. I would like to talk you about the media experiences that you are represented in the disaster risk communication process in Bandung. Specifically, how the news that is broadcast is triggering the people interest and desire to act in disaster and enhances the resilience in Bandung. And how is the role of television in risk communication.

The interview should take less than 1 hour. I will be recording the session, because I would not like to miss any of your comments. Although I will be taking notes during the session, I cannot possibly write fast enough to record everything. Because we are on tape, please be sure to speak loud enough so that we will not miss your comments.

All responses will be kept confidential. This means that your interview responses will only be shared with the research team members of Graduate School of Global Environmental Studies, Kyoto University, Japan.

We will ensure you that any information we include in our report does not identify personally as a respondent.
Should you have any questions, you can raise them now.

Thank you very much in advance for your availability and cooperation in conducting this interview.

Part 1. General Information	
Name of Interviewee	
Name of Television	
Designation	
Telephone No./Mobile	
Email Address	
Date of Interview	

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Part 2. Electronic Media and Disaster	**Answers**
1. Could you tell me about the focus of the media that you are representing? *(Background, aim, specialization, target community, penetration level, coverage)*	
2. Has the media that you are representing cover news about disaster? 2.1 If yes, what kinds of news? *(Casualties, injuries, hazard-prone areas, damage and loss, warning)* 2.2 In which segment does such information broadcast in the television program? 2.3 If not, why not?	
3. How does the television gather disaster information?	
4. What role does television have in assisting community in following scenarios: 4.1 Before disaster? 4.2 During disaster? 4.2 After disaster?	

Part 3. Electronic Media and Disaster Risk Communication	**Answers**
Target Audience:	
1. Who are your target audiences for disaster risk communication?	

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2. How does the television broadcast the risk information to the public? *(Mechanism of conveying risk information to the public)*	
Source of Information:	
1. What is the source of information for the television?	
2. What kind of disaster information is the television looking for from various sources?	
3. How does the television validate the obtained risk information? *(Feedback/Risk Information evaluation)*	
Partnership	
Does television partner with any stakeholders in delivering risk information to the public?	
Incentives for Television in Risk Communication	
What is the incentive for television in conveying disaster and risk information to the public?	
Lessons Learned	
Have the television broadcasted past disaster events of and/or outside Bandung?	
Potential of Television in Risk Communication	
How do you see the future role of television in risk communication in Bandung?	
Barriers/Challenges of Television in Risk Communication	
How do you see the challenges of television in risk communication Bandung?	