Debris Flow Disaster Mitigation Project in Mt. Merapi Area, Indonesia

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Mt. Merapi is located in Central Java, Indonesia, which is one of the most active volcanos in the world. Eruptive activity, including small and medium-sized eruption, has occurred every three to five years. In January 1969, the large scale pyroclastic flow occurred, and successive debris flows caused damages of 291 houses destroyed, losses of 320 ha of agriculture land in addition to 6 casualties.

In 1990s, eruption cycle was shortened and arable land and residential area expanded to hillside, while Sabo facility construction was extended. As a result, vulnerability against volcanic disaster is still high. The 2010 eruption is estimated as probability more than 100 years, resulting in 386 people dead and 400,000 people refugee. Tremendous debris flow occurred in the rainy season just after the eruption, and damaged not only houses and farms but many public facilities such as roads, bridges, irrigation facilities.

On the other hand, uncontrolled sand mining conducted extensively in Mt. Merapi area has caused serious problems, such as riverbed degradation, unstableness of river structures, environmental issues and so on. In the lower reaches of Progo River to which many mountain streams from Mt. Merapi flow into, two important bridges for regional/national transportation system are in danger of collapse.

To mitigate the disaster issues, sediment disaster mitigation is recognized together with riverbed stabilization and sand mining management to achieve the regional development. Sand mining management is a part of sediment control plan and the regional development is necessary to control the sand mining by providing an alternative income source.

A Japanese ODA Loan Project has been conducted in 2006 - 2013 with targeting "sustainable regional development through disaster mitigation". The Project consists of structural measures against debris flow disaster, i.e. construction of sediment control facilities so called as “Sabo facilities”, non-structural measures such as enhancement of monitoring, forecasting and information system, evacuation shelters and evacuation routes, community-based disaster management programs such as evacuation drills and public campaigns, development of GIS database and OM programs, workshop and equipment for disaster emergency works, riverbed stabilization works in downstream reach, and sand mining management programs. These countermeasures interact to each other and require the integrated implementation to contribute the sustainable regional development, such as agriculture, tourism, and so on.


DEBRIS FLOW DISASTER MITIGATION PROJECT IN MT. MERAPI AREA, INDONESIA
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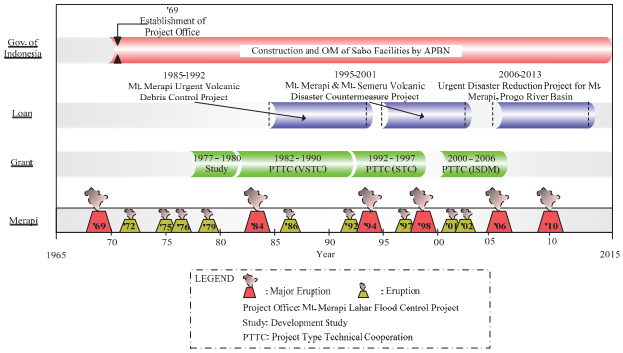
Yachiyo Engineering


Mt. Merapi


'69
Establishment of Project Office
Gov. of Indonesia
Construction and OM of Sabo Facilities by APBN
1985-1992
Mt. Merapi Urgent Volcanic Debris Control Project
1995-2001
Mt. Merapi & Mt. Semeru Volcanic Disaster Countermeasure Project
2006-2013
Urgent Disaster Reduction Project for Mt. Merapi, Progo River Basin
Loan
Grant
1977 - 1980 Study
1982 - 1990 PTTC (VSTC)
1992 - 1997 PTTC (STC)
2000 - 2006 PTTC (SDM)
Merapi
'69
'72
'75
'76
'79
'84
'88
'93
'94
'97
'98
'01
'02
'06
'10
1965
70
75
80
85
90
95
00
05
10
2015
Year
LEGEND
: Major Eruption
: Eruption
Project Office: Mt. Merapi Lahar Flood Control Project
Study: Development Study
PTTC: Project Type Technical Cooperation

Objective

1. To protect Yogyakarta and Central Java from Mt. Merapi volcanic disaster
2. To sustain sabo facilities and sand mining
3. To increase people's welfare

Urgent Disaster Reduction Project for Mt. Merapi, Progo RiverBasin

Countermeasures of Volcanic Disaster Mitigation

Structure Measures:
-Sabo Dams
Non-structure Measures:
-Evacuation Roads and Shelters
-Monitoring,Forecasting,and Early Warning System
-Evacuation System
-GIS Database for Disaster Management

Institution & Community Development

Institution and Community Develop.:
-Establishment of sand mining management institution
-Establishment of community instit.

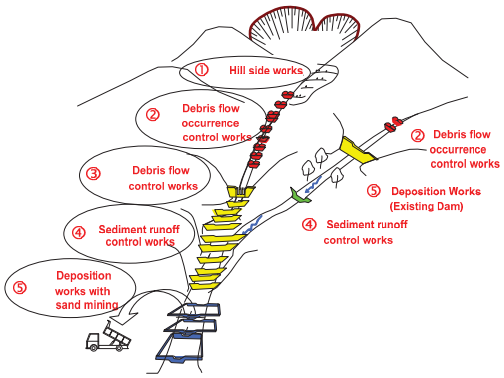
Sand Mining Facilities for Sand Mining Management Institution:
-Office Building, Equipment, Stockyard, etc.

Riverbed Stabilization
-Construction of Groundsill in lower basin of Progo river

Regional Development
-Rehabilitation of Irrigation Weirs
-Construction of Syphone in Krasak

Community-based Sand Mining and Disaster Management in Mt. Merapi Area

Conceptual Sabo Facility Plan



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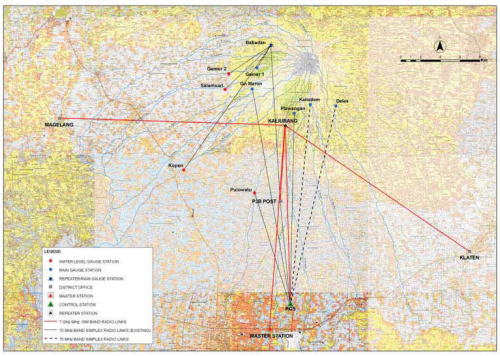
Evacuation System

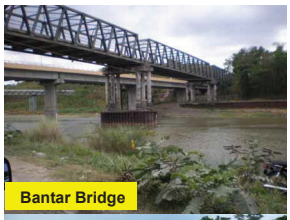
Item	Description	Volume
Evacuation Road	Cangkringan-Geblok	1.975 km
	Tempuran-Sumberejo	2.875 km
	Tegal Mulyo-Surowono	0.811 km
	Total	5.661 km
Signboard	Sleman Regency	32 posts
	Klaten Regency	79 posts
	Total	111 posts
Evacuation Shelter	Balai Desa Ngadipuro (New Building)	1 hall
	Ex SMP Bapendik - Jeruk Agung village (New	1 hall
	Soccer ground in Kepuharjo village (New	1 hall
	Supporting Equipment for Klaten - 50 kg Rice Cooker - 5,000 litter Movable Water Tank	1 set

Non-structure Measures

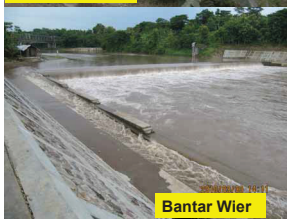
Monitoring, Forecasting and Early Warning System:
Improvement of existing telemetry system



Riverbed Stabilization


Bantar Bridge


Kebonagung Bridge


Bantar Wier

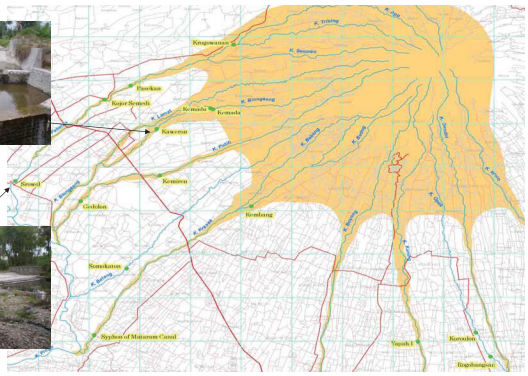

Kebonagung Wier

Regional Development

Rehabilitation of Irrigation Weirs and Syphon


Kaweron


Srowol



Institution and Community Development

Sand Mining Management | **Volcanic Disaster Mitigation**

Pilot Project

Objective:
To formulate community based sand mining management
Targeted Area:
3 villages
Activity:
- establish community organization
- make action plans for field activities

Tools:
- Yonmenkaigi System Method (YSM)
- Sand Mining Handbook

Events

Objective:
improve public awareness on disaster risk management
<Disaster Education>
Targeted Area:
8 kindergartens
Activity:
- disaster education
- prepare materials
- adapt new tools

Tools:
- Disaster Education Materials
- Bosai Duck
- Bosai Dance

<Merapi Festival>
1 day festival for public

Evacuation Drill

Objective:
enhance capacity of community on disaster management
Targeted Area:
4 sub-villages
Activity:
- organize community members
- prepare e evacuation materials
- plan and conduct evacuation drills

Tools:
- Standard Operating Procedure (SOP)
- Evacuation Map
- Evacuation Poster

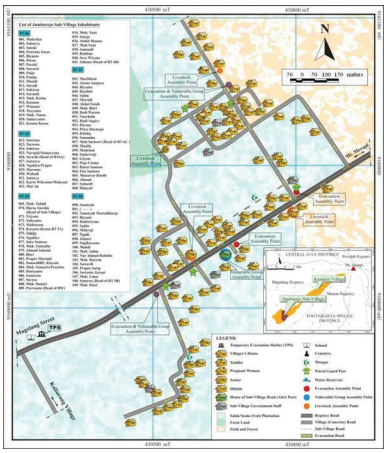

Evacuation Drill


Events

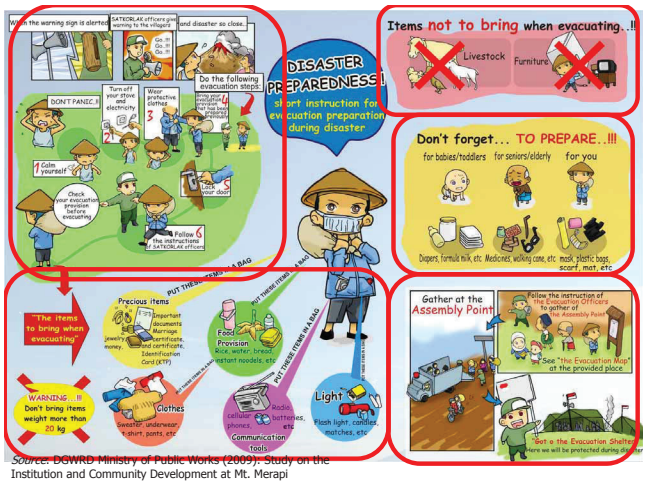

Pilot Project

Evacuation Map

- Location of house, TPS, and alert post
- Assembly point
- Evacuation route
- Vulnerable group

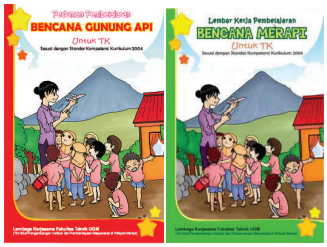


Source: DGWRD Ministry of Public Works (2009): Study on the Institution and Community Development at Mt. Merapi



Source: DGWRD Ministry of Public Works (2009): Study on the Institution and Community Development at Mt. Merapi

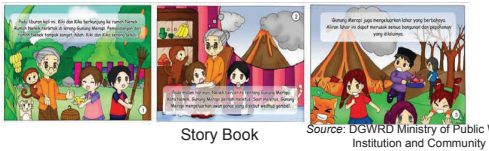
Education Materials (Draft)



Guideline Book & the Worksheet

Some Pictures of Comics

Height Scale



Story Book

Source: DGWRD Ministry of Public Works (2009): Study on the Institution and Community Development at Mt. Merapi

Introduction and Adaptation of Bosai Duck and Bosai Dance

Bosai Duck : is a game used as **disaster education tool**

Bosai Dance:

is a game **aimed** to make the community easier in **understanding the characteristics of disaster** and managing a panic condition.

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