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論文題目	Development of a Community-Based Natech Risk Management Framework Through the Lenses of Local Community, First Responders and Government (地域コミュニティ、第一応答者、政府の視点を通じたコミュニティベースのNatechリスクマネジメントのフレームワークの開発)		
<p>(論文内容の要旨)</p> <p>The main aim of this thesis is to propose a community-based Natech (natural hazard triggering technological accident) risk management framework that enables local stakeholders to manage and enhance the coping capacity to deal with Natech disaster risks. The aim is achieved through 1) the development of a conceptual model framework based on an extensive literature review; 2) case studies that explore the views and role of multi-stakeholders to determine the elements of the framework; and 3) analysis of results and formulation of the community-based Natech risk management framework. Mainly, case studies were selected as a research methodology and used to obtain empirical data from local community and first responders in Japan, and government in Japan and South Korea by looking at natural, chemical and Natech disaster risk management practices and experiences. The thesis fills a much-needed research gap, as there are no previous studies addressing how local communities can manage Natech risks. The thesis contains eight chapters described in detail below.</p> <p>Chapter 1 (Introduction) addresses the research background, problem statement, and research aim and objectives. Previous studies have shown that residents living near areas potentially subjected to Natech risk have little to no information on how to manage Natech accidents. Despite the large body of research on the role of local citizens in disaster risk reduction, their participation in chemical and Natech risk management is still missing. Hence, a community-based Natech risk management framework is needed to manage both natural and technological hazards effectively at the local level.</p> <p>Chapter 2 (Literature review) presents an overview of the relevant literature and research gaps concerning community participation in disaster risk management of compound and cascading disasters such as Natech. This chapter also provides an overview of community-based disaster risk management and risk governance in the context of Japan.</p> <p>Chapter 3 (Conceptual framework) discusses and proposes the initial concepts of the framework for community-based Natech risk management from the viewpoint of different local stakeholders. The conceptual framework uses as a starting point, the Japan government's (natural) disaster risk governance framework, acknowledged in the literature, as a model framework. The main elements of the conceptual framework include public support, mutual assistance, self-help, and an expert group on Natech risk management.</p> <p>Chapter 4 (The theoretical approaches in the methodology) introduces the theoretical background of the research approaches used in the thesis: Case studies, thematic analysis, and an accident investigation methodology called Sequentially Timed Events Plotting (STEP). The chapter explains the advantages and limitations of the methodologies applied and the processes in general.</p>			

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<p>Chapter 5 (Research methodology) discusses the data collection methods adopted, including in-depth interviews, focus group discussions, field notes, and questionnaire surveys. Furthermore, the case study areas visited in the thesis, namely Shimobara district (Okayama Pref.), and Omachi town (Saga Pref.) in Japan; and three industrial park areas in Korea, are presented.</p> <p>Chapter 6 (Results) discusses the findings of the thesis. The first case study focused on local community activities, roles and perspectives in the context of a flood triggered explosion in Shimobara. The findings showed that residents in Shimobara were very active in the local self-help group, which greatly contributed to the successful improvisation and evacuation during the Natech disaster. Their roles included the provision of local knowledge, communicating risk, monitoring the situation, making decisions, serving as a liaison between local government, first responders and neighbors, and providing assistance to other community members. These roles, confirmed by previous studies on natural hazard research, proved just as important for response to the Natech disaster. The most critical gaps identified were no knowledge and high uncertainty regarding the chemical accident, the potential consequences, and hence the type of protection measures that could be taken. In the second case study, the roles and activities of first responders, particularly the fire department within the local disaster risk management system, were investigated following an oil spill caused by flooding in Omachi town. The results showed a lack of hazard and risk assessment of, and no emergency planning for chemical and Natech hazards despite past experiences with similar events. Lack of human and physical resources, and no mandate to consider these types of hazards were identified as challenges. The third case study investigated government efforts for chemical accidents and Natech risk management in Japan and Korea, mostly focusing on practices in Korea. A new law regarding the risk management of chemical accidents in Korea provided an opportunity to learn firsthand about a holistic and inter-multidisciplinary approach introduced to manage both natural hazards and chemical accidents.</p> <p>Chapter 7 (Discussion) provides a discussion about the perspectives of local community, first responders, and government from the case studies. Through the lenses of these stakeholders, the community-based Natech risk management framework is proposed. The proposed framework elements are somewhat similar to the initial conceptual framework, but the links and inter-relationships between the elements have changed. Most importantly, a multi-stakeholder Natech risk management expert platform is introduced at the heart of the framework. The chapter describes the details of the proposed framework, and discusses how it could be implemented, particularly in flood prone area. It also discusses the study limitations.</p> <p>Chapter 8 (Conclusions) presents general conclusions and summarizes the main contributions of the thesis to engineering and disaster risk management. Also, the chapter suggests policy recommendations, and future research.</p>			

(論文審査の結果の要旨)

本論文では、地域コミュニティが主体となる Natech（自然災害が引き起こす化学事故）リスク管理のフレームワーク（枠組み）を提案するとともに、地域の実情に合わせて実践するための細部の設計や推奨事項、留意事項を示している。枠組みの開発には、コミュニティ防災の分野の広範な文献レビューで得た知見、2018年と2019年に日本で発生した洪水 Natech を含む3つの事例を調査／分析した結果、および日本と韓国の政府を対象としたインタビュー調査結果、地域の多様な利害関係者を対象としたフォーカスグループ討議、インタビュー、アンケート調査など、多様な方法で得た数量的・質的情報や知見を利用している。防災分野ではコミュニティの役割や住民参加のあり方に関しては既に膨大な知識が蓄積されているが、複合災害である Natech を対象とした研究はほとんど存在しない。自治体等の多様な利害関係者を含めた枠組みの開発としては、本研究は Natech 分野の初めての貢献といえる。本研究は、具体的には以下の結果を得ている。

- (1) 自然災害リスク管理活動に対する地域社会の積極的な関与は、Natech の脅威、すなわち化学事故に対する、より適切な対応の基礎になっている。
- (2) 事前における自然災害ハザードと Natech リスクの評価の欠如は、住民や第一応答者の準備が不十分となる結果につながる。
- (3) 発生後に急速に状況が変化する Natech 災害に対する適切な緊急行動を導くためには、リアルタイムの災害情報と警告のシステムが必要である。
- (4) 地域の利害関係者は、ハザードとリスク情報の共有、協働と信頼に基いて、さまざまなカスケードを伴うシナリオ（例えば、適切な避難所の設置、洪水、Natech、避難）に柔軟に適応可能なリスク管理システムを導入することで、防止策を採用し、その準備を改善することができる。

提案された枠組みは、全ての利害関係者間の協働と調整のための基礎と必要なプロセスを提供する。さらに本枠組みは、既存の災害管理メカニズムとの一貫性を維持しながら実行することができる。ただし、そのためには政府による強力なサポートと、危険施設の近くに住む利害関係者間のリスク情報の開示と共有が必要になる。本枠組みは、インフラストラクチャーの整備と維持管理計画、とりわけ洪水の制御、情報通信、警告システム、および水害リスクのマッピングに密接に関連している。成果は工学的かつ実用的に意義があり、学術上、實際上寄与するところが少なくない。よって、本論文は博士（工学）の学位論文として価値あるものと認める。また、令和2年8月24日、論文内容とそれに関連した事項について試問を行い、申請者が博士後期課程学位取得基準を満たしていることを確認し、合格と認めた。

なお、本論文は、京都大学学位規程第14条第2項に該当するものと判断し、公表に際しては、2022年9月30日までの間、当該論文の全文に代えてその内容を要約したものとすることを認める。