RESEARCH ARTICLE

Mapping Research on Disaster Risk Reduction for Sustainable Development in Thailand: Thematic Analysis Approach

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Abstract: Disaster risk reduction (DRR) and sustainable development are inextricably intertwined on many levels. In the post-2015 development agenda, Southeast Asia countries identify DRR as the primary key to building regional community resilience to achieve sustainable development goals. However, a knowledge gap was found in the current trend of DRR research in Thailand that impedes inclusive, sustainable development in the region. This paper reviews the literature on DRR in Thailand from the different periods during 2016–2020 with different geographic foci in 46 peer-reviewed journal articles to identify academic disciplinary trends in DRR fields using a thematic analysis (TA) qualitative method. In searching for themes, directed by Eakins and Luer's (2006) risk approach, relevant codes were sorted, collected, and combined to show the relationship between codes and themes. Findings indicate that hazard assessment for building infrastructure research occupied the most conducted research in Thailand, whereas disaster education was the least pervasive theme explored in academic research post-2015. The knowledge distribution area of DRR research in Thailand has explicitly endorsed the Central part (the urban) of Thailand as the primary research location, whereas the Eastern region (the rural) of Thailand was the least prevalent for DRR study location. The paper concludes that academic research on DRR toward sustainable development in Thailand has been mainstreaming physical concerns, not yet socioeconomic issues. This paper further argues that the future directions of DRR study in Thailand should ensure inclusiveness and include collaboration among local governments and communities to improve the culture of resilience for sustainable development.

Keywords: DRR, resilience, sustainable development, Thematic Analysis, Thailand

Natural disaster frequency has constantly increased in the 21st century in Thailand. A report from AHA Center in 2018 (Kurniawan & Shea, 2018) mentioned Thailand as the country with the highest number of reported disasters (106 occurrences) in Greater Mekong Subregion or the third highest in Southeast Asia region alongside Indonesia (877 occurrences) and the Philippines (142 occurrences). The occurrences of disasters were two times higher (97 recorded cases) during 2000–2020 compared to 1960–1999 (55 recorded cases). Figure 1 shows a significant escalation in natural disaster incidences in Thailand with two levels of severeness (killed and affected people) in five disaster sub-group (biological, climatological, geophysical, hydrological, and meteorological) with eight main disaster types (epidemic, drought, wildfire,

earthquake, flood, landslide, storm, and extreme temperature).

Figure 1 highlights that between 1960 and 1999, there were 55 disasters recorded in Thailand by natural disasters with 12,600 deaths, 137 million people affected, and almost USD 94 million. Hydrological hazards (floods) caused the most deaths, while biological, climatological, geophysical, and meteorological hazards affected vulnerable people. The severity of hydrological hazards was also two times higher than in previous decades, with worse hazard situations of climatological (drought and wildfire) and meteorological (extreme temperature) affecting more people (Centre for Research on the Epidemiology of Disasters, 2020).

Situating DRR System in Thailand

The initial formation of a comprehensive national disaster risk reduction (DRR) system in Thailand was prompted by the 2004 Indian Ocean earthquake and tsunami event. Concurrently at the time of the catastrophe, cases of flooding were reported to be spread out through provinces in all region in Thailand (Centre for Research on the Epidemiology of Disaster, 2020) with the only disaster-related laws in Thailand to cope with the disaster situations were the 1979 Civil Defense Act (BE 2522) and the 1999 Fire Prevention and Suppression Act (BE 2542). The Thai Department of Disaster Prevention and Mitigation

(DDPM) was established in 2002 with the Ministry of Interior as the leading actor from the government agency for coordinating DRR activities. However, the body was not fully operational because the new agency still lacked legal structures (Kitagawa, 2020). After implementing the global blueprint for DRR in 2005, the Hyogo Framework for Action (HFA), Thailand aimed to decrease disaster losses by 2015 in lives and communities and the social, economic, and environmental assets. From HFA, Thailand officially adopted the Disaster Prevention and Mitigation Act 2007 (BE 2550), fully enacted on November 6, as a law that authorizes government agencies in the central, provincial, and local areas to cope with disasters. Thai Disaster Prevention and Mitigation Act has explicitly prescribed and explicated disaster management arrangement that encompasses disaster types, policy guidelines, operating procedures, and coordinating procedures.

Based on HFA, the National Disaster Prevention and Mitigation Plan 2010–2014 (BE 2553–2557) was created as a national guideline that outlines implementation strategies following the country's 2007 Act for more effective disaster management. Further, the 2007 Act is applied as the National Law in administration work in disaster management, terminating the Civil Defense Act 1979 (BE 2522) and the Fire Prevention and Suppression Act 1999 (BE 2542) and stipulating the National Disaster

Source: EM-DAT, CRED (http://www.emdat.be/)
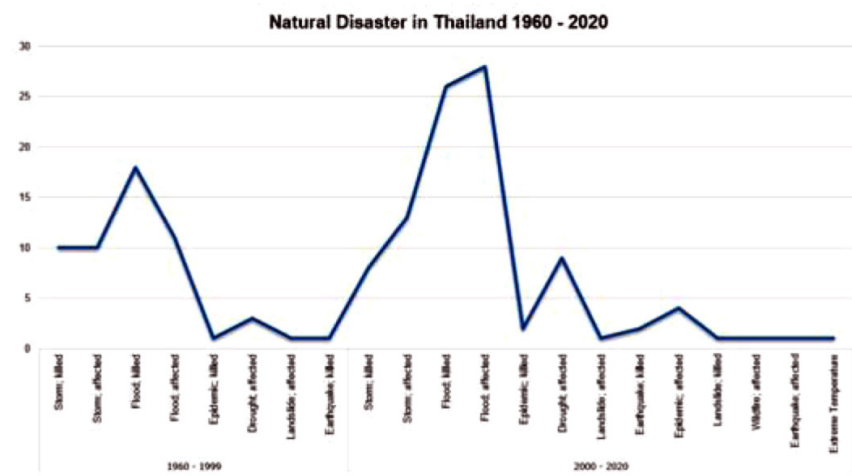
Figure 1. Types of Natural Disasters in Thailand From 1960 to 2020 Show Spikes in Deaths and Losses

Prevention and Mitigation Committee chaired by the Prime Minister. The National Disaster Prevention and Mitigation Plan 2010–2014 was composed of (a) principles of disaster management, (b) disaster countermeasure procedure, and (c) security threat management and countermeasure procedure.

After 2015, Thailand designated a new global agreement named the Sendai Framework for Disaster Risk Reduction (SFDRR) that indicates common goals to prevent new risks, reduce existing risks, and strengthen societal and environmental resilience at the local level with a set of guiding principles in coherence with the sustainable development agenda. The SFDRR was explicitly initiated to advance DRR policy globally to understand the complexity of DRR to increase community resilience (Busayo et al., 2020; Goniewicz & Burkle, 2019).

Post-2015 DRR Agenda: Building Culture of Resilience

There is a global concern that natural disasters are becoming more frequent, deadly, and costly. Therefore, DRR has been planned as a systematic mechanism to reduce disaster risks by scrutinizing and coping with the causal factors of disasters, including reducing vulnerability and improving preparedness for adverse events (UNISDR, 2007). The UN Office for Disaster Risk Reduction/UNISDR (2009) defined disaster resilience as the ability of a system, community, or society susceptible to perils to resist, absorb, accommodate, adapt to, transform, and mitigate the consequences of a threat in an appropriate and efficient manner, including through risk management and the protection and rehabilitation of its essential basic structures and functions.

According to Srikandini (2018), DRR platforms have become standard in most disaster-prone countries, especially in Southeast Asia. The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) is the foremost global policy framework of the United Nations› post-2015 agenda, articulating a set of goals and targets to feature resilience in implementation actions and encourage development (Aitsi-Selmi et al., 2015; Pearson & Pelling, 2015; Peters et al., 2016; Etinay et al., 2018; Goniewicz & Burkle, 2019; Busayo et al., 2020; Wisner, 2020).

From a strategic perspective, resilience offers a potential bridge from the DRR policy and practice to the SDGs at the level of indicators to encourage development alongside risk management (Pearson & Pelling, 2015; Roberts et al., 2015; Tiernan et al., 2019). The SFDRR aims to significantly decrease disaster risk and fatalities of persons, businesses, communities, and countries in the economic, physical, social, cultural, and environmental assets (Asian Disaster Reduction Center, 2015; Wahlström, 2015; Roberts et al., 2015). It holds out the hope of integration and cooperation, pinned on the SFDRR making a difference where the Hyogo Framework for Action (HFA) could not exist at the local level and systematically focus on root causes (Pearson & Pelling, 2015). The SFDRR has shifted the mechanism from disaster management to disaster risk management to promote a culture of resilience (Etinay et al., 2018; Rahman & Fang, 2019).

Gaps and Key Concerns in Building Disaster Resilience

Despite the advances of the SFDRR to target resilience, critics have described several gaps that stand out with the framework. The critical concern identifies resilience as lacking an agreed definition and conceptual clarity under conceptual pluralism to unify diverse expertise to work in an integrated way (Pearson & Pelling, 2015; Tiernan et al., 2019). Resilience as a scientific concept has been applied in many disciplines with a wide diversity of actors applied to individuals in human communities and large societies (Aldunce et al., 2014; Allen et al., 2019). Therefore, most academic work on perspectives of disaster resilience is based on individual case studies; different understandings of resilience are seen as a significant challenge by policymakers and practitioners (Tiernan et al., 2019).

Complexity and uncertainty in DRR are the key concerns for current and future disaster events (Massmann & Wehrhahn, 2014; Djalante & Lassa, 2019; Clark-Ginsberg, 2020; Gurtner & King, 2021). The term "complex" signifies a compound of numerous interconnected and interdependent elements. Complexity is described as a way of characterizing the features of a complex system that include interactions among people and all physical entities in the environment, and it can occur as the result of the interlink of hazard multiplicity (Djalante & Lassa, 2019). In the context of DRR, complexity is a characteristic of large-scale events manifesting in humdrum disasters. Van der Keur et al. (2016) defined uncertainty as a state of mind characterized by doubt based on a lack of knowledge of what exists,

currently and in the future. Further, uncertainty in the context of DRR results from insufficient knowledge and experience with past disasters and often results in prematurely choosing policies or programs (Kartez & Lindell, 2007). Therefore, embracing complexity is necessary for understanding the multi-dimensional nature of hazards when dealing with uncertain disaster risks (UNISDR, 2007; Djalante, 2012).

Purpose of the Present Study

The present study examined recent knowledge production of DRR toward sustainable development in the post-2015 agenda in Thailand. Two objectives were set to address the purpose of the research: (a) determine critical themes on scientific publications of DRR toward sustainable development research in Thailand, and (b) identify the knowledge gap of DRR toward sustainable development research in Thailand. A thematic analysis (TA) in a qualitative method is applied to a subset of 46 peer-reviewed journal articles about DRR in Thailand published during 2016–2020. Eakins and Luers' (2006) risk approach is applied to classify codes that are more central to contributing knowledge in DRR disciplinary field. The limitation of the present study might include outdated data because the collected information was restricted to a specific period. Finally, research mapping is significant as a systematic effort to fill the knowledge gap in DRR studies to contribute to the regional culture of resilience that leaves no one behind.

Method

Data Collection and Data Sources

In addressing the research objective, data were collected from scientific publications found in the Web of Science (WOS), Science Direct, and other scientific-related databases. All papers were assessed following explicit inclusion and exclusion criteria. In step one, connected with the online databases, the terms "Disaster Risk Reduction in Thailand," "Disaster Management in Thailand," and "Disaster Risk Governance in Thailand" were the primary keyword to generate academic publication records. In the custom range period during 2016–2020, specified the inclusive term "Disaster" and "Thailand," academic journals published before 2016 and after 2020 with keywords other than "Disaster" and "Thailand" were omitted from the generated records. The exact keywords with a specified period resulted in 46 data set records (Figure 2). Chronologically, the database presented 1997 as the first year of academic journal publication on Disaster Risk Management in Thailand. Throughout 2015, 46 publications were classified under the DRR theme.

Thematic Analysis Process

The coding process is part of the analysis in organizing data into meaningful groups. The knowledge production mapping process from the different periods and spatial areas foci includes compilation, synthesis, and analysis of scientific publication data in WOS and other databases related to academic and scientific publications (Athayde et al., 2019). TA in qualitative
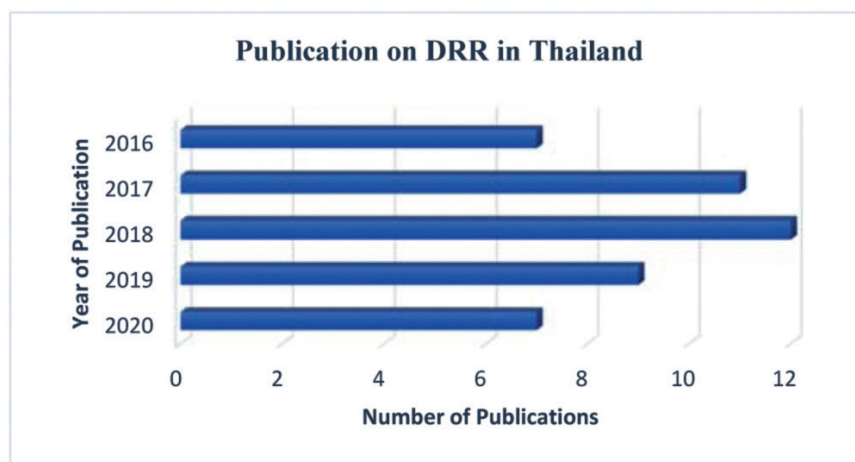

Figure 2. Number of Publications on DRR in Thailand in the Post-2015

descriptive design uses techniques to analyze contextual data and elucidate themes, and it identifies and reports patterns or themes within qualitative data in a 6-step framework (Table 1).

An approach adapted from Eakins and Luers directed key questions as data items to show the complexity of DRR research, allude to relationships between codes, and classify critical questions of risk/hazards to study the patterns of DRR studies in Thailand after the year 2015. According to Braun and Clarke (2006), the theme is the main product of data analysis that captures the importance of the data to the research questions and represents meaning within the data set. Themes or patterns can be identified in inductive (bottom-up) or deductive (top-down) analysis. Codes are the identification of a feature of the data that appears attractive to the analyst. Next, a top-down or a priori approach was applied to illustrate important patterns that reflect valuable information code utilized in Microsoft Excel 2020 spreadsheet to log all raw data for numerical computations and formula creation.

Results

Familiarize With the Data

According to Fereday and Muir-Cochrane (2006), TA searches for themes that emerge that are necessary to describe the phenomenon through theme identification by carefully reading and rereading the data. A typical data extraction follows relevant studies: year of publication, journal publisher, title, authors, place of study, research coverage, concerns on DRR, and methodology. Information cataloged for each paper included year of publication, journal, title, author, and research methods, as shown in Appendix A. The studies covered all five regions in Thailand (Central, Northern, Northeastern, Southern, and Eastern part) involving four disaster sub-group (climatological, geophysical, hydrological, and meteorological) in seven main disaster types (drought, wildfire, earthquake, flood, landslide, storm, and extreme temperature) analyzed in qualitative, quantitative, and mixed methods. The qualitative methods used were content analysis, policy analysis, and SWOT analysis. Literature analysis was also done by using NVivo software. The quantitative method commonly applied multi-analysis combining AHP-GIS, AHP-fuzzy logic, and multi-criteria decision analysis (MCDA). The mixed-methods frequently combined literature study with statistical analysis and AHP with SWOT analysis.

Generate Codes, Search, and Review Themes

Once the data were familiarized with the content overview of each other's data, codes were generated. The codes defined the data to identify the linked pattern and establish a thematic idea about DRR

Table 1

Six Steps of Thematic Analysis Adapted From Braun and Clarke's (2006)

	Step	Description
1	Become familiar with the data	This step provides an active engagement and interaction with the data to gain a comprehensive understanding.
2	Generate initial codes	This step identifies preliminary codes (the features of which the data is meaningful).
3	Search for themes	This step provides an interpretation of the generated codes to allude relationship between codes, subthemes, and themes.
4	Review themes	This step provides a thematic map to combine, refine, separate, or discard initial themes.
5	Define and name the themes	This step provides an ongoing analysis to capture the essence of each theme and emerge a unified data story.
6	Produce the report	This step provides an interpretable report using empirical evidence to address the research objective.

Table 2

Disaster Risks Approach Adapted From Eakins and Luers (2006) and Wisner (2016)

Code	Approach	Basic Key Questions
A	Disaster Hazards	What are the hazards? Where and when? What are the impacts?
B	Social, Politics, Economy	How are individuals and spaces affected differently? What describes the disparity in capacities to cope and adapt? What are the reasons and significances of differential susceptibility?
C	Community Resilience	What is the capacity to respond to change?

studies in Thailand post-2015. The mechanics of coding included an intensive reading of the collected data, and some basic questions helped the reading process to categorize keywords indicated by studies. For this research, keywords derived from the disaster risk approach adapted from Eakins and Luers (2006) and Wisner (2016) were applied as the codes because they possessed a common point of reference and had a high degree of generality under potential themes of DRR studies in Thailand. These codes reflected the core components of the research objective as shown in Table 2.

The construction process of codes in TA is eventually an analytic process that builds a conceptual schema (Gibbs, 2007). The pattern was later recognized in emerging themes (encoded from A, B, and C) as the theme categories (AB, AC, BC, and ABC) for analysis, as shown in Figure 3.
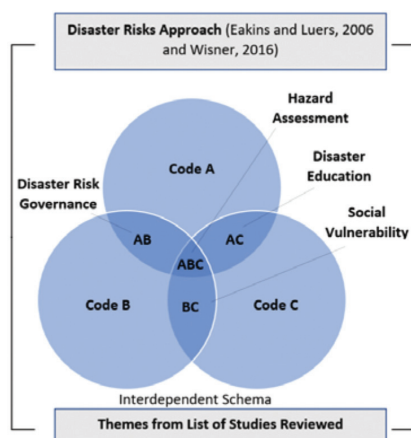

Figure 3. The Pattern Recognition Adapted From Braun and Clarke (2006), Eakins ad Luers (2006), and Wisner (2016)

The list of studies reviewed reveals the multidisciplinary themes of DRR knowledge in Thailand. By compiling and synthesizing the list of studies under provided codes, this research identified four main themes that represented the current trend of knowledge on DRR in Thailand: (a) hazards assessment (ABC), (b) disaster risk governance (AC), (c) social vulnerability (BC), and (d) disaster education (AC).

Define the Themes

As shown in Table 3, 23 papers concentrated on hazard assessment, emphasizing the importance of the model application to understand the complexity and uncertainty of DRR to prepare future scenarios in an integrated disaster management process. Methods applied in the studies were typically mixed methods and quantitative analysis. Twelve studies focused on analyzing governance issues, specifically addressing an emergent framework to identify DRR policy, good practices, gaps, and challenges to strengthen administrative systems and institutions at all levels to achieve multilevel risk governance. Methods applied in the studies were mixed methods, qualitative, and quantitative analysis. Nine papers were centered on social vulnerability embedding social dimensions and a community-based approach at the core of DRR common strategies for resilience building. Methods applied in the reviews were mixed methods and qualitative analysis. The remaining two papers integrated education roles to ensure knowledge development, awareness, and effective preparedness for future disaster risks with mixed methods and qualitative analysis.

Table 3

Summary of Main Themes Observed

Main themes	Concerns	Research Type	ID
Hazards assessment (n=23)	Risk exposure, urban-rural setting, system approach, hazards uncertainty, vulnerability complexity, adaptive capacity indicators, infrastructure planning and preparation, disaster-resilient community, preparedness, evacuation, network analysis, and climate change-induced disasters.	Mixed methods (qualitative and quantitative); quantitative	1,2,6,9,10,19,20, 24,25,26,27,30, 31,33,35,36,37, 38,39,41,42,45, 46
Disaster risk governance (n=12)	Policy-based approach, institutional mechanism, risk management, people's perception, community participation, coordination, leadership, communication style	Mixed methods (qualitative and quantitative); qualitative; quantitative	3,4,5,7,8,12,15, 16,23,28,34,44
Social vulnerability (n=9)	The community-based approach, gender approach, livelihood, risk mitigation, disaster recovery, people's vulnerability, economic impacts, social protection, justice, equality	Mixed methods (qualitative and quantitative); qualitative	11,13,17,18,21, 22,29,32,43
Disaster education (n=2)	Roles of education, experience, preparedness, community development, Japan's lesson learned	Mixed methods (qualitative and quantitative); qualitative	14,40

For the spatial gap of the research, as shown explicitly in Figure 4, the knowledge distribution area of DRR research in Thailand has explicitly endorsed the Central part of Thailand as the primary research location, whereas the Eastern part was the least prevalent for DRR study location. The highest on the national scale, the disaster risk governance theme represented the highest study that determined efforts to build a more integrated DRR system and mechanism in Thailand's social, politics, and economy. In terms of DRR research focus, Thailand still lacks academic knowledge on disaster education, with the least knowledge produced in this academic area. Disaster education was the least pervasive theme explored in academic research in Thailand post-2015, but it elevated the role of education in improving preparedness for disaster risk for community resilience.
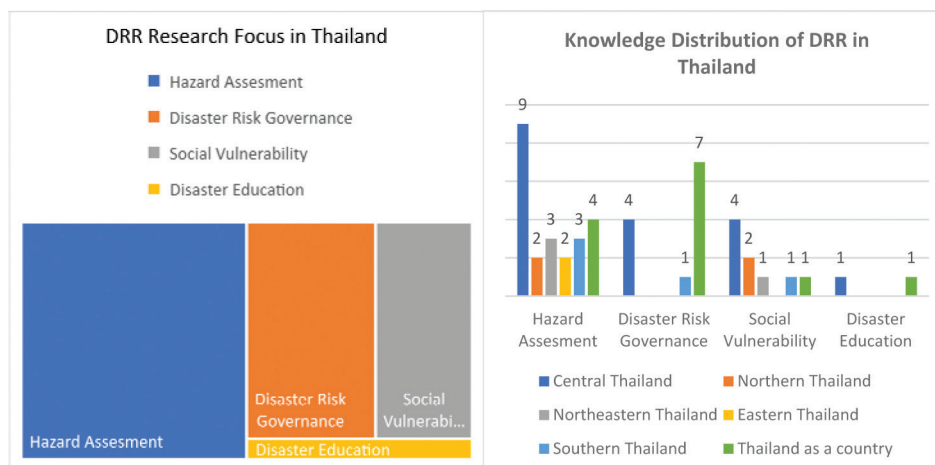
Figure 4. Knowledge Distribution and Research Focus in Thailand post-2015

Discussion

Achieving a Culture of Resilience by Decentralizing Disaster Risk Governance

As shown in the result, the governance of disaster risks in Thailand was still too centralized at the national level, and the knowledge production and distribution of DRR were also centralized in the non-peripheral area. Consequently, disaster management is still concerned about hierarchy (vertical relationship) and adheres strictly to standard operating procedures based on applied Acts or laws initiated by the government in disaster management projects. Further development of local laws, regulations, and public policies involving all communities is considered one of the significant points for strengthening disaster risk governance and reducing disaster risk.

According to UNISDR (2007), each country needs to support a National Platform owned and led by the government to promote and develop a comprehensive national DRR system appropriate to each country. In this way, HFA and SFDRR endorse decentralization from the sub-national level to the provincial and district level, while the national platform nurtures upwards into the regional and global platforms. Some barriers to translating an effective DRR were found on the ground that primarily include a lack of political will (DRR was not seen as a top priority), the struggle to mobilize sufficient resources to support DRR at different levels, and uneven local capacities impacting on community participation and decentralization (Manyena et al., 2013; Jones et al., 2014). Additionally, Djalante et al. (2012) found that one of the barriers to improving DRR at the local scale is a lack of financial resources to foster risk preparedness and recovery measures. Therefore, increased collaboration among local governments and communities would help support DRR planning and improve the culture of resilience to reduce disaster risks (Mercer et al., 2008; Glantz, 2015 de la Poterie & Baudoin, 2015).

Achieving SDG 4 Through Disaster Education

The Sustainable Development Goals (SDGs) reaffirm the connection between DRR and development in SDG4's goals, which include constructing and improving quality education, as well as in SDG9's (on resilient infrastructure) and SDG11's (on sustainable cities and communities) targets. The United Nations Sustainable Development Goal 4 (Quality Education) principally highlights the importance of improving the quality of education and educational facilities that are child, disability, and gender-sensitive within a safe, non-violent, inclusive, and effective learning environment for all. There are numerous detrimental effects of disasters on students' education. Globally, the likelihood of disasters significantly impacts school-aged children. For example, schools that have not been designed, constructed, or maintained to withstand local hazards are more susceptible to damage and collapse, making schoolchildren one of the most vulnerable populations following a disaster (UNISDR, 2009). However, as shown in the result, disaster education was the least pervasive theme explored in academic research in post-2015 Thailand.

In 2016, Thailand joined ASEAN countries in ASEAN Safe Schools Initiative (ASSI) in a regional partnership to promote a comprehensive and inclusive approach to school safety. One challenge identified in implementing disaster education in Thailand is that the key ministries have not set aside some budget to provide technical support on DRR for school safety because most of the budget allocation is directed at disaster response and recovery rather than disaster education (Plan International, 2018). Meanwhile, several studies show that disaster education is positively correlated to disaster preparedness as an individual enables to respond faster and prepare against hazards (Xiao & McCright, 2007; Rodriguez et al., 2007). Therefore, more knowledge production on disaster education is encouraged to ensure the commitment of national authorities to support the mainstreaming of DRR through quality education.

Conclusion

TA is a qualitative descriptive design to analyze contextual data and elucidate themes in the 6-step framework. For this research, a subset of 46 peer-reviewed journal articles about DRR in Thailand published during 2016–2020 were analyzed to determine the data trend pattern on scientific publications in Thailand post-2015. Keywords derived from the disaster risk approach adapted from Eakins and Luers (2006) and Wisner (2016) were applied to classify codes that are more central to contributing knowledge in the DRR disciplinary field. Compiling and synthesizing the list of studies under provided

codes, this research identified four main themes that represented the current trend of knowledge on DRR in Thailand: (a) hazards assessment, (b) disaster risk governance, (c) social vulnerability, and (d) disaster education. The disaster risk governance theme represented the highest study of DRR at the national level. In contrast, disaster education was the least pervasive theme explored in academic research in Thailand post-2015. Further development of the local framework to build a culture of resilience and prevention would be significant for strengthening inclusive DRR to achieve sustainable development in Thailand.

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Declaration of Ownership

This report is our original work.

Conflict of Interest

None.

Ethical Clearance

This study was approved by our institution.

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Appendix A

The List of Studies Reviewed

ID	Year	Journal	Title	Author	Method
1	2016	Australasian Emergency Nursing Journal	"A survey of flood disaster preparedness among hospitals in the central region of Thailand"	Rattanakanlaya et al.	Mixed-method (policy-literature analysis and survey statistics)
2	2016a	Environmental Earth Science	"Assessment of the flood vulnerability of shrimp farms using a multicriteria evaluation and GIS: A case study in the Bangpakong Sub-Basin, Thailand"	Seekao & Pharino	Quantitative (AHP-GIS)
3	2016	Natural Hazards	"Developing a strategic flood risk management framework for Bangkok, Thailand"	Singkran & Kandasamy	Quantitative (outlines method)
4	2016	Habitat International	"Disaster governance and the scalar politics of incomplete decentralization: Fragmented and contested responses to the 2011 floods in Central Thailand"	Marks & Lebel	Qualitative (literature review and content analysis)
5	2016	Habitat International	"Governance beyond the government: Responding to a reactionary flood governance regime in Ayutthaya, Thailand"	Ng	Qualitative (literature review and content analysis)
6	2016b	International Journal of Disaster Risk Reduction	"Key factors affecting the flood vulnerability and adaptation of the shrimp farming sector in Thailand"	Seekao & Pharino	Quantitative (AHP – WLC)
7	2016	Ocean & Coastal Management	"Local people's perceptions of Lake Basin water governance performance in Thailand"	Cookey et al.	Qualitative (literature review and content analysis)
8	2017	Journal of Disaster Prevention and Management	"An expected event, but unprecedented damage: Structure and gaps of large-scale response coordination of the 2011 Thailand floods"	Yeo & Comfort	Mixed-method (policy-literature analysis and survey statistics)
9	2017	Journal of Japan Society of Civil Engineers, Ser. D3 (Infrastructure Planning and Management)	"An integrated multi-model optimization and fuzzy AHP for shelter site selection and evacuation planning"	Boonmee et al.	Quantitative (mathematical optimizations with multiple criteria decision-making phase)

ID	Year	Journal	Title	Author	Method
10	2017	Mitigation and Adaptation Strategies for Global Change	"Building low-carbon and disaster-resilient communities: Integrating climate mitigation and adaptation into the assessment of self-help housing design"	Charoenkit & Kumar	Quantitative (rating system with multiple indicators)
11	2017	International Journal of Disaster Risk Reduction	"Flood risk management in Thailand: Shifting from a passive to a progressive paradigm"	Singkran	Qualitative (content and policy analysis)
12	2017	International Journal of Disaster Risk Reduction	"Gendered approach towards disaster recovery: Experiences from 2011 floods in Pathumthani province, Thailand"	Pathak & Emah	Mixed-method (literature analysis and survey statistics)
13	2017	World Development	"Learn from the past, prepare for the future: Impacts of education and experience on disaster preparedness in the Philippines and Thailand"	Hoffmann & Muttarak	Mixed-method (literature analysis and survey statistics)
14	2017	International Conference on Thai Studies 13th Globalized Thailand	"Natural disasters and disaster management in Thailand: Status, risks, and trends"	Nakasu	Qualitative (content and policy analysis)
15	2017	Natural Hazards	"Responses to the 2011 floods in Central Thailand: Perpetuating the vulnerability of small and medium enterprises?"	Marks & Thomalla	Qualitative (content and policy analysis)
16	2017	Tourism in Marine Environment	"Tsunami disaster risk and vulnerability in coastal tourism community: The case of Khao Lak Area, Thailand"	Jitpraphai et al.	Qualitative (content and policy analysis)
17	2018	Journal of International Geoscience	"Community-based landslide risk mitigation in Thailand"	Schmidt-Thome et al.	Qualitative (content and policy analysis)
18	2018	International Journal of Water Resources Development	"Policy narratives help maintain institutional traps in the governance of floods in Thailand"	Lebel & Lebel	Qualitative (NVivo tool)
19	2018	Procedia Engineering	"Assessment of flood hazard areas using analytical hierarchy process over the Lower Yom Basin, Sukhothai Province"	Seejata et al.	Quantitative (AHP)
20	2018	MDPI	"Available flood evacuation time for high-risk areas in the middle reach of Chao Phraya River Basin"	Jamrussri & Toda	Quantitative (AHP - Fuzzy Logic)

ID	Year	Journal	Title	Author	Method
21	2018	International Journal of Disaster Risk Reduction	"Contributions of gaming simulation in building community-based disaster risk management applying Japanese case to flood-prone communities in Thailand upstream area"	Tanwattana & Toyoda	Qualitative (participatory action research)
22	2018	MDPI	"Emerging livelihood vulnerabilities in an urbanizing and climate uncertain environment for the case of a secondary city in Thailand"	Beringer & Kaewsuk	Mixed-method (policy-literature analysis and survey statistics)
23	2018	International Journal of Disaster Risk Science	"Flood resilience building in Thailand: Assessing progress and the effect of leadership"	Khunwishit et al.	Qualitative (survey and interview)
24	2018	Kasetsart Journal of Social Science	"Key success factors of disaster management policy: A case study of the Asian cities climate change resilience network in Hat Yai city, Thailand"	Siriporananon & Visuthismajarn	Mixed method (policy-literature analysis and survey statistics)
25	2018	International Journal of Environment and Science Education	"Participatory approach on water scarcity solution of tourism city: A case study of Hua-Hin Municipality, Thailand"	Noimunwai et al.	Quantitative (Water Scarcity Index. AHP, and participatory approach)
26	2018	Journal of Cleaner Production	"Prospects of green roofs in urban Thailand – A multicriteria decision analysis"	Sangkakool et al.	Mixed-method (AHP – SWOT)
27	2018	Integrating Disaster Science and Management	"Risk assessment and reduction measures in landslide and flash flood-prone areas: A case of Southern Thailand (Nakhon Si Thammarat Province)"	Pal et al.	Mixed-method (policy-literature analysis and survey statistics)
28	2018	Natural Hazards	"Role of government in flood disaster recovery for SMEs in Pathumthani province, Thailand"	Pathak & Ahmad	Mixed-method (policy-literature analysis and survey statistics)
29	2018	International Journal of Disaster Risk Reduction	"Systematizing community-based disaster risk management (CBDRM): Case of urban flood-prone community in Thailand upstream area"	Tanwattana	Mixed-method (policy-literature analysis and survey statistics)
30	2018	Environment and Urbanization Asia	"Urban flooding and climate change: A case study of Bangkok, Thailand"	Thanvisitthpon et al.	Mixed-method (policy-literature analysis and survey statistics)

ID	Year	Journal	Title	Author	Method
31	2019	Geocarto International	"A GIS- and AHP-based approach to map fire risk: A case study of Kuan Kreng peat swamp forest, Thailand"	Nuthammachot & Stratoulias	Quantitative (AHP-GIS)
32	2019	Political Geography	"Assembling the 2011 Thailand floods: Protecting farmers and inundating high-value industrial estates in a fragmented hydro-social territory"	Marks	Qualitative (content and policy analysis)
33	2019	Natural Hazards	"Assessment of drought hazard, exposure, vulnerability, and risk for rice cultivation in the Mun River Basin in Thailand"	Prabnakorn et al.	Quantitative (drought risk assessment and ArcGIS)
34	2019	International Journal of Disaster Response and Emergency Management (IJDREM)	"Disaster crisis communication innovations: Lessons learned from 2011 floods in Thailand"	Pathak	Qualitative (questionnaire, interview, SWOT analysis)
35	2019	MDPI	"Fuzzy AHP integrated with GIS analyses for drought risk assessment: A case study from Upper Phetchaburi River Basin, Thailand"	Wijitkosum & Sriburi	Quantitative (AHP – GIS)
36	2019	Science of the Total Environment	"Hydrometeorological risk assessment methods and management by nature-based solutions"	Sahani et al.	Quantitative (Fuzzy AHP and probabilistic methodology)
37	2019	Resources, Conservation and Recycling	"Multicriteria decision analysis to mitigate the impact of municipal solid waste management services during floods"	Phonphoton & Pharino	Quantitative (Multi-Criteria Decision Analysis (MCDA))
38	2019	Journal of Health Research	" Knowledge, attitude, and practice (KAP) of earthquake preparedness amongst the elderly in risk areas: Chiang Rai, Thailand"	Songlar et al.	Mixed methods (AHP and interview)
39	2019	Engineering Journal	Uncertainty and fuzzy decisions in earthquake risk evaluation of buildings"	Ketsap et al.	Quantitative (fuzzy model)
40	2020	Nakhara Journal of Environmental Design and Planning	"A prospect of disaster education and community development in Thailand: Learning from Japan"	Wongphyat & Tanaka	Qualitative (interview and questionnaire)
41	2020	Environmental Impact Assessment Review	"Assessment of flood adaptive capacity of urban areas in Thailand"	Thanvisitthpon et al.	Quantitative (adaptive indicators)

ID	Year	Journal	Title	Author	Method
42	2020	International Journal of Disaster Risk Reduction	"AHP-GIS analysis for flood hazard assessment of the communities nearby the world heritage site on Ayutthaya Island, Thailand"	Kittipongvises et al.	Quantitative (AHP-GIS)
43	2020	Asia Pacific Viewpoint	"Contested notions of disaster justice during the 2011 Bangkok floods: Unequal risk, unrest, and claims to the city"	Marks et al.	Qualitative (literature review and policy analysis)
44	2020	Disaster Prevention and Management	"Development of disaster risk reduction policy in Thailand"	Kitagawa, Kaori	Qualitative (literature review and policy analysis)
45	2020	International Soil and Water Conservation Research	"Factor influencing land degradation sensitivity and desertification in a drought-prone watershed in Thailand"	Wijitkosum	Quantitative (GIS – RS)
46	2020	Geographia Technica	"Urban flood hazard map using GIS of Muang Sukhothai District, Thailand"	Kongmuang et al.	Quantitative (GIS)