
Mapping the new elements of local government disaster management capability: a systematic analysis of research trends 2003–2018

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Abstract: Natural disasters have tested the ability of local authorities to handle them effectively, while at the same time recognising local governments as the first local responders. Nevertheless, the disaster literature studies on local governments are limited, concentrating on their capacity to respond to disasters as a public organisation. Therefore, this research emphasises the capacity of local governments' disaster management, centred on the disaster phases, with the goal of contributing to strategic management and to understanding to what degree their local capability was understood in disaster studies. Essentially, this study would apply the mapping review method, in which the findings would generate new elements as a basis of recommendations regarding local governments' capability, particularly in disaster management. The findings of this analysis are meant to offer guidance to public administrators in the hope of getting a deeper understanding of their potential and of improving their response to natural disasters.

Keywords: disaster management; local government; capabilities; systematic mapping; natural disasters; public sector; organisational capability; scopus; disaster stages; institutions.

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1 Introduction

The phenomenon of disasters is known to be inevitable. The World Health Organization (2002) defines a disaster as an occurrence that disrupts the normal conditions of the existing community and causes a level of suffering that is beyond the capacity the affected community can handle. The term *disaster* can only be applied to an event caused by external factors if its target's capacity is low or has high vulnerability. Furthermore, disasters occur when there is no sufficient response to a hazard (WHO, 2002). Although there are three different categories of disasters – natural, man-made, and hybrid – the three types have a common aspect, which is its severity (Shaluf, 2007). Amongst the three types, the most common disasters are caused by natural hazards.

The frequency of disasters has increased, since the number of recorded emergency appeals escalated to 1107 events in the past two decades (Fisher et al., 2018) with weather-related disasters consuming the most numbers. Natural disasters can be geophysical, such as earthquakes and volcanic eruptions; hydrological, such as floods; meteorological, such as hurricanes; and climatological, such as heat and or cold waves, and droughts (Guha-Sapir and Below, 2013), but not all natural hazards are classified by their main contributing factor. In the past 15 years (2003–2018), the emergency events database (EM-DAT) has recorded 6289 natural disasters, 5746 (91.4%) of which were hydrological, climatological, and meteorological, with floods and storms alone accounting for almost three-fourths of all incidents (Guha-Sapir, 2020). In the report from the IFRC (2018), the estimated number of people affected by natural hazards is 2 billion with an average cost of US \$1658 billion accumulated from 141 countries. Natural disasters cannot be avoided entirely (Fernando and Kumari, 2018), so governments are challenged to formulate appropriate strategies to reduce risks and further damaging effects.

The strategies governments implement to face natural disasters are labelled as disaster management, which is a term that encompasses a range of policies and practices developed to prevent, manage, reduce and rehabilitate the impact of disasters (Henstra and McBean, 2005). In the literature on governments' role in disaster management (Capili, 2003; Buergelt and Paton, 2014), the salient role of local governments in contrast to the central government was proven. According to Oluwu (1999) local government covers the political and bureaucratic structures and processes which regulate and promote community activities. Local government comprises local community management, local administration. It is the level of government closest to the constituents and provides a broad range of services, through institutions called local authorities, which affect the lives of the inhabitants of its area of responsibility. Somers and Svava (2009) added that the degree of disaster response is higher when it is controlled by local governments, while intervention from the higher government results in poor performance. The other fact is that governments in the local level are considered as the first responders for disaster events (Pathak and Ahmad, 2018; Kapucu, 2008). Furthermore, the local governments' hands-on position with communities (Roosli and O'Keefe, 2011) supports their key role in disaster management by developing the appropriate policies and by enacting procedures to respond effectively in the disasters' aftermath (Henstra, 2010). Some scholars have demonstrated the importance of local governments in managing disasters (McGuire and Silva, 2010; Zhang et al., 2015; Hayat and Amaratunga, 2017; Col, 2007; Mehiriz and Gosselin, 2016) but there were cases where local governments have failed to incorporate suitable strategies according to the disaster management scheme.

Local governments are considered as one of the most understudied institutions in disaster literature (Wolensky and Wolensky, 1990). Most research conducted on local governments as public organisations on managing disasters are limited to measuring its capacity (McGuire and Silva, 2010; Anantasari et al., 2017; Nicholson, 2007) or its role in disaster management (Djalante et al., 2017). Additionally, the study of local governments' capabilities are still underplayed or insufficient, which adds to their inadequacy in the disaster literature. Winter (2003) realised the importance of organisational capabilities in the public sector (Wang and Kuo, 2014), which constitutes the reason for further studies on local governments as they are one of the most important public organisations, particularly their capabilities in disaster management (Lee, 2019; Nilsson, 2010; Palm and Ramsell, 2007; Prabhakar et al., 2009; Rahm and Reddick, 2011; Reddick, 2007; Thacher, 2005)

Studies on the association of fundamental organisational principles and management of disasters are limited. Wang and Kuo (2014) emphasised strategic management, which affects local governments' capabilities in disaster management. Meanwhile, Kusumasari and Alam (2011) identified six dimensions in evaluating local governments' capability in pre-disaster, during the disaster, and post-disaster, which resulted in the following elements: financial, human resources, institutional, leadership, policies for effective implementation, and technical resources. These were initially identified in another research, which correlated with disaster management phases as being essential requirements for local governments to acquire before being developed into several dimensions of capabilities (Kusumasari et al., 2010). Based on these studies, they have a similarity on viewing how organisational capabilities influence the performance of local governments in disaster management, but no particular emphasis on the capabilities needed in managing disasters. Therefore, this research would focus more on the capabilities and its suitability to manage disasters in its mitigation, preparedness, response, and recovery stages.

The previous studies' on local governments' capabilities in disaster management focused more on the required capabilities based on the disaster management phases. Regarding the capabilities in a more extensive view, it was not fully elaborated in the aforementioned literary sources and the literature pertaining to them is scarce. Inevitably, the need of organisational capability to be viewed more extensively is clear (Bhatta, 2003, p.402) following another focus in the circumstances of the public sector or local governments.

In responding to the background, the purpose of this research is to answer the following questions: what is the research trend on local government capability in the disaster literature? and what are the new elements of local government capability in disaster management. Specifically, this paper seeks to identify the research pattern of local governments in the disaster literature and to map-out and create a new dimension of capabilities for local governments in disaster management. Lastly, the paper has several parts. First, the views on literature are presented through compiling studies on the definitions and elements of organisational capabilities by various authors and scholars. Second, the research methodology would be elaborated, starting from the method of data extraction up to its classification scheme before the analysis. Third, the results from the findings would be reported, which includes the research development of local government capability in disaster management and the intricacy of local government capability within the disaster management phases. Additionally, empirical evidences on the challenges in disaster management for local governments would be presented as the

supporting factors to formulate the elements of capabilities. Fourth, the reviewed findings and generated dimensions of capability would be examined deeper, conjuring suited capabilities within the dimension of local governments, according to the four disaster management phases: mitigation, preparedness, response, and recovery. Fifth, the function and implications of this study would be explained. Finally, the paper is concluded with final remarks on the research, the limitations, and additional developments for future studies on the subject.

2 Literature review

In this section, the researcher reviews several literary sources on the concept of capability by various authors from journal papers and books. The features displayed are composed of operational capabilities and dynamic capabilities. Although dynamic capabilities are distinct from operational, the idea is similar even though the latter refers to the capacity of an organisation in responding to radical external changes (Helfat et al., 2009). In addition, the researcher adds dynamic capability as one of the key feature as stated in (Bhatta, 2003, p.401) that external environment plays a vital role in shaping the concept. For local governments are considered as public organisations (Wang and Kuo, 2014), this study incorporates the concept of organisational capability as the foundation of identifying the new elements of local government capability. Furthermore, as displayed in Table A1 (attached in Appendix), the researcher limits the features of capabilities under the scope of organisational capability, local government, and disaster management.

3 Research methodology

This study applies the method of systematic literature, mapping with the aim to analyse the concept of capability in organisations, specifically public organisations in disaster management. Moreover, the results of the analysis would be grouped based on the disaster phases of disaster mitigation, disaster preparedness, disaster response, and disaster recovery, and further classified based on the key features of capability. Due to the scarcity of literature on capabilities, particularly in public organisations, Kitchenham et al. (2010) argued that this method provides a good overview of an area and the ability to identify research gaps (Petersen et al., 2015, p.3) and also to provide recommendations for practice (Booth et al., 2012). Thus, the generated map of capabilities in disaster management would give the impression for local governments in enhancing their strategy to manage disasters and to overcome the challenges they would encounter in the process.

Referring to Petersen et al. (2008, p.2), the study method requires five stages:

- 1 defining the research questions or the research scope
- 2 conducting the search
- 3 screening the literature with the inclusion and exclusion criteria
- 4 key-wording of abstracts or classifying the scheme
- 5 data extraction and systematic map of studies.

The research scope is strictly confined to capabilities, disaster management, and local government. The search would be conducted through the extraction of literature in Scopus, for Leydesdorff et al. (2009) had stated that it's the largest database with numerous peer-reviewed literature. In screening the literature, the researcher applies an inclusion and exclusion criteria. For this study, literature included English and pertaining concepts, key features, or elements of capability under the scope of local government in disaster management. This inclusion criteria were set to review the collected literature with the aim of narrowing the papers to the relevancy of the study. Meanwhile, the exclusion criteria distinguish literature of capability outside the inclusive criteria, such as any relevant literature but under the scope of public health, engineering, computing, and business management studies. The literature extracted would be from 2003 to 2018, with the starting year being the most abundant for disaster management literature (Lettieri et al., 2009), and ending at the year 2018 due to the beginning of the researcher's research period. Furthermore, the key features serve as the fundamental base of various interpretations regarding organisational capability.

For this paper, the researcher set the scope of search by forming research questions. The research questions' purpose is to identify the range of the search, as well as to formulate search strings. In result, the researcher managed to create two sets of search strings and classified them into several groups. First, the writer emphasised the concept of capability by only using the keywords of 'capability' and 'capacity' in the search. Second, the scope of disaster management are limited to the four phases that was mentioned as a real disaster strategy of disaster management by Jayaraman et al. (1997) which are 'disaster mitigation', 'disaster preparedness', 'disaster response', and 'disaster recovery' (Jayaraman et al., 1997), as well as including the broad term, 'disaster management', in the second set. Lastly, the main subject of the research were comprised of two terms, which are 'local government' and 'public organisation'. Therefore, there were 20 sets of search strings that were conducted.

The first search acquired a sum of 77,504 papers from the 20 sets of search strings. After applying the inclusion and exclusion criteria, the amount of papers decreased to 2067. The papers were screened thoroughly after the inclusion and exclusion criteria were applied, which eased the search of relevant papers needed. Apart from the previously mentioned inclusion and exclusion criteria in screening the papers, the researcher also added the availability of the paper in full-text as an inclusion criteria since the introduction is required to further screen the literature if the abstracts are not sufficient. Consequently, the number of literatures dropped drastically to 139 papers after re-examining the papers based on the abstracts, and several on their introductions. Finally, the researcher managed to compile and utilise 21 papers after screening for its relevancy with the topic.

4 Results

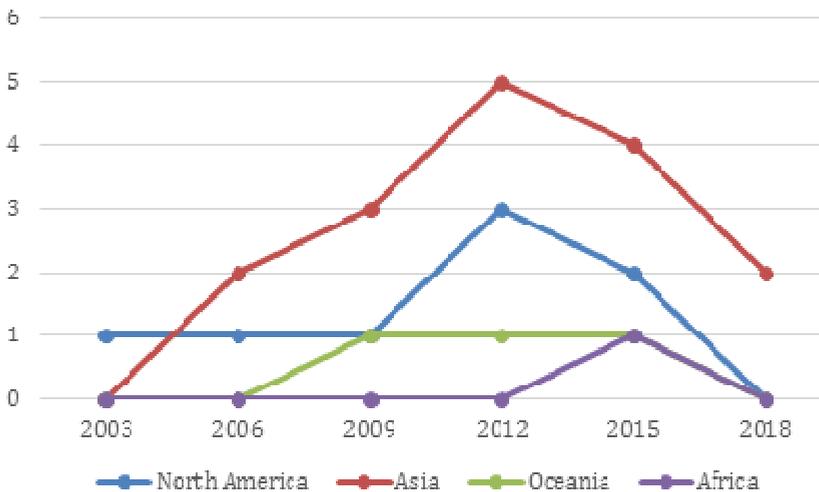
The literary sources collected were not limited to any journal but was constricted based on the aforementioned fields of capability. Afterwards, the literatures were further classified based on Jayaraman et al.'s (1997) real strategy of disaster management, which includes mitigation, preparedness, response, and recovery, and categorised them into several groups with two sections. Section 1 elaborates two categories as it was initially grouped with a single aim. First, this category includes the year and location of the

empirical studies, with the aim to map out the research trends of local government capability in managing disasters. The presented graph would represent the amount of research conducted. Second, this classification represents the most researched disaster management phases, as a study had proven it to be one of the most studied topic in the disaster literature (Lettieri et al., 2009). The initial two groupings are to observe to what extent local governments had been studied in the field of disaster management, as well as to identify the concept of capabilities within the literature. Section 2 and last set of the group is the local government capability, which has been sorted into the disaster management phases. The outcome of this classification is the systematic map of the new local government capabilities, which would be exhibited in a tabular figure and further justified.

4.1 Research trends

The studies, which were previously conducted, revolved around the phases of disaster management and around incorporating its strategies, excluding the elaboration on the indicators of the implementations' effectiveness and efficiency. Noting that local governments are considered as one of the most understudied institutions in the disaster literature (Wolensky and Wolensky, 1990), the researcher reviewed numerous disaster studies emphasising local governments and their disaster management capabilities in the disaster management phases. The results are shown (Figure 1) where research on local governments in the disaster literature fluctuated over the span from 2003 to 2018, with 3 years categorised within the displayed year.

Figure 1 Numbers of studies published in 2003–2018 (see online version for colours)



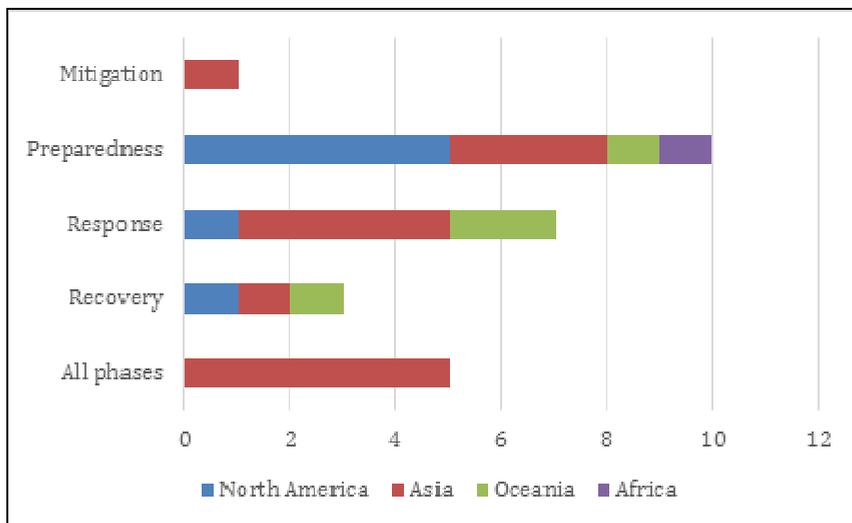
Literary sources on local governments are not as abundant as the concept of disaster management, hence the low to average amount presented. However, in contrast to a study on the development of disaster management literature (Lettieri et al., 2009), the highest contribution of studies originated from the continent of Asia, whereas the previous study concluded the continent of North America had contributed most of the disaster literature. Nevertheless, the previous paper focused solely on the concept of disaster management,

which could only be partially relevant to this study. Apart from the dominating continent with the most papers, the graph also entails the escalation from the year 2009 to 2012, both from North America and Asia. The author found this interesting since CRED (2013) reported a drastic increase amount of natural disaster occurrences in 2009 from 2008 (p.3), while several authors (Hu et al., 2018; Chern and Liu, 2013; Zukowski, 2014; Zhang et al., 2015) applied the natural disasters that occurred from the range of 2009 to 2012 as their main empirical cases.

Lettieri et al. (2009) conducted a review on the development of disaster management literature and observed the ample of studies pertaining to the disaster management phases, which resulted in mitigation, response, and recovery constituting the majority among all the stages. However, the results from the study are partially similar, as the summed outcome (Figure 2) showed different degrees of favoured literatures, which are disaster preparedness and disaster response. From the accumulated results, the prominence of disaster management phase studies still exist, with an addition to disaster preparedness becoming a common research theme in the disaster literature. Although North America possesses the most literature in disaster preparedness, Asia's stance is higher in the search of local government in disaster management. To sum up, the development of literature on disaster management has increased prior to a previous study (Lettieri et al., 2009), but the fact remains that the local government studies are still limited (Wolensky and Wolensky, 1990) along with their potential for disaster management.

Aside from the outcomes of the research trends on local governments in disaster management, the other conclusion of this section is the grouped concept of local government capability, which was classified based on the disaster management phases. As presented in Table A2 (attached in Appendix), the concept of capabilities is not bound to one phase of disaster management, but it mainly serves as different functions in multiple stages.

Figure 2 Most studied disaster management phases from 2003 to 2018 (see online version for colours)



4.2 *The new elements of local government capability*

This section elaborates the new elements of local government capability under the scope of disaster management as a result of the systematic mapping study. The new elements serves as a set of recommendations for the previous models as they lacked in-depth illustration. In comparison to the traditional elements of capabilities from previous studies (Kusumasari et al., 2010; Kusumasari and Alam, 2011; Wang and Kuo, 2014), these new elements were mapped out as a result of the continuously changing environment that surrounds disaster management. The progressive component does not only apply to the increasing cases of natural disasters, but also to the rapid development of governance, which impacts the public managers' methods in managing disasters. As society advances, the generated contemporary elements gives a different sense of capability in the area of disaster management.

The mapped elements synergise between one another since the impact of natural disasters requires a variety of capabilities according to the disaster management phases of mitigation, preparedness, response, and recovery. As shown in Figure A1 (attached in Appendix), there is a total of six dimensions: public engagement, resources, networking, environmental sensing, systems, and institutions. The elements were fabricated based on the empirical evidence of the literary sources and are not classified into any disaster management phase, for they serve as fundamental features of local governments' capability. In addition, the new elements would also convey sub-elements within the disaster management phases to provide a broader overview of the capabilities' functions within the different stages, which the author grouped based on their functions and similarity with the elements. Therefore, the illustrated interpretation of the elements and their sub-elements would construe recommendations for public managers in the local level to devise new strategies in managing natural disasters, as well as answering the two final research questions.

5 Discussion

5.1 *Public engagement*

The sub-elements of dissemination of information, capacity-building, and education shape the component of public engagement. This dimension prioritises the efforts of local governments in any way that communicates with the public, which are highlighted below:

5.1.1 *Dissemination of information*

According to Zhang et al. (2016), effective information dissemination plays a critical role in disaster management. The activity entails the local authorities disclose relevant information on the occurring natural disasters, which benefits them in several ways. Subsequently, the aspect of an early-warning system (EWS) falls into this sub-element. The synchronisation of dissemination of information and an early warning system broadens the options of the community, decreases the consequences they might face from the disaster (Muhonda et al., 2014), and bestows the ability for the local authorities to issue an evacuation (Spahn et al., 2010). This is a primary concern in the disaster prevention phases of disaster mitigation and disaster preparedness, as the IFRC (1995)

had stated that the aforementioned phases require the public to obtain information on the disaster so they are able to plan for themselves and to make relevant choices to act, therefore reducing their vulnerability.

5.1.2 Capacity-building

Building capacities is meant to improve their ability to withstand natural disasters, in which the aim is to build a strong and resilient society. This secondary element's most popular purpose is to improve the public's capabilities before disaster strikes by improving their abilities, which implicitly enhances their awareness of responding to natural disasters that occur. In addition, the concept of capacity-building also includes providing the opportunity for constructing strong infrastructures to minimise hazards (Alcayna et al., 2016) even though its basic idea is frequently known to construct human capacity or capability. Kusumasari and Alam (2012) also argue how capacity-building is utilised in the form of activities to rebuild the community post-disaster phase through rehabilitation of public facilities to improve the communities' economic well-being.

5.1.3 Education

Education on disasters emphasises the necessary knowledge and information about natural disasters with the means of increasing public understanding and reducing risks as well as losses (Yen et al., 2006). Anantasari et al. (2017) added how education and training could improve the capacity as well as the capability of an individual or a collective group, including organisations and communities (p.146), in which this signifies the influence that disaster education has towards the disaster management scheme. However, the public's capacity for an adaptive response to natural disasters along with their risk perceptions are often overlooked by local governments (Peng, 2018), which has an effect on several other areas, such as the increasing devastation impact from the disasters (Kusumasari and Alam, 2011), the local authorities' poor efforts in formulating an appropriate disaster mitigation plan (Peng, 2018, p.3), and the community's preparedness concerning disasters. This sub-element serves as the most impactful as it not only increases the awareness of the public, but also their understanding of disasters such as the hazards, risks, etc.

In summary, public awareness of natural disasters significantly affects local governments' disaster management system. In addition, Hosseini et al. (2014) added that by disseminating information and providing relevant education, knowledge can be promoted, hence the interlinkages between two of the sub-elements. Because of its popular prominence in the pre-emptive phases of disaster management, it is also recognised that the sub-elements contribute to the post-disaster recovery process. Additionally, the study that emphasised the importance of public awareness and its effects on disaster management governance (Peng, 2018), shows how this aspect promotes the preservation of an efficient disaster management plan to ensure that disaster management costs and losses are minimised by an anticipatory approach.

5.2 Resources

The second dimension of local government capability is resources, which consists of personnel, logistics, and funds. These three components interconnect with each other as

they are the fundamental features of capability, particularly in the public sector. To underline, the context of this element lies in the terms of quantity, availability, and quality. Below is the elaboration of the three sub-elements:

5.2.1 Personnel

Referring to Kusumasari and Alam (2011), visible aspects of human resource capabilities are when local governments possesses sufficient quantity of workforce, clear responsibilities, allocation and division of labour within the sector in managing disasters (Kusumasari and Alam, 2011). Meanwhile, their capacities are constrained to four major indicators:

- a the ability to attract and retain qualified individuals
- b ongoing training opportunities
- c the importance of broad knowledge
- d local leadership where there are goals and a visions that encourages community support (Pirie et al., 2004).

Overall, it has been repeatedly revealed in numerous disaster literature that their adequacy is essential, particularly when it comes to disaster management as it applies to the whole disaster scheme of mitigation, preparedness, response, and recovery. However, for each disaster phase, the degree of human resources required differs, based on the activity that demands it.

For instance, disaster preparedness gives precedence to the quality or skills the personnel possess. The expertise needed consists of knowledge on past disasters (Ollerenshaw et al., 2016) and knowledge on the potential risks caused by the natural disasters (Kusumasari and Alam, 2011; Hosseini et al., 2014). The skills aforementioned mainly revolve around their role in providing relevant knowledge and in disseminating information towards the public, whereas disaster response focuses on a different scope of intangible qualities, such as the knowledge on responding to the disasters (Wang and Kuo, 2014) and the expertise on adjusting the suitable logistics for vulnerable communities (Kusumasari et al., 2010, p.447). This indicates that the manifold of personnel quantity and quality cannot be separated to ensure an effective disaster management flow.

5.2.2 Funds

To improve the capacity of local governments, it is important to have sufficient funds, as all disaster-related activities in the phases of disaster management require funding (Kusumasari and Alam, 2011). The focus issue in this part, however, is the amount and effort needed to allocate it. Local governments have the most limited funds relative to other levels of government, which often involves the higher level of government in financial affairs. In addition, the capacity to handle financial resources at the local level is also important (Al-Nammari and Alzaghal, 2015), as the method of distributing and maintaining funds for situations as unpredictable as natural disasters affects the efficacy of the disaster management plan and its effects on the well-being of the public.

5.2.3 Logistics

This sub-element represents the disaster management's physical aspect; unlike the two preceding pieces, it focuses on the disaster response and recovery processes. Through the physical perspective, local governments' efforts include setting up shelters and assessing the related infrastructure for vulnerable communities (Kusumasari et al., 2010), which represents the entire response process. Disaster recovery is seen as a more complicated step; in this stage, physical resources need to be rebuilt or restored. Therefore, the concept of this part not only adapts to the concrete idea but also to its enigmatic aspect of organisation.

This aspect implores the concrete aspects of power of local governments, while also recognising the intangible considerations within it. While being one of the many preconditions of local governments' efficiency, Bhatta (2003) emphasised the need for these three sub-dimensions to achieve such outputs. In the case of disaster management in the public sector, the use of resources, funds and infrastructure will affect local governments' ability to mitigate negative outcomes and promote positive outcomes.

5.3 Networking

The idea of networking requires contact with others – in this case, with organisations that assist the public when natural disasters happen. In this dimension, the sub-elements of communication, collaboration, and cooperation are graded with interconnecting functions. Although each notion consists of separate functions, the three are best used in this element by collectively synchronising the features. Thus, the elaboration is explained as the following.

5.3.1 Communication

The principle of interacting with other interested parties in disaster management is a two-way street of contact, be it vertically, within the local governments, or horizontally. This ability is above the other two features of networking since the first phase of communication is necessary to establish relationships with other agencies, before advancing to further actions. In addition, this aspect is used through different platforms, such as telecommunications and IT infrastructure (Kapucu, 2008), which requires maintenance due to it being destroyed. The aftermath leads to the main communication issue, such as when leading organisations' one-way communications with other agencies resulted in confusion (Ollerenshaw et al., 2016). By providing a first-hand connection with the other parties, further actions could be taken if a positive outcome happens.

5.3.2 Coordination

Coordination is described, according to Parmar et al. (2007), as an efficient explanation of useful tools to efficiently accomplish common goals and to eliminate disparities in service delivery in the aftermath of disasters (Bahadori et al., 2015). Interrelating with the previous component, this aspect describes the next phase after a relationship is established through communication. For the local governments' case, coordination is seen as an activity to manage and control their resources, whether they are personnel, funds, or logistics. Furthermore, the visibility of its impact is viewed in the way governments manage it. For instance, a clear mechanism of coordination between local

governments and other stakeholders strengthens their efficiency in responding to disasters (To and Kato, 2018). In addition, a successful attempt of coordination among relevant parties, such as volunteers and local authorities, leads to an effective process of disaster recovery as well (Ollerenshaw et al., 2016).

5.3.3 Cooperation

The notion of collaboration encompasses the willingness of one or more actors to cooperate in disaster management, or within different sections of an entity. In most cases, local governments are burdened with the whole responsibility of disaster management. However, To and Kato (2018) argued that developing a framework for multi-stakeholder collaboration enhances their disaster response capability (p. 24) without excluding the actor who provides intangible support of information dissemination, which is the media (Prizzia, 2005). Cooperation results in trust between organisations in addition to their capacity to respond to disasters (Kapucu, 2008; Spahn et al., 2010), thereby enhancing their efficiency.

The three networking sub-elements are difficult to separate, as they all intertwine in supporting disaster management efforts by local governments. In the internal context, Kusumasari and Alam (2011) states that strong hierarchical networking is one of the key factors for an effective response and recovery to the disaster. In addition, the three elements perform various functions through an external network. First, the use of communication opens a link between different government parts and/or different stakeholders, followed by encouraging coordination that promotes more measures for other organisations to assist in disaster relief efforts, and lastly, cooperation enhances their capacity for effective management.

5.4 Environmental sensing

This element encourages the ability to recognise and understand their environment, particularly when natural disasters cause actions and/or decisions to be made immediately. The definition of flexibility and adaptability falls under this category for the following reasons.

5.4.1 Flexibility

The notion of flexibility, according to Tsai et al. (2007), is the capacity to handle the high complexity of a situation (p.34), regardless of the initial implementation structure. Despite the current policies adapted for natural disaster happenings, the degree of uncertainty affects the participants, often beyond their capability and ability. Kapucu (2008) argues that while overall policy decisions can remain centralised, implementation policies in the field must also be changed or revised in order to address local circumstances in real time. The purpose of this sub-element is to respond to the problem that most responses to disasters do not conform to the current socio-economic and political context of the hit areas (Scott and Few, 2016). In fact, this is primarily intended for decision-making when implementing disaster policies.

5.4.2 Adaptability

The interpretation is nevertheless conceptually distinct, almost identical to the previous term. Adaptability is also related to the capacities of the organisation, such as the ability to assess and recognise emergency situations and accordingly adjust the resources and operating structure (Kapucu, 2008). The dilemma of using adaptability is known to address the issue of inadequacy and uncertainty. For example, Kusumasari and Alam (2012) noted how adaptability is regarded as a key feature of a team recovery effort (p.366), hence its vitality in the efficiency of implementation of the disaster management scheme.

The environmental sensing aspect is of great importance as one of the main characteristics for local level public administrators to cope with the uncertain situation of a natural disaster occurrence. The distinct but similar concept also affects local governments' low capacity to distribute their resources, or if an undesired result occurs, even if they had abided by their structure for disasters. Therefore, both versatility and adaptability are important for fighting problems within the disaster management flow to ensure it's monitoring after a sudden roadblock.

5.5 Systems

This dimension concerns the way an organisation is run. This also focuses on the appropriateness of resource utilisation and the consequences of its implementation (Bhatta, 2003). The sufficiency of resource management up to the organisation of its production is critical because it needs a comprehensive strategy. This function therefore involves planning, monitoring and assessment, which are elaborated as follows:

5.5.1 Planning

Disaster planning is one of the most critical activities in the disaster management process, and it takes place in the early stages of disaster prevention. The success of the planning can be seen in the execution, and the feedback it generates for the public can be observed. In addition, the connection with strategic and efficient disaster management preparation is the well-structured activities of government, followed by a comprehensive social strategy of the actors concerned, in particular for them to cooperate (Kusumasari et al., 2010). Overall, this sub-dimension is certainly important for disaster management as a steppingstone.

5.5.2 Monitoring

It is just as necessary to track implementation after the planning process. The role of this sub-element is to ensure its stability until the final stage of the disaster management process, and any aspirations for a permanent solution. This function serves as an intervention during the mitigation process to recognise the dynamism of natural disasters (Kusumasari et al., 2010) such as follow-up events or after-effects. However, Anantasari et al. (2017) includes how this action is closely associated with planning, especially in building and managing the growth of infrastructure (p.136), which avoids further damage and fatalities in the process of managing disasters.

5.5.3 *Assessment*

The final phase of the disaster management program incorporates both prevention and recovery assessment procedures. Kusumasari and Alam (2010) notes the importance of the mitigation stage assessment of the environmental situation (p.446), which affects the level of policy of local governments during the process of disaster planning. In addition, Peng (2018) also recommends this sub-element as a method for defining public awareness and information in terms of formulating a detailed disaster reduction strategy. Eventually, disaster recovery evaluation requires the restoration and rehabilitation phase, which includes the process of determining the extent of damage.

The three sub-elements of systems encourage the public sector to improve, rather than possess. In the disaster management, all three features are previously included and indulged as a responsibility for local governments to act on. Even so, the three synchronise and support each other, to the extent they intertwine in certain activities within the disaster phases, such as assessment also being utilised for comprehensive disaster planning, etc.

5.6 *Institutions*

The final dimension focuses on local governments' internal capacity as well as their capacity in delivering services to the public. In this element, the strengths of the public sector influence the implementation and its outcomes. The sub-elements' regulations and decision-making compose this element, and have the explanation as below:

5.6.1 *Regulations*

According to Kusumasari et al. (2010), a successful implementation represents the availability of adequate regulations for decision taking, mobilising resources, and involving related stakeholders. The disaster management regulations contribute to their efficiency, as they act as guidance for local governments. In addition to the regulations on disasters, the presence of legislation also influences the consistency of the laws concerned; it exists as an actor to enforce existing disaster management activities towards the public (Kusumasari and Alam, 2011; Malalgoda et al., 2013). Furthermore, policies also include sustainable recovery of disasters and their cost, preparedness and public engagement, and organisational skills for proactive actions (Calvin, 2012), all contributing factors to the flow of disaster management.

5.6.2 *Decision-making*

Decision-making is an important component in managing disasters, as their impact branches not only to their implementation, but to their outputs as well. The choices that public managers had to make require a full thought as Prizzia (2005) highlighted the degree of uncertainty natural disasters possess has been a major constraint for local governments. Moreover, their rigid bureaucratic system and "command and control" method tends to hamper their ability to adjust their capacity in decision-making within the natural disaster setting (Kapucu, 2008), and with poor decisions being made, it affects the whole scheme of disaster management (Sinclair et al., 2012). Regardless, the sub-feature of decision-making is valued as critical for various reasons, as stated previously, and its level of importance needs to be readdressed by the public sector

because it has major effects on the emergency management plan, particularly in disaster recovery (Liu et al., 2018).

The institutions dimension contributes most to the setting of a disaster, as local governments are the main actors in responding to local-level natural disasters. The level of appropriateness and specific policy priorities, as well as their ability to make decisions in complex circumstances, are the key criteria for the public sector to prioritise within the framework of its administrative power. Furthermore, their duty ranges from being the first respondent to the resilience of the country, of which an administrative structure with the notion of enhancing the capacity of the country to withstand natural disasters is also considered to be one of their obligations (Malalgoda et al., 2013). Therefore, the capacity of local governments itself is the core issue, since the elements and their sub-elements depend on their capability to manage and execute the related tasks.

6 Implications of study

The improved elements of the capability of local governments offer a clearer understanding of each of the elements and the necessary sub-features, but in the sense of disaster management, and with the previous model as the basis of its development. Throughout the course of developing an efficient disaster management system, the flow starts with the formulation of a disaster plan and relevant measures, followed by their execution when a catastrophe occurs, and it eventually reviews the findings for potential guidance on enhancing catastrophe preparation. The elements on and sub-elements of capability prove useful in formulating a holistic disaster management plan at the local level from the generation of the new model. Based on the conducted research, the mapped capabilities of local governments is basically a concept of analysis through the research trends of the local government in the disaster literature and a compilation of learnt lessons based on the empirical evidences within the literary sources. In the research performed, local governments' mapped capacities are essentially a framework of study through local governments' research patterns in the literature on the disaster. However, the findings of the new elements may serve as realistic guidelines (Booth et al., 2012). In addition, state-level government studies are still uncommon (Wolensky and Wolensky, 1990), but the outcome of this study, which are the new elements, may provide more references within the disaster literature for potential study into local governments' capability. Therefore, apart from filling in the research gaps, this study may help local governments in implementing them to prepare a holistic strategy for disaster management and to reduce inefficiencies in the many stages of managing disasters.

7 Conclusion

Overall, the research has mapped out existing literature on local governments as key actors in managing disasters, and it has generated new elements of local government capability based on the existing literature to enhance its capacity and strategy in disaster management, due to the limitations of the previous model.

Organisational capability has not been fully incorporated to the idea of public sector capability as the orientations from private and public sectors are not similar. Even so, several studies have managed to merge the two separate studies and to produce elements of local government capability, particularly in disaster management (Kusumasari et al., 2010; Wang and Kuo, 2014). The research trends indicated the number of disaster literature that emphasises that the role of local governments in natural disasters is abundant but not plentiful. It shows that the study of the local level of government is not a common subject to research as previous research had indicated its scarcity. The new elements of public engagement, resources, networking, environmental sensing, systems, and institutions serves as a recommendation for the local government in ensuring an effective and strategic disaster management. Interpreting and elaborating each of the elements would add to the concept of local government capability and provide further insights on the prerequisites to a strategic and effective disaster management.

However, in this study, there are limitations that constricted the authors in forming more theories and arguments regarding the mapped-out capabilities. The data was enough; however, more data could have been interpreted to form a narrower sense of the mapped-out elements as well as their sub-elements. Moreover, this study was restricted to only one database, which limited more interpretations about local government capability. Apart from the conducted research, this study did not include the role of vital external stakeholders such as non-governmental organisations and international institutions within the disaster management framework. Hence, the study is restricted to the role of local government in managing natural disasters. For future research, the study should add a variety of databases, followed by a more comprehensive elaboration from the results, with the hopes of applying it practically in local governments' disaster management scheme, and a broader scope in also identifying the other stakeholders' role in managing disasters, such as the NGOs and international institutions.

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Appendix

Table A1 Key features on capability

<i>No.</i>	<i>Scholars</i>	<i>Capability elements</i>	<i>Definition</i>
1	Bhatta (2003)	Resources Structures Systems	Capability refers to the resources, systems, structures, and processes necessary to deliver – currently and in the future – the required level of performance in fulfilment of the mandated objectives
2	Tsai et al. (2007)	Cooperation Dedication Flexibility Swiftness (Speed of response)	Capability comes from various elements of an organisation, providing the basis upon which organisations can implement programs and achieve goals
3	Jiao et al. (2010)	Change and renewal Environmental sensing Organisational flexibility Technological flexibility	Capability can be referred to the ability of enterprises to integrate, develop, and reconfigure internal and external competences to address rapidly changing environments
4	Wang and Kuo (2014)	Budget Autonomy Coordination Personnel Autonomy Red Tape	Capability is the ability to perform a coordinated task, utilising organisational resources, for the purpose of achieving a particular end result (Helfat, 2003 in Wang and Kuo, 2014)

Table A1 Key features on capability (continued)

<i>No.</i>	<i>Scholars</i>	<i>Capability elements</i>	<i>Definition</i>
5	Wang and Ahmed (2007)	Absorptive Adaptive Innovative	Capability refers to an organisation's behavioural orientation constantly to integrate, reconfigure, renew and recreate its resources and capabilities and, most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage
6	Whitley (2003)	Coordinating Learning Reconfigurational	Capability is an ability that is developed as a framework which influences how firms compete in different sectors and technologies
7	Anantasari et al. (2017)	Building and development control Community development Education and training Funding Networking Regulations Risk reduction activities Strategic planning Understanding hazard and risk	Capability means that an organisation is able to undertake functions, such as provide a service or fulfil a task. The author argues how these categories are essential in government capacity and capability
8	Kusumasari and Alam (2011)	Financial Human resources Institutional Leadership Policy for effective implementation Technical resources	Capability is the ability to organise assets, competence and knowledge to protect the community from a disaster's potential effects. The author adopted Cigler's (2007) view on capability as a form of competency
9	Kusumasari et al. (2010)	Damage assessment Debris removal Disaster assistance skill Dissemination Evaluation Exercise Information exchange Logistic management expertise Logistical expertise Monitoring Needs assessment coordination Planning Training	Capabilities tend to focus on the ability of an organisation to learn and evolve, and on "the antecedent organisational and strategic routines by which leaders alter their resource base – acquire and shed resources, integrate them together, and recombine them – to generate value-creating strategies" (Eisenhardt and Martin, 2000, p.1107 in Kusumasari, Alam and Siddiqui, 2010)

Table A2 Classification on the concept of capability

<i>No.</i>	<i>Author</i>	<i>Disaster management phase</i>	<i>Concept of capability</i>
1	Peng (2018)	Mitigation	Resource acquisition capability Adaptive response capability
2	Hosseini et al. (2014)	Preparedness	Technical capability (e.g., knowledge on DRR) Physical capability (e.g., logistics) Financial capability (e.g., funds)
3	Calvin (2012)	Preparedness	Public policy effectiveness
4	Chern and Liu (2018)	Recovery	Efficiency Respect Innovation
5	To and Kato (2013)	Response	Command and control Operational information Cooperation and coordination
6	Al-Nammari and Alghazal (2015)	All phases	Administrative capacity: Structural capacity Process capacity Cultural/ normative capacity Institutional and organisational capacity Learning leadership and managerial capacity Strategic human resources capacity Financial resources capacity Cognitive capacity Technological capacity Developmental capacity Ethical and fairness capacity Financial management Organisational management
7	Kapucu (2008)	Preparedness	Adapt and expand capacity Communication systems restoration Flexible decision-making Innovation Coordination Trust

Table A2 Classification on the concept of capability (continued)

<i>No.</i>	<i>Author</i>	<i>Disaster management phase</i>	<i>Concept of capability</i>
8	Kusumasari et al. (2010)	Mitigation	Evaluating Monitoring Dissemination (of information)
		Preparedness	Planning (on-site and off-site) Exercise Training Logistics management expertise
		Response	Needs assessment coordination Information exchange Logistical expertise
		Recovery	Damage assessment Debris removal
9	Kusumasari and Alam (2011)	Mitigation	Focusing on people's needs Establishing particular institutions Sufficient budget
		Preparedness	Knowledge of potential risk Adequate early warning system and public disaster awareness Provision of disaster awareness programs in education institutions Regular disaster drills
		Response	Good hierarchical networking Sufficient budget
		Recovery	Good hierarchical networking Sufficient budget
10	Malalgoda et al. (2013)	All phases	Institutional and administrative framework
11	Ollerenshaw et al. (2016)	Preparedness	Knowledge on past disasters
		Response	Personnel knowledge and experience with natural disasters Interagency cooperation and communication
		Recovery	Establishing relief centres Road management Coordination of volunteers Community cooperation in recovery Government funding Interagency cooperation Recovery support events

Table A2 Classification on the concept of capability (continued)

<i>No.</i>	<i>Author</i>	<i>Disaster management phase</i>	<i>Concept of capability</i>
12	Prizzia (2005)	Preparedness	Inter-stakeholder cooperation (i.e., media) Advanced early-warning system Institutional based (i.e., FEMA) training for disaster response
13	Sinclair et al. (2012)	Response	Decision-making
14	Spahn et al. (2010)	Preparedness	Implementation: Division of labour (roles of stakeholders) Political leadership Cooperation Commitment of personnel Skilled personnel
		Response	Commitment Technological investment and development Enhanced human capacity Division of labour (roles of stakeholders)
		Response	Sufficient funding Capacity-building Instructive guidelines
15	Wang and Kuo (2014)	Response	Coordination Budget autonomy (e.g., sufficient funding) Personnel autonomy (e.g., human resources)
16	Yen et al. (2006)	Response	DRR technology R&D
17	Zhang et al. (2015)	All phases	Leadership Learn from international experiences
18	Kusumasari and Alam (2012)	Recovery	Flexibility Adaptiveness Creative leadership Mobilisation and organisation Coordination Capacity building for the community Long-term planning
19	Scott and Few (2016)	Preparedness	Ownership Engagement Flexibility Adaptability Design Sustainability

Table A2 Classification on the concept of capability (continued)

No.	Author	Disaster management phase	Concept of capability
20	Muhonda et al. (2014)	Preparedness	Dissemination of information Strong institutions
21	Pirie et al. (2004)	Preparedness	Vertical and horizontal linkages Adequate financial resources Adequate human resources Extensive monitoring network Institutional framework Knowledge on disaster
22	Liu et al. (2018)	Recovery	Availability of recovery resources Social disparities Decision-making Organisation capacity
23	Alcayna et al. (2016)	Preparedness	Hazards, vulnerability, and risk assessments Early warning systems and evacuations Risk transfer mechanisms Capacity building (activities) for disaster preparedness

Figure A1 The new elements of local government capability in disaster management (see online version for colours)

NEW ELEMENTS OF LOCAL GOVERNMENT CAPABILITY

