Disaster Policy Strengthening in Indonesia: Case of Batu City

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Abstracts: The article addresses the pioneer of policy transformation in emergency management system at sub national government of Indonesia by comparing two situation from previous starting condition and after the disaster flash flood. The Kota Batu Flash Flood in November 2021 helped to uncover problems with the Indonesia emergency management system. This study also analyses the importance of decentralized commitment and its relation of implementing cluster collaboration during emergency response. The paper also supported with a tool of geospatial aspect in disaster events of Indonesia to provide better understanding and trend of disaster, combined with the strength's empirical practice of Kota Batu will upscale the benchmark on the cluster based implementation of disaster emergency management for national level policy in Indonesia. Policy learning and administrative reforms, including changes in the local disaster response organizations and practices in the Kota Batu Flash flood were highlighted. Our findings pointed out that we can collaborate with multiple helix in cluster emergency management system by investing goodwill of enabling policy and community awareness, collaborative model of management in decentralized context, facilitating leadership, and Institutional design relates to procedures and inclusiveness. These findings highlight the importance of focusing efforts on addressing cluster collaboration in disaster emergency management both on 1. National scale disaster by activating post command of emergency disaster management and cluster coordination and 2. Province/Municipal disaster by activating post command assistance as platform cluster.

Keywords: Disaster Management, Collaboration, Multiple Helix

1. INTRODUCTION

Learning from emergency disaster management refers to the lessons learned by public organizations and policy makers. The changes made to public policies and practice in order to effectively cope with future disasters. Scholars of public administration have provided discussions on the factors that influence learning from crises and disasters, whereas other scholars of policy studies were more concerned with learning pre, during and the aftermath of disasters. Recently, several studies have focused on the effects of natural disasters on society, lives and livelihoods, and resources; however, fewer studies have focused on disaster policy and emergency management reforms rooted from local strong commitment perspective.

Emergency Disaster Management in Indonesia have dilemmatic challenge on how to enabling' other potential actors for participation. The Government Regulation on Head of National Disaster Management Agency/NDMA or BNPB number 03 year 2016 on Command Emergency System for Disaster Management prerequisites were hampered by the sub national Government incapability to determine proper action resulted from the rapid assessment. To add, another structure programs was developed from regular planning of each stages from disaster at national and sub national level have not been optimally synchronized and yet to make further deteriorate, in most cases was conducted by different changed personnel resulted from high turnover in decentralized local government. Thus, emergency disaster management have not been implemented in effective and efficient manner.

Considering the frequent of disaster climate related in the year of 2021, floods have been dominated with total of 854 occurrences during a monthly period of November 2021. Among severely high impacted by precipitation event was Kota Batu, located in Eastern part of Java in Indonesia (BNPB, 16 Oktober 2021). The impact of rain on the

upstream area of the Brantas River Basin has resulted in the destruction of natural dams which were unable to withstand the high water discharge from upstream which then caused 10 villages and sub-districts in the affected Batu city to be inundated by flash floods caused casualties, impact damage and loss. One of important aspect consideration for research analysis was the emergency disaster management. This was due to Local Government of Kota Batu implementation of emergency disaster management case's in elicit-unique way, involving multi-actors within the command emergency system of disaster management. In this research, the term multiple helix will be further used to represent different actors and stakeholders.

This study examined the following research questions: How did the sub national government have implemented emergency disaster management for flash Flood in Kota Batu? How did the collaboration between stakeholders during emergency disaster management in Kota Batu? What are the supporting and impeding factors encountered in collaboration between stakeholders in emergency disaster Management in Kota Batu?

In addition, using content geospatial analysis, this study evaluated the frequent trend of disaster, what is the most occurrence, casualties, economic losses, and spatial distribution data since 1980 with the focus of the latest 10 years disaster progress. Affirmative backstop in disaster management emergency is strongly needed in linear spatial supporting for the central government after the flash flood Kota Batu and its identified changes in the policies and practice. Using the transition from semi-cluster to cluster approach analysis, this study evaluated the collaboration among organizations and their influences on the network for a better understanding of the policy learning. In the following sections this article presents the literature related emergency management system at the central government level since post the year of 2008, introduces the contexts of the flash flood Kota Batu, describes the research methods used, finally discusses the findings and presents conclusions.

1.1. Recent Progress of Indonesia Emergency Management System

The Disaster Management model currently being adapted is the contract-expand model. This interpretation model has been developed since year 2014 (Maarif 2014), referring to Article 23 paragraph 1 of Government Regulation Number 21 of 2008 regarding Disaster Management in Indonesia that during the period of an emergency, the Government or regional government declares the status of a disaster emergency in accordance with the hierarchy level of disaster. While, the national level is declared by the President, the provincial level by the governor, and the district/city level by the regent/mayor. This consideration assumes that it will provide space for all integrated fields in all stages of disaster management (pre-disaster, emergency response and post-disaster) to be implemented in disaster-affected areas. The transition process towards contract expand from the disaster management cycle model emphasizes how each has to be seen as a continuous process, and not limited to one 'stage' in time. The efforts made by the government are to provide protection to the community from the effects of disasters and recovery from the effects of disasters.

1.1.1 The Absence of Cluster at Sub National in the Regulation and Practice

During emergency disaster management, there is a strong need of coordination and management that capable to respond, precise, effective, efficient, comprehension and accountable. These are all need to be coordinated in one command and clear arrangement that international community have deliberated in cluster model approach. Prior regulation, Indonesia as matter of fact have had developed for short 6 months span of cluster approach. The Decree of Head NDMA number 173 year 2014 regarding National Cluster of Disaster Management that apparently expired but regrettably moved away due to dynamic interpretation in other line ministries. In addition, The Post Command Emergency System Regulation Head of NDMA No. 3 of 2016 stipulated cluster only at national level. Thus, in practice there was a gap of unavailable cluster scheme at sub national level for successive years to date.

While, several line ministries and CSO, FBO, International community in humanitarian has relied on NDMA direction policies for activities and development have worked together respectively but unintegrated framework and practice.

1.1.2 Enabling Collaborative Governance for Multi-Stakeholder Participation in Emergency Disaster Management

The collaboration of multiple helix in Disaster Management involving The Government and participation of community such as private company, community affected disaster, civil society, academician, press, international community in disaster management was clearly defined in Chapter VII of Head of NDMA Number 4 year 2008 regarding the guideline on Development Disaster Management Plan.

Refer to global practice, clusters are responsible for strengthening system- preparedness and providing technical capacity to respond for humanitarian emergencies in their respective sectors. At the country level, clusters ensure that partner activities are coordinated and harmonized (IOM, 2012). In line with IOM, UNOCHA (2020) also revealed that clusters are able to promote common strategies and good practices related to sharing responsibilities, avoiding duplication, overcoming gaps and sharing information. They build national capacity to prepare for emergencies, and advocate for more effective and accountable humanitarian action.

Therefore, the cluster approach in disaster emergency management is very important to be studied and reformulated as a national formulation which is then translated into regional formulations. The problems of National and Regional Disaster Management which often occur out of harmonization should begin to be solved and the cluster model approach through multiple helix collaboration will become a solid force in dealing with disaster emergencies in Indonesia. Each stakeholder needs to 'properly' sit together in a forum with public agencies, NGOs, the private sector, and related agencies to strengthen consensus-oriented decision-making. This collective coordination process is called "collaborative governance", which was later popularized by Ansell & Gash (2008). Because it requires inter-agency collaboration (Bryson et al., 2006, Provan & Kenis, 2008), or also known as multiple helix collaboration which involves all disaster management stakeholders who proposed by Ortiz et al. (2016).

1.1.3 Facilitating Leadership and Decision Making

The key to success in disaster management is a story of influential leadership. Disaster management actors need to act as leaders. Leaders and managers contain two different meanings. A leader is able to overcome the dynamics in the field which are often not in accordance with normative regulations or legal products which can actually hinder disaster management which are required to always be fast, responsive and accommodative. A leader is more dynamic than manager usually fixated on existing rules, trapped in a static status quo.

From existing theories of leadership, there are two suggesting refinement model emerged from practical emergency management and disaster risk reduction stages as whole cycle, namely *vertizontal and sapalibatism*. In disaster management, it is necessary to develop a model of mentoring and commanding leadership simultaneously. Decisions are based on an agreement on deliberation and consensus as the essence of Vertizontal leadership (Maarif, 2011, 2012, 2013). Disaster problems often cannot be approached with general management and leadership principles. In this case, a transformative leader is needed as a bureaucrat with a volunteerism spirit. Leadership in the existing bureaucracy is often fixated on a formal format based on an organizational structure system that has a vertical hierarchy system. Due to decentralization in archipelagic Indonesia, local governments are in control for building disaster resilience. The provincial government is committed to allocating and mobilizing resources to districts/cities if needed, while central government functioned as a catalyst and reinforcement for local government. Thus, NDMA horizontally must coordinate with relevant ministries/agencies to allocate and mobilize

the required resources. It is important to underline that strengthening and assistance by the central government is not meant to create dependency or take over the role of local government, which will ultimately weaken local resilience.

The involvement of multi helix participation in disaster management is important, but also it required challenges and complexity, including in the provision of aid assistance. A lack of coordination may often prevent humanitarian assistance from reaching people in need during emergency response. For this reason, the *Sapalibatism* or "*Menyapa dan melibatkan*" is a humbling proactive approach and involvement participation leadership model was recognized, by giving roles to all stakeholders by not taking over their duties and functions. All disaster management actors are consulted or their needs are listened to and assisted, where the implementation of disaster management actively involves all actors (Maarif, 2011). Sapalibatism is the essence and manifestation of coordination to manage the interdependence of various activities implemented to achieve a goal.

2. MATERIALS AND METHODS

This study used Focused Group Discussion and separate In-depth interview in Kota Batu, Malang, East Java as an analytic technique to examine the structure, influence of actors, and collaboration in implemented emergency disaster management. These include performance of inter-organizational coordination, the optimization of emergency plan implementation, funding from local regional budget (included *belanja tidak terduga/BTT*), and private sector and community involvement were also subject for studies used analysis. The primary data combined with document policies, instrument regulation, and literature theories relevant with empirical scientific methods is very useful in exploring the organizational position and contributions to disaster response efforts, as well as the relationships of each actor in the network for the coordination of disaster response operations.

Taking into account that supporting the correlation from sub national government of Kota Batu emergency management to the recommending cluster based of disaster emergency management at national level, extended analysis were collated from secondary data of geospatial. Furthermore, the combination from initial primary data together with the result of geospatial are in order to explore the strengthening the relevance of emergency management system as disaster policy reform in Indonesia.

The natural disaster event databases used in this study are the Emergency Events Database (EM-DAT) and the Indonesian Disaster Information Data (DIBI) of period from 1980–2021 generated (Meilano et al 2021). Data taken from EM-DAT, data on natural disaster events in 1980–1999. While the data was taken from DIBI, data on natural disaster events in 2000–2001, the data was collected for the last 40 years (1980-2021), which aims to provide a comparison of losses due to earthquakes with other disasters that have occurred in Indonesia. The EM-DAT is administered by the Center for Research on the Epidemiology of Disasters (CRED) at the Université catholique de public health school, Louvain in Brussels, Belgium

3. ANALYSIS

An interactive model framework used in this section analysis content are based from Miles, Huberman, and Saldana (2014). Furthermore, in providing an appropriate systematic in analyzing the data obtained were categorize based functional theory management of Henri Fayol (1987) for the following:

3.1. Planning

In reviewing the effectiveness in emergency management, the sub national regulation was studied. It reflected the organizational structure of disaster emergency management, the Decree of the Mayor of City Batu Number:

188.45/342/Kep/422.012/2021 regarding the Establishment of Implementing Team for the Disaster Management Command System Flash Floods in the District of Bumiaji.

We observed from FGD and Interview, in relation from fig.1. that "The application of the cluster concept to the flood disaster in Batu City has been used in a creative different way from Post Command Regulation No. 3 of 2016 which is still in the configuration of section operation by institution. But when the City of Batu planning's, the internal consensus agreed to establish 3 section and 6 clusters. The most important to note since the beginning is the joint commitment. In this case, the process of awareness built has been clearly mapped out that implementing this cluster was a joint commitment because with a shared commitment involved in this cluster can collaborate in synergy. A cluster is a grouping according to each sector coordinator so that it is easier to organize.
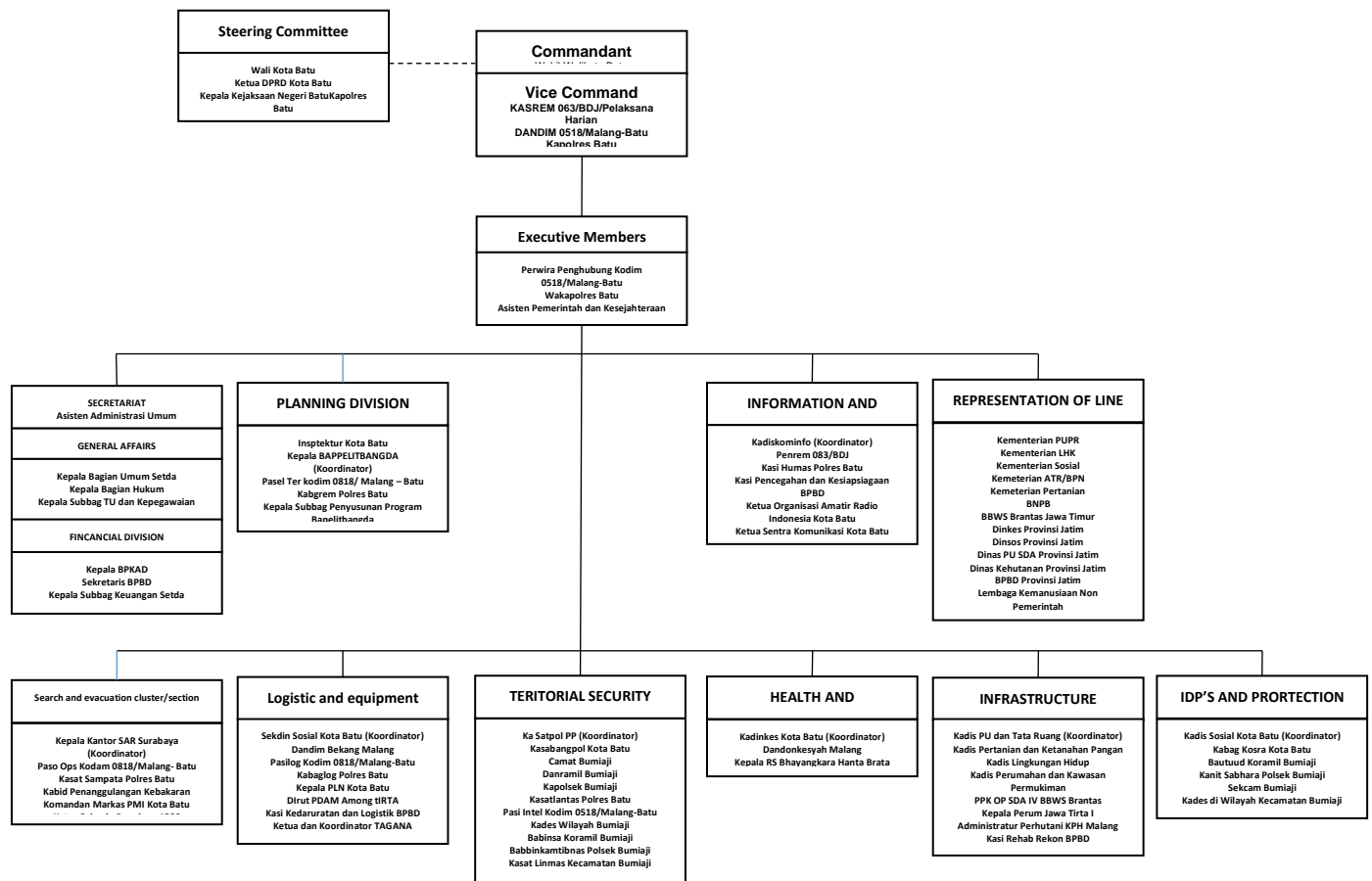

Figure. 1. Structure Team for the Post Command Emergency Disaster Management System Flash Floods Kota Batu, East Java

3.2. Organizing

In between, before, and by the latest 14 days after disaster occurrence, the Head of City Batu declared the regional state of emergency status and immediately set up the post command emergency. At similar pace the rapid

303

team assessment conducted, recommend and preparing the operation emergency (ops) plan. From the flow steps of activities, the intersection between structure and ops plan was interesting because of the first time activation of transitional cluster or semi cluster and coordinate within internal organization and external parties in sub national government as seen in fig. 1.

We also perceived that the relationship of organizing between related institutions such as the Armed Force, Police, NDMA support, sub national NDM, *Babinsa* (Territorial Army supervisor at village scale), *Babinsakamtibmas* (Territorial Police), community leaders and the community is very harmonious and respectful of each role and function based on ops plan. Similar support such as Pentahelix, from academician, mass media and other agencies in the government and the regions. Apart from that, grouping based on cluster per cluster is very clear as a supporting structure, in the health cluster there is the Health sector, and the Mitigation Cluster there is Basarnas or search and rescue sector a) cluster for evacuation, b) cluster for search (missing persons or Victims). There is also mix of perception resulted from interview that *in* Batu City's case has their own characteristic. But according to the rules, they don't fully understand or comply with the procedure. For example, in implementation sector of operation, this does not reflected as cooperation. Nevertheless, they honored the commitment. Apart from that, discrepancy of status echelon rank between Head of local NDM is lower (echelon 3 level), is the challenge in coordinating with the Sector above within sub national organization. Nonetheless, the solution for involving echelon 2 to become a cluster coordinator was profound in the field."

3.3. From Commanding to Coordination

In inter-organizational coordination and their networks, public organizations can take advantage of broader sets of resources and increase their capacities by partnering with other organizations. Another important aspects of emergency management is inter-organizational coordination among different organizations for notably relation between disaster preparedness and emergency response. Inter-organizational coordination helps optimize resource utilization and knowledge sharing in emergency management.

The experience of local resilience Kota Batu's event demonstrated that leadership, flexible and collaborative relationships among the different units of government and nonprofit organizations could increase the effectiveness of disaster response efforts. A cluster approach and mulitple helix management was revitalized to emergency management in Indonesia relatively recently. The joint commitment agreements also to strengthen regional disaster response coordination mechanisms and served to overcome the resource and capacity gaps of local governments. NGOs and the private sector began to emerge as an increasingly important force in the supply of equipment and the provision of services. For instance, the utilization of local state budget itself (APBD/BTT) by the coordinating infrastructure for repairing, Public Works and Housing is due to the use of heavy equipment so, available resources of the ranks of the Armed Forces, the National Police who use heavy equipment coordinate those with Public Works and Housing. Meanwhile, the private sector such as Association of Indonesian Hotels and Restaurants (PHRI) was encouraged to participate in emergency relief, which was incorporated into local emergency plans-public kitchen and reflected in the long-term disaster prevention program such as in Bali's practices.

3.4. Controlling and Local Resilience Shifted Model

Fayol's management perspective addresses the structures, natures, and meanings of the collaboration between actors. In public administration and policy, typically refer to multi-organizational arrangements for solving complex problems that cannot be easily achieved, or even achieved at all.
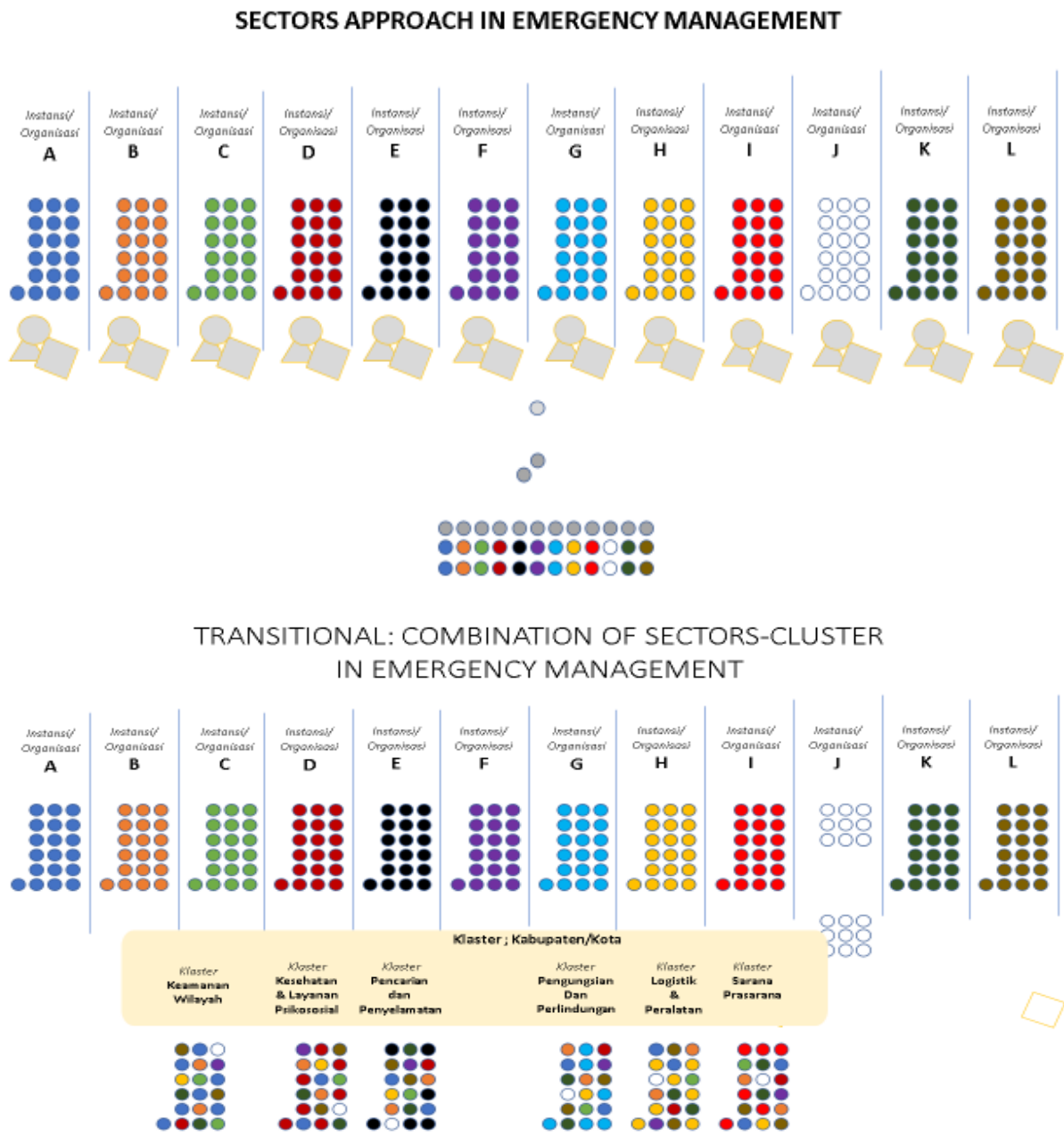
SECTORS APPROACH IN EMERGENCY MANAGEMENT

TRANSITIONAL: COMBINATION OF SECTORS-CLUSTER IN EMERGENCY MANAGEMENT

Figure 2. Shift Model from Sectoral to combination of Sectoral-Cluster Emergency Disaster Management in Kota Batu

In practice, capable resource mobilization was surfacing by the performance skills based cluster collaboration. It is hoped that these clusters will not merely occurred during an emergency, but established in pre-disaster so before an emergency or disaster occurs they can prepare by doing exercises with the cluster concept and already know each other as cluster members. NDMA's task is to increase or standardize that capacity by means of certification,

so everyone in the cluster has the same understanding that certified, exchange knowledge and information of one another so when they are grouped they understand what their duties.

4. RESULT

4.1. The Sub National Government Implementation on Emergency Disaster Management for Flash Flood in City of Batu

During the implementation of the emergency management, we review that the local regulation on organizational structure for cluster has undergone 3 times of gradual improvement changes, from the beginning of the incident on November 4 2021, then revised on November 21 2021, and recently in 4 November 4th, 2022 for preparedness emergency management for potential hydrometeorological threats in the year 2023. The changes scheme reflected commitment, inclusiveness and leadership from the City Mayor of Batu, local NDM and ranks officials regarding inter-organizational and networking, resource utilization and knowledge are key to effective implementation based cluster. The historical bonding of community from neighboring municipal/regent such as municipal Malang, and City of Malang or Greater Malang or the Malang metropolitan area (was once part of Malang Regency), and northern neighbor Municipal Pasuruan that sent mobilization are also important. However, with stretched policy mentioned, we found limit or further review needed to address and ensure minimizing gaps in transparency and accountability aspect.

Extending from previous analysis' section, we would like to highlight the recent adopted local regulation Nomor 1.88.45/350/KEP/422.012/2022 or the third changes of structure to be compared with Post Command Emergency System Regulation No. 3 of 2016 especially with the focus at the sub national level's findings: 1. The structure are equally similar, with the only major drawback of cluster non-existence at Sub National in post command PDB. 2. Efficiency and data networking in Centre for Data and Control Operation (Pusdalops). The decree was developed during the pre-disaster phase in 2022 which is an advanced mechanism because champion actors have been documented and awereness of their members. 3. Innovative and Brave in Policy Gap. Eventhough there is nonexistence regulation at national and provincial level, the essence of cluster collaboration involving multiple helix have been pioneerly workable. 4. The numbers of cluster are based on local needs that based disaster risk reduction approach. Previous and followed by new scheme contained with 4 sections and 6 cluster and succedingly by 8 cluster in 2022 with accommodating additional of economics and early recovery cluster.

We finally move on to all evidence proxies for sub national government composition that **"the system of cluster can be established by combining the the contract expand model with collaboration theory and current regulation Head of NDMA No. 3 of 2016 on Post Command Emergency System".**

4.2. Collaboration between Stakeholders during Emergency Disaster Management

In terms of several aspects that need to be compared between before and after condition of the disaster with several paramaters: 1. Starting condition, 2. Institutional design, 3. Aspects of Leadership or Leadership. First, the history of the beginning of the "bare Clusterness" was started by a joint commitment from the 2014 experience in the eruption of Mount Kelud. Simulation prepared for the community related in the Greater Malang area which was then due to the changing wind direction. Since the past, the division of roles and responsibilities referred per "sector" has been implemented in the experience of emergency response in several areas such as the Berantas River, Dusun Brawi which were affected by landslides.

Second, City Mayor Batu's commitment was a strategic momentum for the development of direction from the sector, the division towards the cluster which includes the functions of coordinators and members who involve cross

public services sector, armed force, police as stated in the Regional Decree. The challenge that emerged was related to the pragmatic context of transitional bureaucratic culture, for example when determining the coordinator where Armed Forces argued the search and rescue to become coordinator.

Third, based on the analysis, it can be assumed that understanding on regulation Head of NDMA number 3 of 2016 on Post Command Emergency system and UN Clusters in the flash flood disaster of Batu city is partially limited, yet affirmative spirit toward goals oriented to minimize vulnerability and coping mechanism of community and economic losses. The cluster referred is all stakeholders or sub national government Kota Batu capable in forming a group in which parties from various multiple helix unite to help each other during emergency disaster management. Nevertheless, the third structure showed consistency of City Batu in adopting the the cluster based. Based on interviews and FGDs, community leaders, PHRI (Indonesian Hotel and Restaurant Association), members of the media, universities, NGOs and CSOs play a very active role and comfortable with the structure in emergency management. Challenges for logistics and equipment based on ICT or Technology, Information/ICT and Communication can be optimized and integrated in the future. So that it can optimize the mobilization of resources and networking coverage both at the city level, cross-regional districts, and at a broader level at the provincial and national levels

4.3. Supporting and Impeding Factors Encountered In Collaboration between Stakeholders in Emergency Disaster Management

Besides supporting factors mentioned above, there are several obstacle factors during the implementation. One of the impeding factors for the implementation of collaborative governance is regulation that has not been optimized and lack of awareness within few communities on environment- economical utilization have had a serious anthropogenic impact. According to interviews with key informants, the awareness of various parties to conduct training in the pre-disaster disaster was also a key since it has not yet been designed when a flood disaster occurs the system does not work properly and communication between stakeholders and related parties was unease of mechanism at first which was another problem. In addition, at practical field, obstacles also arise from evacuation posts that lack of clean water sanitation provision during the grace period of 7 days which is very much needed for people affected by the flash floods.

4.4. Robustness Model

Disaster are localized and often times with the local context and local needs. In relation, we explored the configuration of cluster and structured gap from hierrachichal support of the national and provincial perspective.

Based on findings in the field, there is one additional priority cluster which is disaster-affected communities to be included. There is strong debate whether to include the emergency management cluster or not because of redundancy with the role of NDM as already mandated. While two other clusters that are flexible according to the local needs: In total of 4 additional cluster to be considered, namely 1. the Disaster Affected Community Cluster, 2. Emergency Management cluster, 3. Upcoming Hazard cluster, 4. Public Communications cluster, 5. Security Management cluster. From previous 8 cluster become 12 cluster depending on the need and agreed consensus. While, international community suggested 11 cluster to coordinate (UN Cluster 1997).

To operationalize the clusters, it is necessary to activate the cluster and organizational structure at the National Scale Disaster as well as at the Province/District level for Cluster Operationalization that still refer to regulation Head of NDMA No. 3 of 2016 on Post Command Emergency System: 1. At the national level disaster, NDMA activates the post command post emergency disaster management (*Posko PDB)* and coordinates the National

cluster. 2. in provincial/district/city level disasters, NDMA activates the national post assistance (*pos pendamping*) as a cluster platform. Therefore, adjustment for the structure of post command.
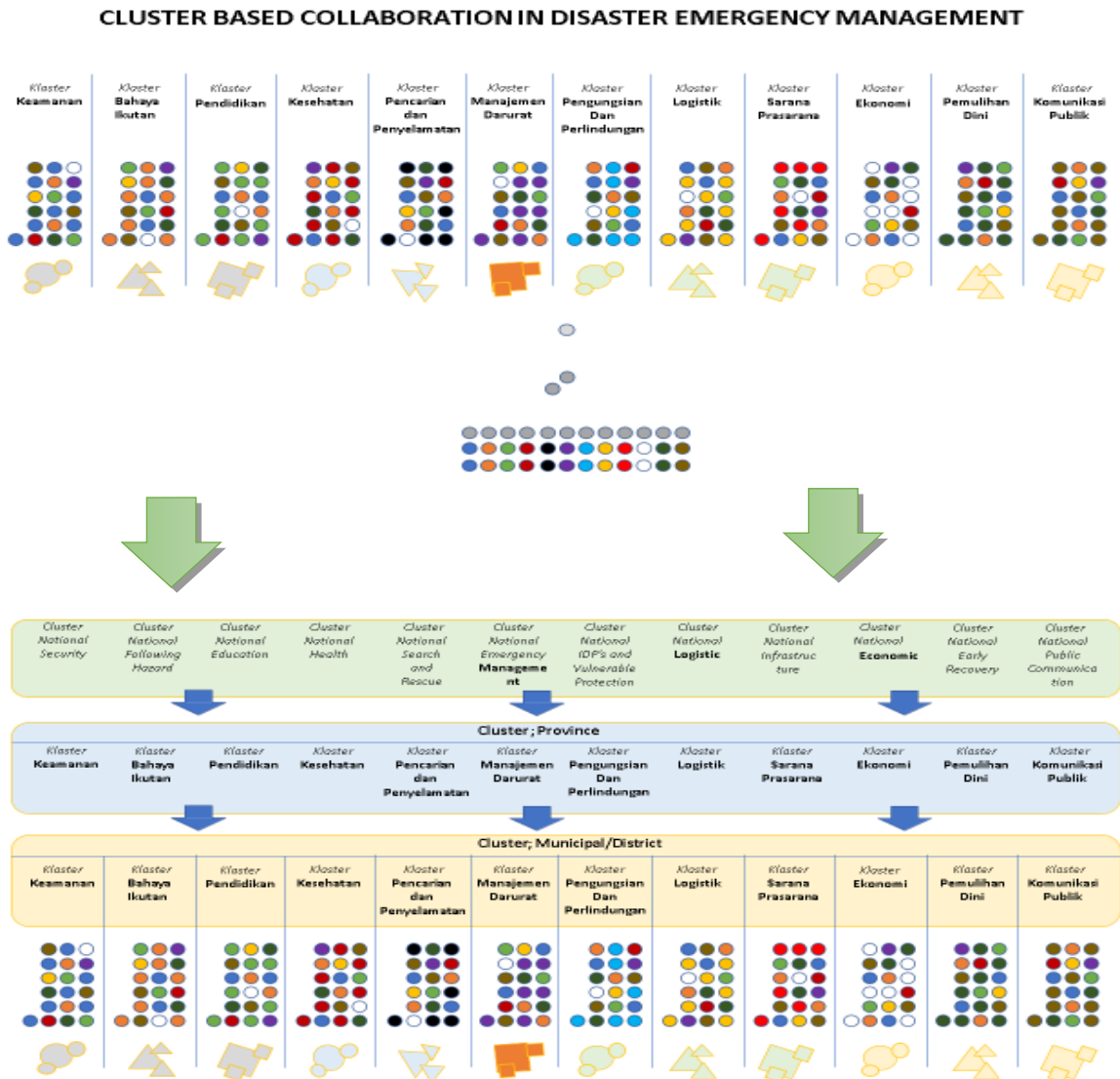

Figure 3. Recomended Model for Cluster Collaboration in "Implementation of Disaster Emergency Management" for National Policy

4.5. Spatial Aspect of Disaster Events in Indonesia

Surprisingly, human have propensity of short memory. Slowly after the disaster people tend to forget it. This section will highlight the trends of disaster events as extention tool to backstop and strengthen cluster collaboration in disaster emergency management in order to minimize vulnerability and economic losses for national policy. Since disaster is everybody's business, we would like to know what kind disasters occured most frequently or result in casualties? Economic losses, and their spatial distribution. In disaster history, the disaster event may provide documentation regarding disaster events that might be repeated in the same place, with regardless different amount

of loss, intensity, frequency, and different distribution rate. Thus, we gathered data information to categorize the statistics based percentage disaster events in 40 years, per decade, and yearly.
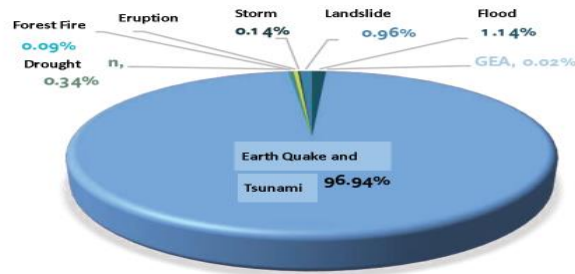

Figure 4. Statistics of Fatalities due to natural disasters in 40 years

Indonesia is ranked in the top two overall global in absolute death rates from disasters in 20 last year, with a total of 41.6 deaths per million population (278 events) (Centre for Research on the Epidemiology of Disasters—CRED, 2021). The total of death toll from disasters in Indonesia for the last four decades, namely as many as 367,840 inhabitants, in total disaster victims per year as many as 8,758 people. The most fatalities (> 300,000 people) actually happened during the earthquake and tsunamis. Hurricane storm disaster with the most number of recorded events, resulting in 510 fatalities (0.14%). Incident floods, karhutla, drought, and landslides have an average 1 fatality per incident. While the average victim 9 people died as a result of the volcanic eruption per incident.
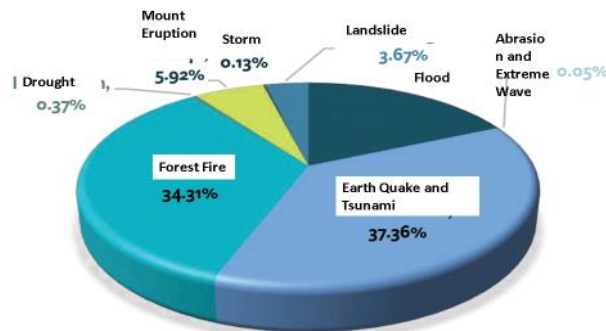

Figure 5. Statistics of Economic Losses due to natural disasters in 40 years

Monetarily in absolute terms, in the last 40 years, 22,441 disaster events have been recorded of natural disasters in Indonesia or an average of 560 disasters in one year. The total amount of economic losses amounted to 44 billion USD (660 trillion rupiah), or an average of 15.72 trillion rupiah per year. This condition reflects the high value of the asset as well as the events that occured frequently (Fig. 5.). These losses are only partial of the possible total loss, as most reports disaster events in EM-DAT and DIBI do not contain data of economy loss (70.84%), especially in the early years of data collection. Earthquake and tsunami disasters with the most victims

also give the impact of economic losses the highest > 16.5 billion USD (237 trillion rupiah) in last 40 years. Apart from earthquakes and tsunamis, floods and fires forest/land also causes high economic losses.
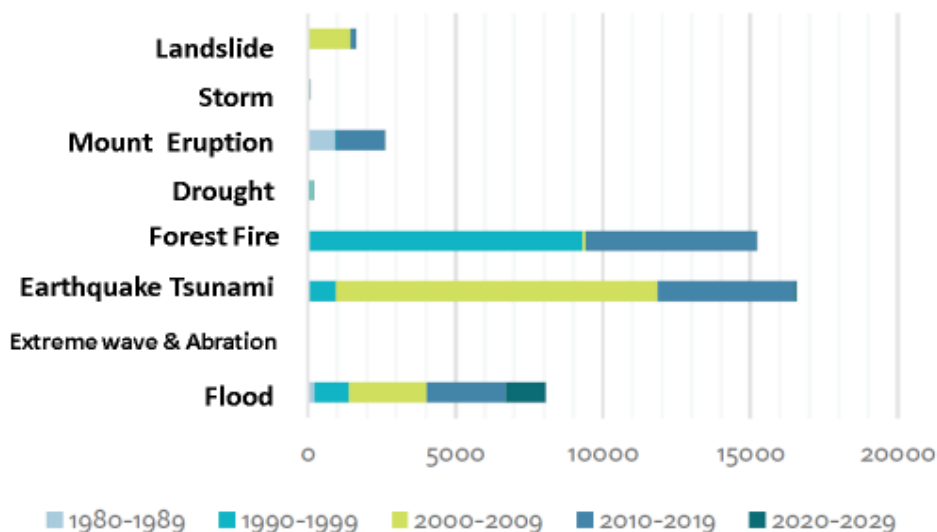

Figure 6. Statistics of Economic Loss (million USD) of every type of natural disaster per decade

Disaster occurrences began to increase since 2000 onwards. Based on classification of disaster events per decade, the catastrophic events documented the number of victims resulting from the natural disaster per decade. Natural disasters captured period in 2000-2009 caused the most deaths in history disasters for the last four decades. As for the casualties in that decade reached 345,124 deatth toll, in particular earthquake and tsunami in 2004.

It is very interesting to denote economic loss (millions of USD) due to natural disasters per decade. Earthquake and tsunami too is the most detrimental type of disaster economically, with reported losses of USD 16.57 billion (237 trillion rupiah) during the last 40 years. The loss is two times compared the losses reported as a result of the flood disaster. Losses due to karhutla almost close to losses due to the earthquake earth and tsunami, which is 15 billion USD (215 trillion rupiah) contributed the most due to karhutla events in the range 1990-1999. Temporary extreme waves and abrasions (GEA) 0.05% and hurricane events, 0.13% of the total economic loss. This pattern shows that the number of events is not proportional directly with the resulting economic losses.

It can be seen in Fig 7. that the economic loss per year continues to experience increase every decade. Especially in the last decade it has just been recorded disaster events over 2.5 years (2020–2022). 1st decade has the lowest average annual economic loss with 68 natural disaster events.
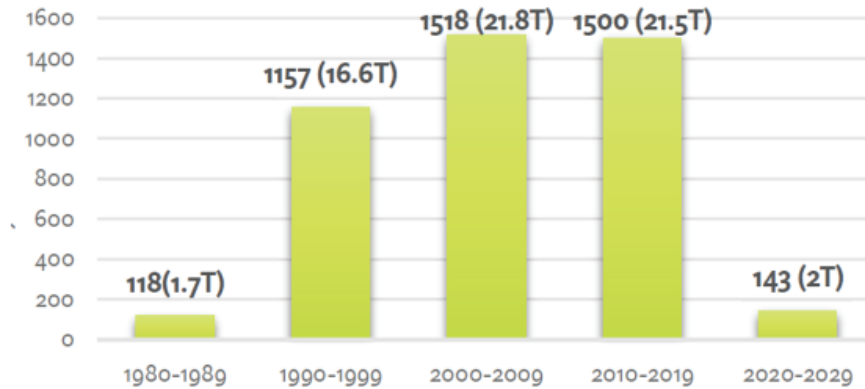
Figure 7. The average economic losses per year on all types of disasters for each decade

Furthermore, in the 2nd decade almost 10 times increase from the previous decade, especially as a result of the karhutla disaster in 1997, the island flood Tidung in 1996, and the Central Halmahera earthquake in 1998. The highest economic Losses per year occurs in the 3rd decade, especially as a result of several major earthquakes and tsunamis in in 2004, 2006, 2009 and 2010. In the 2010–2019 period range, there was a decrease in the average annual economic loss, however were insignificant, mainly affected by earthquakes and the tsunami that occurred in 2018 and karhutla in 2014.

In the period 1980-2020, the number of disasters occurred on an annual basis have propensity to rise, the highest was occurred in the year 2010 with 1,927 incidents. Disaster that struck Indonesia are generally caused by hydrometeorology. Storms, floods, landslides and droughts dominated the natural disasters that occurred for the last decade.
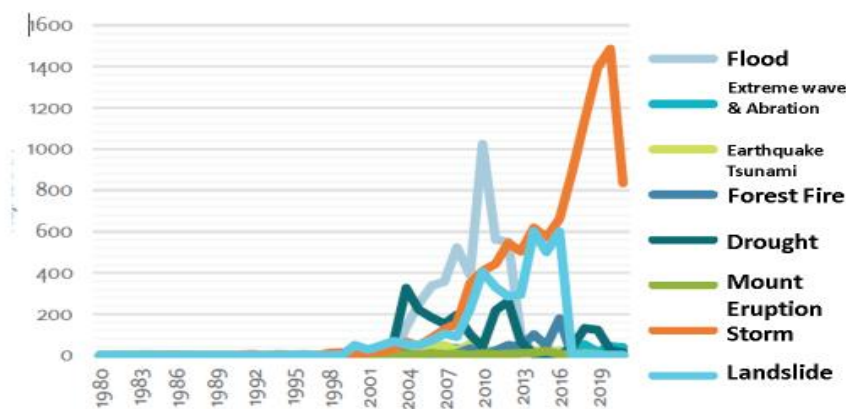

Figure 8. Statistics on each type of natural disaster per year

311

We notice that the flood disaster, the landslides, and storms have an increasing trend of occurrence per year. While volcanic eruptions, forest fire karhutla, and earthquakes and the tsunami shows a relative stable trend in the number of events per year below 200 events. The Figure 8. also shows that Hurricane disasters have the highest intensity of events per year especially in 2020 which reached 1,486 incidents.

Number of fatalities due to disasters each year shows a stable trend. In 2004, there was an extreme increase in the death toll from disasters earthquake with a magnitude of 9.1 followed by a tsunami in the Indian Ocean. Another disaster that has an average death toll is quite high, ie floods and landslides (> 84 people). The flood disaster claimed the most fatalities (500 people) occurred in 1981 on the slopes of Mount Semeru. Meanwhile, landslides with the most fatalities (225 people) in South Sumatra. Hurricane disasters have an average death toll of 12 people per year. This disaster also needs special attention, because the intensity of events and the number of fatalities continues increase. Extreme wave disasters and abrasion have an average casualty at least (2 people), but not reduce the need for attention, especially related to mitigation systems.
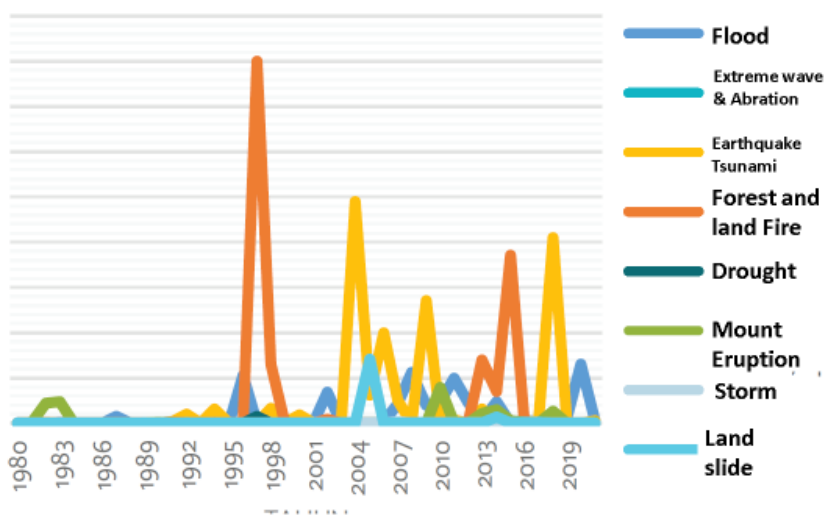

Figure 9. Statistics on Economic Loss (millions USD) of each type of natural disaster per year

From Fig.9, we can observe that economic losses in yearly statistic do not have a specific pattern. Economic losses depend on the intensity of the incident and affected area. The highest economic losses occurred in during the forest and land fires (karhutla) in 1997 in Sumatra (Riau) and Kalimantan with economic losses reaching 8 billion USD. Another disaster with the highest losses, was earthquake and Indian Ocean tsunami of 2004 (4.9 billion USD). Flood disasters also cause losses by a large economy with an average annual economic loss 192 million USD. The highest economic losses due to floods reached 1.2 billion USD which occurred in 2020, in Sumatra North (Labuhan Batu), Bengkulu, and DKI Jakarta which resulted continuous high rainfall.

We have measured the disaster statistics since Indonesia has a high risk of disasters and it may occur to happen any time. For the past 10 years, the Government of Indonesia has allocated Disaster Reserve Fund of IDR 5–10 trillion. This allocation consisting of On Call Funding (DSP) and Grants for rehabilitation and reconstruction for local government affected disaster (RR grants). This allocation too can be used in the emergency response period, such as during the process search and evacuation of victims, as well as managing evacuation.

CONCLUSION

For the first time, we have identified the implementation cluster collaboration in emergency management practice from the initiative of sub national government since the enactment of the Law no. 24 year 2007 on Disaster Management in Indonesia. The bottom up approach from City of Batu came up with awareness and understanding, commitment and operational implementation that despite lack of regulation and mechanism support. Our objective was to explore the relationship on how did the sub national government implemented the Emergency Disaster Management for Flash Flood in City of Batu? In conjuction, this preposition arguement lead to another answering question, Can this model become a benchmark for national policy on cluster collaboration in emergency management?

To the essence, we need to answer the very fundamental question: Why is Cluster Collaboration in Emergency management are so important?

1. To make emergency management more effective and focused;

2. To accommodate and provide the roles and responsibility of multi-stakeholders, because there are many actors wanted to participate during disaster emergency;

3. It requires an accommodative policy, so that it becomes a legal framework regulation for ministries/agencies and organization for budgeting;

4. To facilitate the arrangement of both the On-Call funding (DSP) and the Joint Disaster Management Fund [Perpres 75/2021]. The Joint Fund is a complement to the Disaster Management Fund. In order for the Joint Fund to be immediately operational, the Ministry of Finance and NDMA will complete the necessary regulations;

5. To implement the coordination function of NDMA as mandated by the Law no. 24 year 2007.

Our focus on cluster collaboration in emergency disaster management is driven by the unique self-reliance and resilience of City Batu's practice, all of which articulate the need to improve strengthened enabling policies, cluster collaborative structure in decentralized aspect, facilitating leadership, preparation and capacity building cluster group in pre-disaster.

Our research looks at the empirical evidence of the effectiveness of these sub-national policy objectives, primariy and secondary data support. Consequently, our findings have implications for basis recommendation for national policy. Our findings offer new insights into how system of cluster collaboration can be developed by merging contract expand model with collaboration theory and current regulation Head of NDMA No. 3 of 2016 on Post Command Emergency System to be conducted by sub-national government. By comparing starting condition on before and after disaster, we are able to identify trends that have previously been shadowed by national and sub national hesitance to focus led by government, but not solely accommodating government sectors institution but multiple helix integration in forms of cluster.

This paper also supported by the spatial aspect of disaster event based on percentage of natural disaster events, statistic per decade and annual related economic losses. In addition, to combine the City's batu case with consideration disaster statistics for the past 10 years and medium to high risk areas in Indonesia for strengthening national policy on disaster emergency and disaster risk reduction as useful insight for the central government point of view.

The indicators of success according to Andy Fefta Wijaya in the New Public Management/NPM that the collaboration process is to provide space for the participation of the parties; transparent and accountable and effective. From our analysis, the researcher tries to enabling environment by improving existing model to suggest the regulation on "Implementation of Disaster Emergency Management" "as was inspired by local resilience of City of Batu. We stipulate the terminology "cluster" already under the coordination and command system from national perspective. Then in this study, researchers updated the recommendation model by adding our key findings suggestions:

1.   Strengthened Regulations at the level of Presidential Regulations (Perpres) which can encourage and harmonize roles and responsibilities at the National Level for Ministries/Institutions and elements of the multiple helix. Furthermore, the Perpres is translated into a more operational Head of NDMA Regulation. In order the implementation of Disaster Emergency Management can be referred to the disaster risk reduction plan (PRB), which will "integrated in regional planning and budgeting system (RPJMD). The proposed construction is meant to be an integral part of the regular development plan, so it is integrated into the Middle Plan Development document from the national, provincial, regional to village levels.

2.   Propose a Presidential Regulation to accommodate developments in the current situation and conditions, it is necessary to update regulations, including the addition of clusters, in accordance with the duties and functions of each Ministry/Institution/Organization.

3.   The role of the central government in responding during a disaster emergency, the Central Government role is supports emergency management in district/city regional governments, where the Regional Government is the main party in charge. During a disaster emergency, the Central Government supports emergency management at district/city regional governments, where the Regional Government is the main responsibility.

4.   Cluster system Principles in disaster emergency management:

a. Integrated. Implemented & integrated in the disaster emergency management command system (SKPDB)

b. Scope of work. At the national level, regions can adjust to the emergency management command system (SKPDB) in their respective regions

c. Clusters are tailored to the local need. Cluster activation is adjusted to the needs in the field

d. Pentahelix engagement. Involving all relevant stakeholders, including business institutions, academia, media, community, and adjusting to needs in the field.

5.   In the operationalization of clusters, it is necessary to have a Cluster Activation Flow and Organizational Structure at the National Scale Disaster as well as at the Province/District level for Cluster Operationalization

a. At the national level disaster: NDMA activates the PDB command post and coordinates the National Class

b. In provincial/district/city level disasters: NDMA activates the national post assistance as a cluster platform

314

6. Establishment of Clusters in the Pre-Disaster Stage

Cluster development is designed to be prepared during the pre-disaster period in the Non-Structural Mitigation section so that each cluster and existing resources in the area can be inventoried and facilitate coordination by getting to know each other. This is considering the availability and limitations of resources and the type of expertise that can cross regional and regional administrations. In turn, when an emergency occurs, the implementation and coordination both internally and between clusters can be implemented effectively.

7. Integrated Big Data Expertise classification in Clusters.

In relation connection with point a, efforts to inventory the availability and needs of clusters from multi helix must be documented so that the map of resources and equipment is integrated at the local NDM Pusdalops at the Regency, Provincial and NDMA levels. So that gaps or deficiencies can be anticipated and minimized.

8. The next update is in the Collaborative Governance Model for Disaster Emergency Management in the Perspective of Multiple Helix Collaboration adding a cluster component for Disaster Affected Communities or Internal Displaced Person's IDP's at the disaster-affected area level so that community representatives can be involved and have a role in disaster risk reduction-based management and recovery.

Currently, the Government of Indonesia has enacted Presidential Decree Number 75 of 2021 on Joint Funds for Disaster, as the legal umbrella for the establishment of Pooling Disaster Fund. Pooling Fund Disaster relief (PFB) is a source of response funding disaster in Disaster Risk Financing and Insurance (DFRI) to complement the state budget (APBN) which aims to obtain a effective scheme and efficient financing. Government has allocating 3 trillion or the equivalent of 200 million USD from the state budget for PFB which will be managed by the Public Service Agency *(Badan Layanan Umum/BLU)*. This PFB allocation value is the basis for a comparative analysis with economic losses in the history of disasters in Indonesia from 1980 – 2021 from spatial disaster event.

Overall, this paper has shed light on cluster collaboration in emergency disaster management/ex post policy that could reduce the vulnerabiity of disaster affected people and further economic losses and on what governance arrangements are most appropriate for developing and delivering these policies. We asked, can we implement cluster collaboration in emergency disaster management? Our findings and recommendation suggest that yes we can, but to do this there needs to be committed to stregnthrning disaster policy and increasing investment to delivering both the SDGs and the Sendai priorities, Indonesia DM Plan (RPB) integarated in Mid-term Development Plan (RPJMN), notably mainstreaming disaster risk reduction with focus on disaster preparedness and emergency disaster management in economic growth (infrastructure, communication and technology) and education, as well as requiring all disaster possibility and risk to be considered in spatial planning, and improved resilience building.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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