Promote collaborative governance? Review of disaster risk reduction strategy in Jakarta

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Abstract. Increasing climate change problems affect disaster risks that will be fundamental threats to sustainable development. Climate change has driven global warming results in repeated severe flooding across Greater Jakarta and its surrounding cities. Central, provincial, and local government regulations reflect the public sectors’ effort in disaster risk reduction. This study aims to analyze the current disaster risk reduction strategies and investigate the collaborative perspective on floods that affected the local government. This research utilizes a post-positivism approach and collects data through in-depth interviews, online media content analysis, and literature studies. The study found that the central and local governments have policies that are in place to reduce the risk of floods. The government already implemented structural and nonstructural disaster risk reduction. The result implies that various government levels already establish policies to increase collaborative perspectives among government institutions. However, it is essential to create an integrated framework to facilitate a more collaborative process in managing floods in Jakarta.

1. Introduction
As climate change rapidly increases, there are significant impacts on the occurrence of disasters in various parts of the world, including Indonesia. Climate change is a global phenomenon that causes an increase in global temperatures, rising sea levels, and extreme changes in climate and weather. This phenomenon is 95 percent caused by human activities since the mid-20th century and continues to grow at an alarming rate [1]. As a result of climate change, a variety of disasters have become a routine. These disasters include floods, landslides, forest fires, drought, and a reduction in the supply of clean water. Over the last two decades (2000-2019), BNPB has recorded a total of 41.148 natural disasters in Indonesia [2]. The number of incidents shows a fluctuating number every year, with an increasing tendency. The natural disasters over the past 20 years have caused a total of 189.493 death and 373.700 injured. During 2015-2018, the disasters caused greater effects each year and the number of people affected and evacuated keeps increasing every year. There was an upsurge of number in 2018, where approximately 10.239.533 people were affected by natural disasters and needed to be evacuated.

The data from the National Agency for Disaster Management (BNPB) showed that from 2011 to 2020, the most common natural disasters are floods, landslides, and cyclones, which are prominent each year. In 2019, floods occurred 385 times, landslides 355 times, cyclones 568 times, droughts 33 times, and wildfires 55 times. As of February 2020, 7 cyclones, 5 floods, and 1 landslide occurred [2]. One of the natural disasters concerning Indonesia is the occurrence of floods in the capital city. As the capital
city of Indonesia, DKI Jakarta is the center of government and also the center of the economy. The phenomenon of flooding has been a recent challenge for DKI Jakarta since the impact of the flood on the community and government increased. The impact of flood indicates that the occurrence of flood creates significant impacts to the people [2]. Not only coercing people to move from their homes during a flood, but also making them lose their homes due to severe flooding that washed away people’s homes.

Table 1. Disaster in Indonesia.

| Year | Number of incidents | Death | Injury | Affected displaced |
|------|---------------------|-------|--------|--------------------|
| 2000 | 63                  | 302   | 127    | 0                  |
| 2001 | 75                  | 118   | 33     | 3,038              |
| 2002 | 130                 | 430   | 81,823 | 1,019,297          |
| 2003 | 401                 | 963   | 17,818 | 727,507            |
| 2004 | 767                 | 166,388 | 6,973  | 1,897,710          |
| 2005 | 594                 | 1,278 | 6,715  | 368,827            |
| 2006 | 721                 | 7,396 | 86,049 | 3,281,112          |
| 2007 | 790                 | 730   | 28,688 | 1,965,578          |
| 2008 | 904                 | 304   | 70,606 | 5,254,147          |
| 2009 | 1,236               | 1,767 | 5,160  | 5,533,241          |
| 2010 | 1,912               | 1,907 | 35,730 | 1,663,103          |
| 2011 | 1,612               | 428   | 692    | 475,529            |
| 2012 | 1,774               | 320   | 1,198  | 954,241            |
| 2013 | 1,644               | 512   | 3,410  | 3,892,986          |
| 2014 | 1,951               | 604   | 2,104  | 2,814,265          |
| 2015 | 1,691               | 276   | 370    | 1,227,929          |
| 2016 | 2,302               | 578   | 2,675  | 3,162,491          |
| 2017 | 2,853               | 378   | 1,042  | 3,674,369          |
| 2018 | 2,572               | 4,814 | 21,083 | 10,239,533         |
| 2019 | 1,426               | 0     | 1,402  | 0                  |

Source: BNBP [2], data downloaded from DIBI Database on July 30, 2020.

The flood disaster which occurred in Jakarta and its surrounding areas is a problem that has a long history [3]. At the time of the Dutch colonial government, various efforts were made to control flooding, such as building canals, constructing water gates at the downstream side of the river, dredging mud, and improving water systems. However, these various countermeasures have not automatically been able to cope with flooding in Jakarta. The problem of flooding continued after Indonesia’s independence. In early 1979, there was a flood which was known as one of the floods with the biggest impact. The number of refugees was estimated to reach 714,861 people and claimed 20 lives [4]. In 1996, the drainage system, which was unable to accommodate water sent from the upstream area, caused several regions in Jakarta to be submerged [5]. The flood height at that time reached seven meters in some areas. The intensity of the greater floods occurred in 2002 and 2007, known as the most severe floods after the independence era. The 2007 floods paralyzed Jakarta because 70 percent of its area was deluged. At the beginning of 2020, massive floods hit Jakarta and its surrounding areas and the flood-affecting areas covered all the municipalities of DKI Jakarta, Depok City, Bogor City, Bogor Regency, Bekasi City, Bekasi Regency, and Banten.

The paradigm shift from a centralized government to a decentralized government gave a more autonomous authority to local government. The Government began to decentralize authority to regional governments, except for absolute authority. The Regional Government Law in Indonesia has further strengthened regional autonomy to regulate and manage its affairs. The Regional Government Law divides matters between the Central Government and Regional Governments. The Regional Government has the authority in public order, peace, and protection of the people. It was further
explained that one form of this sub-function is disaster management efforts. Disaster management efforts will be under the jurisdiction of the Central Government if the location and the negative impacts are cross-province, as stated in article 13 of the Local Government Law.

Along with the division of government authority, flood management also involves both the central and local governments. From the impact aspect, the impact of flooding is also experienced by not only DKI Jakarta, but also its surrounding areas. In this regard, this paper aims to analyze the strategies implemented by various local governments affected by the floods in DKI Jakarta and the Central Government, so that the efforts made by various actors in disaster risk reduction, especially in the flood disaster in DKI Jakarta, can be further understood.

2. Literature review: Disaster risk reduction framework
Disaster management consists of four components namely mitigation, preparedness, response, and recovery. This study focuses on risk management or mitigation that is often referred to as Disaster Risk Reduction (DRR). Mitigation involves reducing or eliminating the likelihood or consequences of a disaster or both. There are several objectives for mitigation, including risk likelihood reduction, risk reduction, risk avoidance, risk acceptance, and risk transfer sharing and spreading [6]. The objective of reducing risk likelihood is to reduce the potential for disaster. Risk consequence reduction is by reducing the impact of disasters on humans, structures, economies, and the environment through both structural interventions and instituting systems. The goal of risk avoidance is to relocate people from high-risk disaster areas. Risk acceptance, namely due to financial constraints, mitigating other consequences, or for cultural reasons, it is necessary to internalize risk acceptance efforts. Finally, risk transfer sharing and spreading, that is, if the risk of occurrence and consequences of a disaster cannot be reduced or modified (diluted), a system is developed to transfer risk.

Mitigation is in either a structural or a non-structural approach [6]. The structural mitigation group includes resistant construction, building codes and regulatory measures, relocation, structural modification, construction of community shelter, construction of barriers, deflection and retention systems, detection systems, physical modification, treatment systems, and redundancy in life safety infrastructure. Meanwhile, non-structural mitigation includes regulatory measures, community awareness, and education programs, non-structural physical modification, environment control, and behavioral modification. Non-structural mitigation is carried out with an attempt to modify human behavior or natural processes without the use of structural engineering changes.

To reduce the risk of losses and damage caused by disasters, it is essential to develop strategies based on the concept of a resilient region or city. The concept of resiliency is a city that can survive and handle various types of hazard without causing havoc or permanent damage [7]. The city’s government, NGOs, and private sector organizations are well-informed of the hazard vulnerability and disaster resources, have strong and effective communications, and can work together effectively [7]. Four factors build the city resilience, namely (1) spatial management, (2) adaptation, (3) disaster mitigation, and (4) technological innovation [8]. Furthermore, the researchers explained four strategic steps that are needed to build the city resilience integrating disaster-prone areas, evacuation routes, and places of refuge into the spatial management plan [8].

Related to the importance of integration in flood risk management, there is a framework that highlights two dimensions of integration: (1) building governance capacity for integration and (2) realizing integration in practice [9]. The involvement of the local community is important to strengthen the flood-risk governance and contribute local knowledge [10]. The role of the local community in flood risk management. The local community take various part in the mitigating process, such as spread flood-risk warning message to the local residents, provide evacuation shelter and survival packages during the flood [11].
Table 2. Conceptual operationalization.

| Concept                  | Variables                  | Indicators                                                                 |
|--------------------------|-----------------------------|----------------------------------------------------------------------------|
| Disaster Risk Reduction  | Structural mitigation       | Construction of technical structure to minimize hazard risk and consequences |
| Mitigation               |                             |                                                                            |
|                          | Non-Structural Mitigation   | Development of behavioral or natural modification thought nonstructural physical modification |
|                          |                             |                                                                            |

3. Method
This research utilized a post-positivism approach and collects data through in-depth interviews, online media content analysis, and literature studies. This study is a descriptive study that aims to investigate the current disaster risk reduction strategy. This study used data collection methods through in-depth interviews to obtain information related to local government strategies in dealing with floods and reducing the impact of these disasters. Besides, this study also conducts literature studies to examine policies and secondary data related to strategies that have been implemented by local governments. This study conducts an in-depth analysis of regulations issued during the last government period, precisely at the end of 2017 to the present by accessing government regulations with the searching filter were disaster and flood.

4. Result and discussion

4.1 Flood disaster risk reduction
Floods, fires, and earthquakes are potential disasters in Jakarta. Flood is one of the disasters that has been a challenge for Indonesia’s capital city for years. Previous research highlighted that the causes of flooding in Jakarta are rainfall and climate change, land subsidence, increased sea level, and less optimal maintenance of flood mitigation facilities [12]. Also, climate change, land subsidence, and land-use change resulted in flooding [13]. The policy about DKI Jakarta Province mid-term development plan also cites several risk factors for flooding, including the land's slope and the high flow of the 13 rivers that pass through Jakarta. Besides, there are several problems in drainage systems, clogged rivers by garbage, and reduced water catchment areas, and flood mitigation infrastructure.

The government has formulated various policies at various levels to deal with floods in Jakarta. The issue of flooding in DKI Jakarta Province is not only an internal issue of the province but has also become an issue of the central government. At the national level, there are longer-term cross-regional policies such as the 1973 Drainage Master Plan. Flood management in DKI Jakarta is one of the national priority projects that aim to manage flood disasters that was listed in the 2015-2019 National Disaster Management Plan. Also, there was a mutual agreement to deal with floods from Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak, and Cianjur (Jabodetabekbukpjun) areas in 2020-2040 on June 3, 2020 [14]. This agreement involved the Minister of Home Affairs, Minister of Public Works and People’s Housing, Minister of Agrarian Affairs and Spatial Planning, Minister of Environment and Forestry, Minister of Planning and Development, Governor of DKI Jakarta, Governor of West Java, Governor of Banten, Regent of Bogor, Regent of Tangerang, Regent of Bekasi, Regent of Cianjur, Mayor of Depok, Mayor of Bogor, mayor of Tangerang, Mayor of South Tangerang, and Mayor of Bekasi.

Meanwhile, at the provincial government level itself, flood management is also a priority. DKI Jakarta Province has enacted several regulations related to disaster and flood. Inside the DKI Jakarta Province Medium-Term Development Plan, the provincial government stated that managing flood is a strategic issue for 2018-2022. The government will mitigate the risk by utilizing three strategies such as:

4.1.1. Construction of sea wall and river barrier. The construction of the sea wall has received regulatory support from both the provincial and national levels. Based on Governor Regulation No. 1685/2015, the Government has set a plan to build sea and river barriers with a total length of 120,276
meters. The construction of a sea wall is also one of the national strategic projects based on Presidential Regulation Number 3 of 2016, which has been changed to Presidential Regulation Number 58 of 2017. To meet the embankment development target, the DKI Jakarta Provincial Government is planning a development of 3,338 meters of the sea wall and river barrier in Blencong and Muara River estuary.

### Table 3. Initiator and barrier length.

| Initiator                                      | Coastline (m) | Estuary (m) | Barrier length (m) |
|------------------------------------------------|---------------|-------------|--------------------|
| Government                                     | 19.145        | 57.644      | 56.430             |
| Jakarta area                                   | 11.906        | 50.869      | 62.775             |
| Bekasi area                                    | 6.659         | -           | 6.659              |
| Tangerang area                                 | 580           | 6.775       | 7.355              |
| Private Sector/ State Owned Enterprise/ Local Government Owned Enterprises | 43.487        | -           | 43.487             |
| DKI area                                       | 35.526        | -           | 35.526             |
| Bekasi area                                    | 4.124         | -           | 4.124              |
| Tangerang area                                 | 3.837         | -           | 3.937              |

Source: DKI Jakarta medium-term development plan.

#### 4.1.2. Construction of reservoirs/river naturalization/river normalization.

The DKI Jakarta government has been normalizing and naturalizing thirteen rivers that cross the Jakarta area. In addition, the government has fixed the flood canals and reservoirs to increase the water catchment area. The provincial government carries out normalization work on the channel in response to the aspirations of the citizens through the Development Planning Consultation (Musrenbang)[15][16][17].

#### 4.1.3. Improved water governance.

This measure is implemented by disciplining unsustainable groundwater use, which contributes to increased flood potential. The government is committed to limiting groundwater use beyond safe limits, ensuring adequate rainwater absorption capacity, and encouraging the optimization of collective absorption wells. The next step is to construct an integrated tunnel or multipurpose tunnel as an integrated effort to overcome traffic and flood problems.

This study found that DKI Jakarta Province has utilized structural and non-structural mitigation to manage flood disaster. The mitigation measures listed in the medium-term development plan show that Jakarta's provincial government is taking structural mitigation measures by constructing sea and river barriers. The construction of the wall is considered effective in reducing the risk of tidal flooding and decreasing the risk of water overflow from upstream. However, structural mitigation is often considered expensive. Inside National Medium-Term Development Plan 2020-2024, the central government estimates that seawall development on the north coast will require 132 trillion with funding sources from the central government budget, cooperation between government and business entities, and state-owned enterprises. Structural mitigation also requires comprehensive management. The breakdown of the barrier in Muara Baru in December 2019, which is part of the National Capital Integrated Coastal Development, indicates that periodic monitoring and inspection are essential[18].

The provincial government also undertakes various structural mitigations other than mandated by the Provincial Medium-Term Development Plan. Under regional secretary instruction No 8/2020, the government at all level need to integrate the disaster information system in an integrated information system owned by the government (SITER). Using this information system, the bureaucrat from the sub-district level to the highest level of position can deliver relevant information and report related to disaster to the regional secretary. The government also introduce a flood detection system using an online-based reporting system called Pantau Banjir and JakLapor application. Pantau Banjir application has been downloaded more than 50,000 times in the google play store. Under the regional secretary instruction No.11/2020, the provincial secretary instructs the local disaster management agency to monitor and investigate the data frequently as the early detection system. The village level can access the early detection system and participate in reporting the condition of water level and refugee number in each
area. The social agency also inputs the evacuee data in the Pantau Banjir application. This measure indicates that the government already develops and utilizes the information system as an early detection system.

The government also implements the nonstructural mitigation measure. The provincial government forms a task force to mitigate the risk of disaster. Under Governor Decree No.96 / 2020, the governor forms Mitigation and Adaptation to Climate Disaster Task Force. The recent multilevel government commitment also indicates that the central government encourages local government commitment to support mitigation measures. Annually, the provincial government also establishes contingency plans to respond to floods containing technical instructions related to flood disaster management. In general, policies at the regional level are technical directives that cover short-term countermeasures. Even though the government has established the institutional design for the climate disaster task force, but DKI Jakarta province has not yet formed a Disaster Risk Reduction Forum as regulated in Government Regulation Number 21/2008. In response to this, the governor issued a governor instruction no.7 / 2020 to instruct the head of the local disaster management agency to form the mitigation forum.

Besides developing institutional design, the government also distributes social assistance to disaster victims, including flood disasters. The government delivers direct assistance by providing food, clothing, health services, temporary shelters, psychosocial therapy, public kitchens, clean water, sanitation, funerals, essential economic recovery assistance, and cash.

4.2. Collaborative process of flood disaster risk reduction

Collaborative governance implies the exercise of the government more than governance that exercises the state power [19]. Collaboration is a continuum that is identified from no collaboration to cooperation, coordination, and collaboration [20][21][22]. With terminology and classification differences, the collaboration continuum is identified from networking to coordination, cooperation, and collaboration [23]. Both classifications assume collaboration as a continuum and use similar indicators with different terminology for each type. The findings of current disaster risk reduction found several structural and non-structural disaster risk reduction that implied the government has several strategies that already provide a collaborative role to not only DKI Jakarta Province but also surrounding governments.

For example, an information system has been available that collaboratively enable every stakeholder to participate in data reporting and monitoring. Through the flood early detection application, all government agencies can share information based on the data inputted by various stakeholders. However, the information sharing system is only for Jakarta province. No information system collaboratively connects the Jakarta province data with other provinces. There is only one integrated data at the national level in Inarisk, which contains static data and mapping of flood events and the impact of floods in Jakarta and all areas. The provincial government also has a website that can be accessed by the public. However, until now, the data is not connected to other provinces in an integrated information system.

However, the efforts to mitigate the risk of flooding in Jakarta and its surroundings require a high level of collaboration. Many factors cause flooding so that it requires a strategy across provinces and levels of government. The central government level and the provincial level strategy indicate a similar approach in structural mitigation, for example, in the construction of sea barrier dikes and estuary barrier. In the Medium-Term Development Plan, the province of DKI Jakarta also synchronizes the surrounding provinces' Medium-Term Development Plan. From the financing aspect, the evidence implies that there are various expected sources of funding from central, regional, and non-governmental organizations.

In most of these policies, the efforts made are focused on each regional government's technical steps. In contrast, integrated cooperation efforts between the affected area are still in the early collaboration process. The technical efforts undertaken were sourced from the 1973 Drainage Master Plan, each of which was detailed in JICA 1991 and 1997, WIEMP 2002, JFM 2007-2009, JCDS 2012, JFMO 2014, and NCICD 2014. This division of tasks and functions effectively encourages multiple levels of government to formulate similar programs and strategies. Still, without routine monitoring and
evaluation, it will be difficult to see from a broader perspective, the synchronization of approach in dealing with this flood disaster. Prehistoric cooperation among stakeholders may increase the effectiveness of flood disaster risk reduction.

Therefore, it is required to increase the collaborative governance among actors in reducing the risk of flood. Several studies have highlighted factors that influence collaborative governance. Ansell & Gash stated that the starting conditions, institutional designs, facilitative leadership, collaborative process, and outcome influence collaborative governance [24]. Also, the collaboration is in a system context that consists of drivers, collaboration dynamics, and actions that influence the outcomes of collaborative governance [25]. The strategy of collaborative governance also needs to consider the public administration paradigm [26]. A recent study that combined five types of research about factors to collaborative governance consists of regulatory framework and policy, standard operating procedures, power disparity, issue salience, horizontal meta-governance, vertical meta-governance, and perceived interdependence [22][24][25][27][28][29]. In the case of floods in Jakarta, horizontal and vertical meta-governance are two crucial factors that illustrate the importance of coordination and collaborative process between the central, provincial, and local government that include the relationship between DKI Jakarta Province and surrounding local governments. Moreover, the current good initiative of the DKI Jakarta Province to gather multiple stakeholders to manage the risk of flood is promising to overcome power disparity and increase the mutual understanding of stakeholders and society about the common problems.

5. Conclusion
The DKI Jakarta Province has established structural and non-structural mitigation. The central government also supported the mitigation effort illustrated by a linear strategy to mitigate the risk of flood disaster. However, in terms of the collaborative process, various government levels need to establish an integrated framework to facilitate a more collaborative process in managing floods in Jakarta and surrounding areas.

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