



The Responsiveness and the Ability of “*Kampung Tangguh Bencana*” in Handling Flood in Yogyakarta City

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Abstract

Yogyakarta City is passed by three rivers, i.e. Winongo River, Code River, and Gajahwong River. Due to that geological condition, Yogyakarta City is prone to annual flood more often than the other types of disaster. Dealing with the risk, the Yogyakarta City Government introduces *Kampung Tangguh Bencana* or disaster resilient villages (DRV). DRV is a village which has an ability to identify hazards in its environment and is able to organize the human resources in reducing the susceptibility as well as increasing the capacity to reduce the disaster risks. These abilities are carried out in development planning and capacity enhancement in restoration after the emergency condition. Thus, it is important for DRVs to understand the responsiveness and the ability to become autonomous in flood counter-measurement in Yogyakarta City. In order to find out the responsiveness of DRVs in handling the flood, a research using qualitative approach was performed through a set of interviews with key persons. Information was gained from related stakeholders, such as the local government officers, community, and local agency for disaster management (*Badan Penanggulangan Bencana Daerah* or *BPBD*) as the organizer of the program. Triangulation method was performed to find out the synchronization between stakeholders. The villages observed in this research were Karanganyar, Warungboto, and Wirobrajan which were located on the river bank. The result of this research covered the description in handling flood through DRVs, the form and identity of DRVs, the contract-expand model action in the management phases of disaster, as well as the advantages and weaknesses of DRVs. The data gained was analyzed in depth by comparing the responsiveness and the ability to become autonomous in the three villages. The recommended formulation was given to the DRVs, the local government, and the local community to carry out the DRVs effectively and sustainably.

Keywords: autonomous ability; contract-expand model; disaster resilient villages; flood; participation; responsiveness

1. Introduction

A natural disaster can endanger human's life and environment. Winarno (2011) explained the risk in his statement, such as flood, extreme weather causing the unpredictable duration of the rainy season. In addition, Suprpto (2011) claimed that the possibility of flooding in Indonesia is high due to the present topography of lowlands, valleys, and the largest coverage area of the sea. Flood and tsunami occurred in some countries have created a great damage. In addition to death tolls and missing casualties, natural disasters also create post-disaster depressions. Such condition happened not only in developing countries

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but also in developed countries such as Japan which has had the advanced technology to encounter death, natural and environmental damage, and depression (Okuyama, Funakoshi, Tomita, Yamaguchi, & Matsuoka, 2017). There are various impacts of natural disasters ranging from a severe impact on the environment (Faleschini, Zanini, Hofer, Zampieri, & Pellegrino, 2017) to the major and long-lasting mental disorders for adolescent age group (Eray, Uçar, & Murat, 2017). The damage condition needs special treatments related to environmental governance. According to Ruiz-Rivera & Melgarejo-Rodríguez (2017), they may include land-use management, ecosystem conservation, and social development. Therefore, disaster should be managed in regulation properly.

Currently, there are several regulations enacted by the central and local governments to form, manage, and monitor DRVs. Some of those regulations are the Law No. 24 Year 2007 about Disaster Management (Pemerintah Republik Indonesia, 2007), the National Disaster Management Agency Regulation No. 1 Year 2012 about General Guidelines of Disaster Resilient Village (BNPB, 2012), the Government Regulation No. 21 Year 2008 about Disaster Management Execution (Pemerintah Republik Indonesia, 2008a), the Government Regulation No. 22 Year 2008 about the Funding and Management of Disaster Relief (Pemerintah Republik Indonesia, 2008b), and the Presidential Regulation No. 8 Year 2008 about National Disaster Management Agency (Presiden Republik Indonesia, 2008).

In order to implement the regulations, concrete steps at any government level are required. Following the central government mandate, the Yogyakarta City Government formed DRVs in compliance with a set of local regulations such as the Yogyakarta Local Government Regulation No. 3 Year 2011 about Local Disaster Management (Pemerintah Kota Yogyakarta, 2011), the Yogyakarta Local Government Regulation No. 1 Year 2013 about the Formation, Organization, and Standard Operating Procedure of the Local Disaster Management Agency (Pemerintah Kota Yogyakarta, 2013), and the Mayor Regulation No. 46 Year 2013 about the Exposition of Function and Assignment Details of Yogyakarta Local Disaster Management Agency (Walikota Yogyakarta, 2013). Under those legal bases, the government conducts disaster management responsibilities including: (1) to provide information and knowledge regarding disaster risks and hazards in the region; (2) to provide education, training, and skill upgrading in disaster management; (3) to provide social protection and safety, especially for disaster vulnerable groups; and (4) to conduct prevention, mitigation, preparation, emergency handling, rehabilitation, and reconstruction.

Referring to Perka BPNB No. 1 Year 2012, DRVs are villages which are capable of adapting and facing hazard potentials as well as recovering from disaster impacts. The chosen mechanism is performed in villages since the sense of cooperation and brotherhood in Yogyakarta is quite solid. Hence, that potential is utilized to improve disaster resilience. Based on its position and role, DRV program is highly strategic in responding disaster issues rapidly (BNPB, 2012).

According to Posner & Georgakakos (2017), the recent years have seen several major natural disasters such as earthquakes, floods, and hurricanes in various regions of the world. Yogyakarta has several disaster potentials such as eruption, flood, earthquake, and drought. The fact that Yogyakarta city is passed through by three major rivers affects the potential of sudden flooding. DRV mechanism becomes an effort to solely reduce disaster risk. The effort comes from village society without having to wait for external aid. Since floods always happen each year, particularly during the rainy season, the existence of DRV is highly required.

This research utilized qualitative approach by gathering data from the government document and regulation, statistical data, and key informant interviews, particularly from the Local Disaster Management Agency of Yogyakarta. The analysis was completed with secondary data related to the disaster to support analysis more comprehensively. In general, this research describes and analyzes:

1. Community-Based Disaster Risk Reduction (CBDRR)
2. Disaster Resilient Village (DRV) flood handling in Yogyakarta City.

2. Community-Based Disaster Risk Reduction (CBDRR)

CBDRR is any form of effort to reduce the hazard of disaster and society vulnerability and to increase readiness capacity which is planned and executed by society as the main actor (BPBD Kota Yogyakarta, 2016). The potential sense of brotherhood and cooperation belongs to Yogyakarta citizens is the important point for initiating community-based disaster risk management (CBDRM). The core of disaster risk reduction (DRR) effort can be concluded as one of the embodiments of community empowerment which is operational, focused, and self-reliant.

In this case, the BPBD of Yogyakarta formed DRVs for actualizing CBDRR. DRV is a village which is able to recognize hazards locally. In addition, DRV is also able to organize community resources in reducing the vulnerability and improving the capacity to reduce disaster risks. DRV is an institution of Community-Based Early Warning System (CBEWS). CBEWS is proposed by de León (2009) as an operational structure which allows active citizens to take actions to minimize disaster impacts. Referring to the model concept developed by Asian Disaster Preparedness Center (ADPC) through its partnership for disaster reduction (Abarquez & Murshed, 2004), it uses contract-expand model which has pre-disaster, disaster, and post-disaster stages.

This ability is embodied in development planning which contains prevention, readiness, DRR, and post-emergency recovery efforts. Along with the composition of development as mentioned above, DRV is expected to respond correctly and accurately in the event of a disaster.

During the implementation of DRR, the role of society and each stakeholder is the main causes its success. The following are the division of each actor's role taken from BPBD Yogyakarta presentation materials or DRV Guidelines (BPBD Kota Yogyakarta, 2014):

a. Government Role

- (1) coordinating the primary assignment and the function of the local government agencies to support disaster management efforts;
- (2) initiating and facilitating DRVs;
- (3) coordinating with related vertical government agencies responsible for disaster management efforts and having potential support to DRVs;
- (4) establishing Disaster Resilient Districts (DRDs);
- (5) gaining multi-party supports in DRV efforts, such as Indonesian Red Cross, higher education institutions, cultural institutions and figures, communities, corporates, non-governmental organizations (NGOs), and voluntary groups.
- (6) coordinating districts in building DRVs;
- (7) facilitating DRV volunteer teams;
- (8) integrating DRVs and DRDs to local planning and development system; and
- (9) funding the initiation and facilitation of DRVs and DRDs in regional budgeting (*Anggaran Pendapatan dan Belanja Daerah/APBD*).

Government roles in DRV efforts include as the coordinator, initiator, and facilitator of the program. In reality, the support given to society are training and equipment lending periodically to manage disasters. BPBD expects all villages are DRVs which are able to borrow disaster management equipment. The key to successful disaster management is really depended on the coordination act between government institutions and related stakeholder. Coordination with all related parties will ease the mobilization of the needed resources, tools, and technology. Facilities in disaster management can be optimized when all parties have given the commitment. The integration of government roles become the main executor which ensure the fulfillment of all elements functions in local, regional until central level. In DRV Management, there is also a district government involvement as directed in the DRV Guidelines (BPBD Kota Yogyakarta, 2014).

b. District Role

- (1) establishing the DRVs;
- (2) monitoring and evaluating the DRVs' efforts;
- (3) reporting the result of development, monitoring, and evaluation of DRVs to the mayor through authorized government agencies; and
- (4) integrating DRVs and DRDs to local development planning through the more relevant mechanism.

The district role is focused more on the functioning of disaster resilient villages at the district level and the building of DRV together with the government for the sake of effective management. The interview results with the DRV trainers confirmed that the active involvement of the district-level government supports the effectiveness of disaster management since the district is a level above the village in coordination line (BPBD Kota Yogyakarta, 2015). Government roles are really important to keep local institutions can function well and optimally. Field observation can be done by government to discover the management of resources, tools, and technology in disaster management. Supervision is performed to strengthen the stability of public service and recovery condition. The effort to monitor and do recording is really important to arrange report. Thus, accountability, efficiency, and effectivity in disaster management can be achieved.

The most important lower-level government institution is a village. The roles and functions of villages are highly strategic as mentioned by Prevention and Preparedness Section Chief. The role of grass-roots is really strategic in preventive efforts and disaster responsiveness. Therefore, public sensitivity towards natural signs, physical environmental changes, and socio-cultural behaviors which can harm the environment need to be concerned. In the grass-roots level, concern, sympathy, empathy and self-belongingness attitudes need to be developed. Referring to the DRV Guidelines, there are several roles of villages in DRV efforts as follows:

c. Village Role

- (1) as the main actor in the DRV formation and management at the local level;
- (2) the village head performs as the DRV advisor;
- (3) encouraging village's self-help ability to form and manage DRVs;
- (4) encouraging society's active participation at the neighborhood level, i.e. *Rukun Tetangga* (RT) or neighborhood association, and at the community level, i.e. *Rukun Warga* (RW) or community organization, to fully participate in the DRV formation and management;
- (5) encouraging the participation of community-based institutions in villages to actively participate in the formation and management of DRVs;
- (6) encouraging the participation of entrepreneurs within village region to actively participate in the formation and management of DRV;
- (7) coordinating the result of DRV activities for Disaster-Resilient Sub-District (DRSB) efforts;
- (8) reporting the result of DRV formation and management to the district head in each respective area;

- (9) integrating disaster resilient village efforts to development planning through the relevant mechanism.

The role of villages is highlighted as the active actors in DRVs since the villages are directly exposed to disaster impacts. The public should have quick response attitude in order to be able to move fast in rescuing themselves and the environment. Community social institutions are the sources of potency for giving active participation. The effort to initiate public participation can be started with education through social institutions. Social skills and physical toughness toward disaster should be established as the move to become disaster resilient community.

The understanding of disaster information system should be owned by the public. Technical skills related to networking organizing in disaster management need to be learned. The availability of simple tools and technology in the context of emergency response and the skills using the tools and technology should be developed. Techniques for rescuing from the disaster are delivered widely through simulations. Public participation in disaster management will be increased if the number of people who understand emergency response procedures is getting bigger. Thus, disaster resilient village can be established.

Village government is the authorized in government management, and development planning arrangement is supposed to be able to integrate disaster issues in the document of RPJMDes. The cooperation within DRVs can be optimized as the optimum disaster management efforts. The optimization in disaster management could also be done in cooperation with other elements.

- d. The role of Village Community Empowerment Agency (*Lembaga Pemberdayaan Masyarakat Kelurahan/LPMK*) referring to the DRV Guidelines (BPBD Kota Yogyakarta, 2014) are as follows:

- (1) in the DRV Team Structure, LPMK might take the role of the DRV Advisor;
- (2) improving society self-reliance in participating the building and managing of DRVs and DRSBs through self-reliant efforts, particularly on CBDRR activities and generally on village development;
- (3) coordinating village potential recording to support DRVs;
- (4) coordinating RTs and RWs in its region to support DRVs and CBDRRs in general;
- (5) facilitating village development problem solving related to disasters based on DRV Volunteer Team; and
- (6) facilitating the integration of village disaster prevention planning to village planning and budgeting development plan and society participation in the integration process.

LPMK as a part of social power should optimize the role in disaster management. The function of LPMK is to strengthen village government in performing its role. LPMK can give inputs, ideas, concepts and disaster management strategy to village government. The activeness of LPMK to handle their role directly, carry out observation and actively participate in disaster management are determining the ability to arrange disaster management recommendation.

Downwardly, LPMK is able to give advice, positive suggestion and solutions to community, RT, and RW. The active role of LPMK in delivering motivation to the public should also be prioritized. An interview shows that LPMK has a close relationship with the public, is able to give the spirit of development and solidarity in disaster management autonomously.

- e. Roles of RW

The roles of RW referring to the DRV Guidelines (BPBD Kota Yogyakarta, 2014) are as follows:

- (1) supporting DRV efforts through assignment completion coordination and RW function according to the law;
- (2) coordinating with LPMK for CBDRR activities; and
- (3) supporting DRV activities through the routine and incidental meetings as well as mass movement for CBDRRs and DRVs at RW level.

The operationalization of DRV activities is at the society level. According to DRV Trainer (BPBD Kota Yogyakarta, 2015), the activity runs in RT/RW (community groups). An interview with DRV shows that DRV needs to have the organizational knowledge to perform the operational function of disaster management which is integrated systematically. In the level of grass-roots, there is not only RW but also RT. Both institutions involve in daily activities, help each other and is in a give-take relationship so that they seem to overlap each other. According to DRV Guidelines (BPBD Kota Yogyakarta, 2014), there are several roles of RT as follows:

- f. Roles of RT

- (1) supporting DRV efforts through assignment completion coordination and RT function according to the law;
- (2) coordinating with LPMK for CBDRR activities; and
- (3) supporting DRV activities through the routine and incidental meetings as well as mass movement for CBDRRs and DRVs in RW and facilitate DRVs.

DRV concrete activities are based on society, therefore, flood risk management in a narrow sense is the process of managing an existing flood risk situation. In a wider sense, it includes the planning of a system, which will reduce the flood risk (Plate, 2002). RT institutions really represent the low level community. The role of RT is as the vanguard in disaster management. The nature of kinship in RT is still very prominent. According to an interview with KTB, the role of RT is really vital, particularly in emergency response. Society

is the primary institution holding the very important role as explained in the DRV Guidelines (BPBD Kota Yogyakarta, 2014) as follows:

g. Society Roles

- (1) getting involved in disaster management efforts at village level conducted by the government at their capacity;
- (2) mobilizing resources in their capacity;
- (3) becoming the main active actor in forming DRVs and CBDRRs in general;
- (4) individually or collectively improving self-reliant volunteering capacity and applying them in disaster management efforts; and
- (5) actively practicing disaster management efforts within each respective area of residence.

The role of society is based on mutual cooperation as a form of local values. Hadi, Kolopaking, Susanto, & Purnaningsih (2014) assumed that the perception of participation for communities is similar to *gotong-royong* (working together towards a common goal) practice developed in the societies. The term *gotong-royong* does not only reflect the soul of society in social activities but also is accustomed to realpolitik, democracy, and the government bureaucracy as well. This phenomenon was previously known in the history of the Indonesian Government, the democracy of *gotong-royong* and the Cabinet of *Gotong-Royong* (Wibisono, 2015). The roles of government and societies are insufficient to tackle flood disasters. Thus, the involvement of stakeholders is important. According to DRV Trainer (BPBD Kota Yogyakarta, 2015), there are several roles of stakeholders. Normatively, this is governed by the DRV Guidelines (BPBD Kota Yogyakarta, 2014) as follows:

h. The role of Red Cross, Higher Education, and Disaster Management Supporting Teams/Communities/Institutions

- (1) contributing and actively getting involved in DRV efforts based on each respective capacity and authority;
- (2) actively getting involved in improving society's capacity with regard to voluntary initiatives based on their competence; and
- (3) synergizing with the DRV efforts and disaster management in general.

A lesson about disaster management is really important to do. Therefore, this institution should give knowledge transformation and skills in disaster management to the public. Technically, Red Cross gives a lot of training to the public. An interview with DRV shows that Red Cross has really helped the government in initiating community awareness in facing disaster problems.

The role of corporate institutions is really important in the history of disaster management. According to the DRV Guidelines, there are several roles of Corporate DRV Guidelines (BPBD Kota Yogyakarta, 2014) as follows:

i. Corporate Roles

- (1) actively getting involved in Corporate Social Responsibility (CSR) activities to support DRVs;
- (2) synergizing with DRV efforts and disaster management in general; and
- (3) actively reducing disaster risks for their business.

An interview with DRV, LPMK, RW, and RT shows that some cases of the real participation of the corporate institution in disaster management are able to give logistic help. The transportation of logistics to the disaster location is done by volunteers from the corporate institutions. Logistics are delivered directly by the volunteers to disaster victims. In summary, each role is presented in Table 1 below.

Table 1: The Role of Each Actor in Community-Based Disaster Risk Reduction

No.	Actor	Role
1.	Government	Coordinator, Initiator, Facilitator, Integrator, Guide, Support Coordinator
2.	Sub-District	Guide, Monitor, Evaluator, Integrator
3.	Village	Main actor, Encourage involvement and active participation, Coordinative function, Integrator, Result Reporter
4.	LPMK	Adviser, Non-government Support, Integrator, Facilitator
5.	Community Group (RW)	Support, Coordinative Function
6.	Community Group (RT)	Support, Coordinative Function
7.	Society	Active Actor
8.	Red Cross Organization, Higher Education Institution, and Disaster Management Supporting Teams / Communities / Institutions	Contributor, Volunteer
9.	Corporates	CSR Function, Disaster Management Synergy

Source: Authors Analysis, 2016

In general, there are nine stakeholder components working together. The number of components might increase or decrease in response to conditions on the field. Floods can occur anywhere as a result of heavy rain and can be of different intensities—from small flash floods to sheets of water engulfing huge areas of

land, causing destruction either way (Singh et al., 2017). The greater the ability of Yogyakarta Government in expanding cooperation network, the greater the scope of involvement of each stakeholder in reducing flood risk in Yogyakarta and neighboring areas.

Each element in society and government naturally needs to be actively involved and contributes to disaster management efforts, particularly the government as the main coordinating performer. According to Kerstholt, Duijnhoven, & Paton (2017), it is important to accommodate social influences on how the risk associated. The government should open coordination channel between actors so that the information can be accessed by and be useful for society. Sub-district as the guide and monitor could also be involved in strengthening the defense against disaster both in its administrative and neighboring regions.

Although the disaster that might happen is mild, the awareness of disaster signs should exist in each component of society. As mentioned by Flanagan, Gregory, Hallisey, Heitgerd, & Lewis (2011), although hazard events may be relatively benign, it is possible that they can culminate in severe physical injuries, emotional distress, loss of life, and substantial property damage to the point of destroying entire communities. The impact of the disaster is numerous. Even mild disaster might cause massive physical or psychological trauma. Disaster might cause light or severe injuries, even permanent disabilities. It could also cause psychological pressure, such as trauma, memory loss, even depression. Furthermore, disaster might cause deaths, property damage, and societal breakdown.

Sufficient activity and knowledge of the main actors, which in DRV context are the village and society, are important to ensure proper disaster management effort can be done effectively. The involvement of other parties such as LPMK, Organizations, and Corporates, might be done through a mechanism such as CSR which supports government programs in increasing societal capacity. Involving volunteers is also a viable option since they do not have a geographic limit. Thus, they are highly effective to be involved in disaster management in pre-disaster recovery, during disaster-recovery and post-disaster recovery.

3. The Role of Disaster Resilient Village in Flood Handling in Yogyakarta

3.1 Disaster Resilient Villages Activities

A village is denoted as ‘resilient’ if it is able to measure the risk of disaster within the village and able to conduct proper planning and actions to reduce disaster risks. In details, according to Imam Santoso in Disaster Resilient Village Guidelines (BPBD Kota Yogyakarta, 2014), there are eight important points related to the village in disaster handling, which can be defined as follows.

1. Village Risk Assessment

While developing DRV, stakeholders should conduct a study of disaster risks in the targeted village. The risk study involves three components, i.e. hazards, weaknesses, and capacity/ability. There are several measures to conduct a risk assessment, one of them is Hazard Vulnerability and Capacity Assessment (HVCA), which was developed by the Indonesian Red Cross. The other risk assessment measures will be explained further in a more technical guideline. The approach needs multi-stakeholder participation. The governments do not act alone; they are supported by other parties. This fact has been mentioned in the government regulation. Zuo, Zhu, Wang, Wei, & Bondar (2017) pointed out that governance quality is particularly important in covering almost every phase of disaster management.

2. Disaster Management Planning and Village Contingency Planning

Village Disaster Risk Reduction Action Plan is an action plan which contains DRR activities, including resource mobilization of various stakeholders, government, or non-government, within the village region. The action plan should be formed along with local communities since the society living in disaster risk zone is the most exposed by the disaster. They are also the one who know their region best. The importance of participation should be emphasized so that the decisions completed are under common ground. Therefore, the society has a higher commitment in implementing the policies on their villages. This participation value is the core of DRV. Day (2017) proposed that it is crucial to consider for disaster planning, preparedness, response, recovery, and mitigation. According to Zuo et al. (2017), governance quality is particularly important in covering almost every phase of disaster management.

3. Village Contingency Plan

Contingency Plan is a plan formed specifically to face a crisis in which the possibility is uncertain. It is an identification process and planning based on uncertain condition. A contingency plan might not need to be activated if the predicted event does not occur. Disaster Contingency Plan contains immediate action plan if a predicted crisis/disaster happens. A Contingency Plan tries to identify the possibilities of disaster and its impact on the society. The plan also covers the acts to build a common agreement in dividing responsibilities to handle the disaster and create decisions in resources mobilization. Boonmee, Arimura, & Asada (2017) explained the purposes of helping at-risk persons to avoid or recover from the effects.

4. Forming Disaster Resilient Village Volunteer Team

In order to support the efforts of DRR and disaster preparedness effort, a Disaster Resilient Volunteer Team is required. This team can be either formed specifically or developed from an existing group. This team is not a part of the local government official structure, yet the government within can get involved together with the other society components. The structure of the team is highly flexible and highly adaptable. The number of required volunteer depends on the severity of flood disaster.

5. Improving Society and Apparatus Capacity in Disaster Management

Improving the capacity in Disaster Risk Reduction issue would include training in Hazard Mapping, HVCA or Hazard Vulnerability and Capacity Assessment of Indonesian Red Cross, Participatory Rural Appraisal/PRA methods, and other required methods. The improvement can be done by providing tools and equipment which support early warning system and disaster preparedness, which is achievable in program context. Support from government is also needed. Spencer (2017) proposed that the government supports can be in form of allocation of financial aid to vulnerable locations when disaster strikes. Good practice of government support is from Japan that they create Government of Japan (GoJ)'s Basic Guideline to Recovery (Walker & Crawford, 2017).

6. Integrating the risk reduction plan to Development Plan and Legalization

In addition to the formation of the Village Disaster Risk Reduction action plan, this program is also expected to support the integration of Disaster Risk Reduction to Sub-District Development Plan. It will be difficult to access fund if it stands alone since it will compete with the other development programs. Therefore, the program is expected not only to form the Village Disaster Risk Reduction Action Plan but also to push the integration of DRR aspects to Mid-Term Local Government Planning, so that it can also contain Disaster Risk Reduction approach. Forino, Von Meding, Brewer, & Van Niekerk (2017) explained DRR as a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk.

7. Disaster Risk Reduction Execution in Villages

Disaster Risk Reduction action plan and Village Contingency Plan need to be implemented to the entire village society. Therefore, funding and resource allocation are required. It will be further arranged through the formed guideline. Based on this statement, the DRV policy operationalization will still need to be concreted in form of technical guideline which can guide the society in real activity.

8. Monitoring, Evaluation, and Reporting

In order to implement the programs in village successfully. DRV program needs to be equipped with proper monitoring, evaluation, and reporting system. These activities need to be done since the beginning of execution from citywide to society level. The monitoring and evaluation device should be made according to the Yogyakarta City's capabilities, available resources, and citizen capacity. In addition, the monitoring and evaluation device should also provide required evidence in giving an assessment.

All the eight points above are the indicators which show the resilience level of a village in disaster handling. The handling approach can be seen from actor, method, and mitigation method aspects. At least, the disaster handling actors are government, private, NGO, higher education institution, and society. Each actor contributes following their respective character and ability in disaster management. Aside from policy formation, the government also institutionalizes the system and facilitation support. Private bodies are more involved in funding and providing aid. NGOs and higher education institutions support education, research, and community service. A case in Australia shows that disaster handling is performed by semi-government organizations. Halgamuge & Nirmalathas (2017) mentioned that the organization for disaster handling is a Hybrid Governance Framework for Disaster Risk Reduction.

Generally, there are two kinds of mitigations which are pursued in disaster management, each with different goals. Both of these mitigations, according to Rahman (2015), are structural and non-structural mitigation which carry out substantial differentiation in nature. Structural mitigation is related to impact handling, while non-structural mitigation is related to facilitation. Disaster risk minimization efforts are highly important to be conducted by government and society. Structural mitigation is an effort taken to prevent a disaster from follow-up negative impact. Every local government needs to program the proper infrastructure condition which fulfills the required mitigation specification. Technology support is highly required in this structural mitigation. Meanwhile, non-structural mitigation covers the facilitation and management of spatial layout which supports emergency response, as well as the improvement of human resources nearby. Societal capacity needs to be improved through education and training, simulation, and advocacy/culturally. Society disaster awareness and readiness need to be cultivated.

3.2 Disaster Resilient Village in Flood Handling

Flooding is a disaster which often suffered by Yogyakarta. Urban areas, in particular, require effective and differentiated approaches for the modeling of flood risk areas due to the accumulation of monetary values (Weichel, Pappenberger, & Schulz, 2007). The rain caused extensive and severe floods (Kawasaki et al., 2017). High rainfall rate is one of the causes of the flood. In addition, bad behaviors, such as littering to the river, also negatively lead to flooding. Flood in Yogyakarta is also affected by natural factors such as the overflowing of cold lava from Mount Merapi eruption. Referring to the explanation above, flood in Yogyakarta can be categorized as flood inundation and Merapi-cold-lava flood.

BPBD instructs citizens to get away from river channels in order to avoid getting dragged into the flood. Shutting down residential electricity or contacting the National Electricity Company to shut down electricity in impacted regions is the other instruction from BPBD. Society might take refugees into the safe zones or flood posts as early as possible when the condition is still under control. Securing valuable goods to the

higher ground should also be done. However, if the flood is getting higher, people need to contact related institutions such as village offices or BPBD.

The DRR is a mechanism made by the government for enabling quicker response against the flood by the society. Early management might be done individually by utilizing the equipment on each village. This can be done while waiting for a more comprehensive government support. Therefore, the casualties can be minimized.

North Dakota State University produced a research and journals on disasters, where the research results and engineering technology are highly useful in disaster management. Namwamba & Lyles (2007) mentioned that the role of technology is to forecast and visualize a forensic engineering. During the development of DRRs, the supporting technology is required. This technology has a strategic role in facilitating the officer and society to identify the disaster signs. Prediction of the disaster possibility can be done through a tool called Early Warning System (EWS).

In order to support the existing mechanism, the Yogyakarta Government, particularly the BPBD, has installed EWS equipment along the three rivers passing through Yogyakarta. By 2016 there are already 10 points of EWS equipment installation with the following details.

Table 2: Flood EWS installation points in Yogyakarta

No.	Village	EWS
1.	Kampung Ngampilan, Kel Ngampilan Kec. Ngampilan	Winongo
2.	Kampung Tejokusuman	Winongo
3.	Kampung Ledok Macanan Kel. Suryatmajan Kec. DN	Code
4.	Kampung Bintaran Kel. Wirogunan Kec. Mergangsan	Code
5.	Kampung Darakan Kel. Prenggan Kec. KG	Code
6.	Kampung Juminahan Kel. Tegalpanggung Kec. DN	Code
7.	Kampung Rejoinangun, Kel Rejowinangun ,Kec.KG	Gajahwong
8.	Kampung Gambiran RT. 30 RW. 08 Kel. Pandeyan Kec. UH	Gajahwong
9.	Kampung Gambiran RT. 51 RW. 13 Kel. Pandeyan Kec. UH	Gajahwong
10	Kampung Ponggalan Kel. Giwangan Kec. UH	Gajahwong

Source: BPBD Kota Yogyakarta, 2016

By 2016 BPBD has installed EWS at 10 points along the river around Yogyakarta. In accordance with the data, DRV Warungboto, Karanganyar, and Wirobrajan do not have a specific EWS installation point in the related regions. However, each river bank is supported by at least two EWS as an early warning measurement of flood occurrence. Warungboto Village which is located near the Gajahwong riverbed, for instance, is already supported by four EWS including two EWS at Gambiran Village, one EWS at Rejowinangun Village, and one EWS at Ponggalan Village. Geographically, the distance between those villages to Warungboto Village is still considerably near. Therefore, it is still quite effective to utilize the four EWS supports in its neighboring regions. Johansson (2017) explained that it may increase the availability of and access to multi-hazard early warning systems to people.

The Karanganyar Village which is located near the Code Riverbank is supported by four EWS points. The four points are at Ledok Macanan Village, Bintaran, Darakan dan Juminahan. In addition, Wirobrajan Village, which is near the Winongo Riverbed, is supported by EWS located in Ngampilan and Tejokusuman Villages. Quantitatively, EWS located at Winongo Riverbed is the least compared to EWS at other riverbeds. This could be a special attention for the government to add supporting EWS for Winongo Riverbed. Government support is not only to install EWS at 10 points at the riverbed but also to lend tools and equipment to be used when a disaster occurs.

Tabel 3: Equipment aid lent to Warungboto, Karanganyar, and Wirobrajan villages year 2015

Numb.	Village	Equipment Aid
1.	Warungboto	Three-wheeled Motorbike (1 unit), Generator (1 unit), Chainsaw (1 unit), Water Pump (1 unit), Handy Transceiver /HT (2 unit), Vertical Rescue Gear (Carmantel Rope, Prusik Rope, Webbing, Sitting Model Harness, Pulley fix, Figure 8, Oval Screw Ring, Ascender, Flotation Device, Rescue Helmet)
2.	Karanganyar	Three-wheeled Motorbike (1 unit), Generator (1 unit), Chainsaw (1 unit), Water Pump (1 unit), Handy Transceiver /HT (2 unit), Vertical Rescue Gear (Carmantel Rope, Prusik Rope, Webbing, Sitting Model Harness, Pulley fix, Figure 8, Oval Screw Ring, Ascender, Flotation Device, Rescue Helmet)
3.	Wirobrajan	-

Source: BPBD Kota Yogyakarta, 2015

The analysis research method used analytical hierarchy process method and factor analysis method. Factor analysis used was the procedure for identifying some of the variables based on its similarity. The similarity was shown through the high correlation value. Factor analysis method consisted of the exploratory analysis method and confirmatory analysis method. This research used confirmatory analysis method because this research had first determined the variable and had included the indicator of research in its research design.

Analytical Hierarchy Process (AHP) method was a systematic method or decision-making technique in a complex issue. It was used to analyze the first target. The first target was the identification of factor priority regarding community participation in the planning stage, the Neighborhood Upgrading and Shelter Sector Project (NUSSP) Program according to stakeholders. Meanwhile, factor analysis method was used to analyze the identification of factor priority regarding community participation in the planning stage, NUSSP Program, and positive impact according to general communities.

The focus of disaster resilient program in Yogyakarta is to provide equipment facilities for anticipating the flood disaster. Since the disaster is specific to a flood caused by riverbed overflow, the facilities provided are tools which can reduce that kind of flooding in the village. Considering the characteristics of road access that is mostly quite narrow, the vehicles provided are motorbikes since they are able to increase mobility.

Based on the available data, it is only Wirobrajan Village that has received any disaster equipment. However, the aid provided by BPBD of Yogyakarta is quite sufficient. In 2015, there were 25 villages which have already received disaster support. The support was delivered by the representatives of BPBD of Yogyakarta to the chief of DRVs. The aid will be granted each year periodically so that the entire villages can acquire sufficient facilities.

Table 4: List of villages which receive equipment aid in 2015

Numb.	Kampung (Village)	Sub-District (Kelurahan)	District (Kecamatan)
1.	Keparakan Lor	Keparakan	Mergangsan
2.	Karanganyar	Brontokusuman	Mergangsan
3.	Jogonegaran	Sosromenduran	Gedongtengen
4.	Ledoksari	Purwokinanti	Pakualaman
5.	Bausasran	Bausasran	Danurejan
6.	Ketanggungan	Wirobrajan	Wirobrajan
7.	Sindurejan	Patangpuluhan	Wirobrajan
8.	Semaki Gede	Semaki	Umbulharjo
9.	Warungboto	Warungboto	Umbulharjo
10.	Ponggalan	Giwangan	Umbulharjo
11.	Gambiran	Pandeyan	Umbulharjo
12.	Iromejan	Klitren	Gondokusuman
13.	Pengok Kidul	Baciro	Gondokusuman
14.	Ngampilan	Ngampilan	Ngampilan
15.	Tejokusuman	Notoprajan	Ngampilan
16.	Ledok Prawirodirjan	Prawirodirjan	Gondomanan
17.	Ratmakan	Ngupasan	Gondomanan
18.	Bener	Bener	Tegalrejo
19.	Jogoyudan	Gowongan	Jetis
20.	Pingit	Bumijo	Jetis
21.	Taman	Patehan	Kraton
22.	Darakan	Prenggan	Kotagede
23.	Rejowinangun	Rejowinangun	Kotagede
24.	Danunegaran	Mantrijeron	Mantrijeron
25.	Suryowijayan	Gedongkiwo	Mantrijeron

Source: BPBD Kota Yogyakarta, 2015

There are 25 villages which have already acquired the equipment lent for flood disaster management. However, these can be operated effectively only if society knows how to utilize the equipment. Therefore, providing equipment aid is not enough. The government needs to provide socialization and training for each DRV in order to increase the capacity of disaster management, particular flood for villages near riverbeds. Training provided by BPBD, as the follow-up of the Yogyakarta Government Regulation No. 1 Year 2013, are as follows:

1. training to build Disaster Management SOP at the village level;
2. training to utilize DRV equipment;
3. emergency first aid training;
4. logistic distribution in disaster area training; and
5. communication training.

The support provided by the government is not in form of budget, instead of in asset facilitation, so that society empowerment and self-reliance can be formed. Resilience towards disaster is formed through socialization of values and building behaviors which can sense disaster signals. Society involvement is an important point in building resilience towards disaster. Society needs to be introduced, trained, and being accustomed to managing disaster at all times. Building a disaster resilient community becomes a highly important agenda. Society involvement is explained further by Stewart, Sun, Patterson, Lemerle, & Hardie (2004) as the form of community participation and a supportive physical and social environment. The potential for societal participation can be improved through social communities which have disaster resilient behaviors. Besides building disaster care communities, communities which are ready to undertake real action are also provided through social and physical support appropriate to the disaster management effort.

The government role is to provide socialization in form of knowledge, expertise, or disaster resilient behavior. Jabar & Lamberte (2017) suggested that the disaster management principally starts at the level of

the local government. The socialization can be done by the government, higher education institutions, or NGOs. Education towards society program to form disaster resilient society is optimized through several institutions in villages, including vertical tiers of government agencies and public service institutions. The capabilities of these professionals have significant relevance to general public health, disaster preparedness and disaster management (Guerdan, 2009). The government and public service institutions are important points in providing social, economic, healthcare, and safety for society. The professionalism of the government in healthcare service is a signal of a capability in fulfilling the quality and quantity of healthcare service in general as well as preparedness in disaster management.

DRVs are increasingly required to expand the capability in disaster management. The existence of DRVs is the visualization of the importance of social participation in disaster mitigation. According to Supianto (2015), the purpose of DRV program is not to breed prestige, but rather to direct society as if they are the main consultant in the village development, particularly in DRR. It means that this disaster resilient program is a form of a brilliant society achievement. Rajakaruna, Wijeratne, Mann, & Yan (2017) proposed that this program is regarded as the importance of logistic skills for effective management. Based on the opinion, DRVs are villages which already have had the system and supported by capable society.

DRV is important as a disaster issue solution mechanism, which may emerge due to the worsening of environmental quality. DRV have the ability to conduct prevention, anticipation, and recovery from disaster events. DRV is a reactive strategy to fulfill the changes in the environment. In addition, DRV program is also a proactive strategy which aims to build and empower society. The form of DRV has been defined and implemented in Yogyakarta by forming DRVs. These villages directly face flood threats which happened every rainy season. However, in order to take action to respond the threats, the disaster issue needs to be adjusted to organizational conditions. The strategy to prevent disaster event involves DRV society. The village institutions for DRV are increasingly become existent in Yogyakarta. DRVs are responsively well in disaster mitigation, particularly the readiness towards flood hazard.

The study of the DRV existence in Yogyakarta, responsiveness, and capacity towards flood disaster management has been conducted through several methods as follows:

1. forming regulation in form of local regulation as a regulatory basis;
2. forming the DRV Guidelines which explain various institutional needs, work mechanism, and action plan which could guide DRVs at the society level;
3. building DRVs;
4. providing facilitation of infrastructure to 25 villages;
5. providing training to DRVs and assisting officers;
6. installing EWS at zones which require monitoring; and
7. building a cooperation network with nine stakeholders.

The fastest way in disaster mitigation is performed by community along with local government. Some moves which need to be done according to Posner & Georgakakos (2017) are limited to flood reduction, soil erosion reduction, and water quality improvement or protection.

4. The Effectiveness of Disaster Resilient Villages

DRV is a form of institution which consists of volunteers. Those volunteers are gathered by the village government in a legal team. To implement their roles, DRV has coordination and cooperation lines with BPBD. DRV becomes the foremost guard in helping BPBD to handle and reduce disaster risks. DRV emphasizes the importance of classifying the team behavior in disaster management in accordance with the conditions. The team behaviors are classified into three types of task. They are the task when there is no disaster, the task during the disaster, and the task after the disaster.

At the time when there is no disaster, the task of the team is to perform regular monitoring and observation during the rainy season. In addition, the team also has the task to take care of and maintain the completeness, the safety and the functions of EWS and inventory facilities borrowed from BPBD. During the disaster, the task of the team is to give help and to become perceptive towards disaster as well as preventing the possible expansion of disaster impacts. During the disaster handling, the team often involves Search and Rescue (SAR). Hooshangi & Asghar Alesheikh (2017) explained that during the SAR operations time plays an important role in the task allocation. After the disaster, the task of the team is to recover and improve the condition. This approach is similar to a contract-expand model which assumes that all the existing stages in disaster management (emergency, relief, reconstruction, mitigation, preparedness, and early warning) are still implemented in all disaster-prone areas. Under certain conditions, different actions should be carried out to understand a disaster condition. Thus, a special need can be provided in an appropriate manner and to appropriate target. Fulfilling the monitoring schedule, keeping the completeness, safety, and functions of EWS tools as well as maintaining inventory facilities are included in the pre-disaster stages covering preparedness and early warning stages. The actions performed by DRVs in handling flood in Code, Winongo and Gadjah Wong during 2016-2017 are more developing (emergency and relief) while actions in their post-flood-disaster are more for rehabilitation, and reconstruction mitigation is less emphasized. Observed from the fulfillment of the need of appropriate actions towards disaster context and the stages completed, DRVs can perform their roles and functions effectively. According to Nadi & Edrisi (2017), the effectiveness of this response depends on various social and technical parameters. Shokr & Torabi (2017) explained that the humanitarian logistics has attracted for delivering effective and efficient disaster relief operations.

DRV is one formal form of mutual cooperation principle from Yogyakarta City society. The positive aspect of mutual cooperation as the basis for disaster management affects the effort to improve the

interaction ability and relationship in society as well as increasing the solidarity among the various circles. Society participation is very important to create a disaster management comprehensively and thoroughly. The atmosphere of DRV's mutual cooperation in handling a disaster is marked by the high commitment in every stage of activities. The characteristics of DRV mutual cooperation covers the expressions of high spirit, cooperation, helping others, and sense of belongingness. DRV mutual cooperation creates a willingness to do tasks, not partially only but also can cover all areas prone to disaster. Zhou, Wang, & Zhang (2017) further explained that the interactive process amplifies or attenuates the perceived risks.

DRV is the derivative of participative society behavior in responding disaster, which is a form of community early warning system. The roles of DRV are to perform education, advocating, and empowerment in disaster management in affected areas. DRV is established as formal institutional intended to strengthen the role and material support through budgeting mechanism facilitated either by local government or villages. The implementation of DRV works is done by community action plan mechanism which is proposed to village government. Afterwards, action plan flow is accomplished within five and three years in form of disaster action reduction document. Village government integrates government development plan through a discussion of village development plan.

DRV institution is a reflection of a semi-formal institution designed to facilitate cross-sector coordination flow which needs inter-institutional bargaining position. DRV formal mechanism has succeeded to extend the role of Yogyakarta City Government in allocating and distributing tool facilities. Non-formally, DRV is an early warning system institution based on society, adaptive towards the variety of society's social condition and social capital character. DRV is a form of the institutional model in Indonesia, yet has become more effective when applied in Yogyakarta because it is supported by the social culture typology and mutual cooperation. It is proved by several advantages of DRV as follows:

1. DRV program provides moral support and collects society participation;
2. promotes the society's social capital;
3. DRV preserves the culture of mutual cooperation in handling problems;
4. DRV facilitates resources mobilization and the role of stakeholders; and
5. coordination flows become clearer.

Although DRV has many advantages, this institutional form is quite vulnerable in keeping the stability of value transitions between generations. Furthermore, along with the activation of DRV, the role of government in handling a disaster is reduced. The actual implementation completed by actors related to disaster management are:

Table 5: The actor's role implementation in disaster management

No.	Actor	Implementation
1.	Government	Giving legitimacy, doing DRV pioneering, lending disaster management tools
2.	Subdistrict	Inter-DRV coordination flow
3.	Village	Acting as the Main Actor, doing inventory for disaster management tools
4.	Empowerment Agencies and Villages (LPMK)	Giving directive and assistance
5.	Community Group (RW)	As inter-DRV coordination flow
6.	Community Group (RT)	As inter-DRV coordination flow
7.	Society	Acting as the Main Actor
8.	Red Cross Organization, Higher Education Institution, and Disaster Management Supporting Teams / Communities / Institutions	Supporting the need of DRV related to the specialties of organization
9.	Corporates	Giving support contribution as a part of society

Source: Authors Analysis, 2016

Pathak & Emah (2017) conveyed that disaster recovery is multifaceted and depends upon various actors. Yogyakarta City Government acts only as a regulator, legitimator, and facilitator, while the function of BPBD is actually also as an executor. Interactive process amplifies or attenuates the perceived risks. De Brito, Evers, & Höllermann (2017) proposed that implementation of risk management strategies should be based on a holistic understanding of risks.

5. Conclusion

The responsiveness and capacity of DRV in handling flood disasters is formed through the mandates of central government through regulations, which are followed-up by the Yogyakarta City Government through local regulation enactment. The ultimate government role in forming DRV needs to be balanced with social participation. Facilitation in form of EWS equipment and technology has given proper precondition to increase the flood disaster monitoring capacity.

DRV is the derivative behavior of participative and mutual cooperation as a role model in Indonesia and the form of community early warning system in the form of semi-formal institution so that it becomes flexible and adaptive in a two-way relationship, which is to society and to the government. Observed from

the aspect of disaster management, DRV is the application of the contract-expand model, which structurally programmed a behavior which is done in some phases and appropriate to the condition of the object.

DRV has the advantages in providing moral support, emerging society participation, facilitating resources mobilization, strengthening social capital, preserving the culture of mutual cooperation and clarifying coordination flow. The weakness of DRV lies in transformation and education over generations as well as the narrowing of BPBD execution in disaster management.

Strengthening DRV capacity has been done through technical training and flood disaster management as well as enriched by a volunteer team. Meanwhile, the responsiveness of DRVs towards flood disaster is highly supported by EWS technology. The responsiveness and capacity of DRV which are manifested still stemmed from the government power. The further step will need an effort to revitalize cooperation behavior within DRVs so that social involvement is deeper. The city government agencies, particularly BPBD, is reinforced in the execution by positioning officers to perform DRV assistance during the implementation of disaster management.

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