Assisting smart disaster management for smart city program, case study: Pringgokusuman village, Yogyakarta

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Abstract. The smart city is a concept of creating a comfortable, safe, and accessible living place. Furthermore, a smart city is built to raise the value of the city in economic, social, and technology. One dimension of all seven dimensions planned by Yogyakarta Smart City Program is smart disaster management. Yogyakarta located in the disaster – prone area, with disaster potentials such as earthquake, fire, tornado, and flood. This particular dimension becoming essential to reduce the effects of a disaster. One of the effects of a disaster is the loss of human life. Citizen in Yogyakarta especially in Pringgokusuman is one of the group of element at risk in disaster. Education about disaster is important to them. This research aims to analyse citizen knowledge of the disaster information. This research is using qualitative research methodology including an in-depth interview with descriptive analysis. This study shows that information about disaster management is not optimized, even though the information is needed. A suitable dissemination strategy needs to be developed in order to educate citizens and enhance their awareness in applying smart disaster management technology.

1. Introduction
Population growth develops dynamically. The Yogyakarta City is a district area in the Special Region of Yogyakarta that has the highest population density with a value of 13,007 people/ km², which mean that there are 13,007 people in every km² of the City of Yogyakarta [1]. The growing number of population needs to be balanced by regional development to support community activities in social, economic, infrastructure, technology, and environment aspects [2]. Smart city is one of the solutions in regional development that can progress and develop by collaborating and utilizing Information and Communication Technology (ICT). Through ICT, information services will be more accessible to the community [3]. The important dimensions needed in smart city development are smart economy, smart mobility, smart environment, smart people, smart living, smart governance, and smart disaster [4].

One important dimension in the smart city dimension is smart disaster [5]. In the context of developing smart city in Yogyakarta City, smart disaster is very important. Smart disaster is a manifestation of disaster preparedness and public education about disasters in Special Region of
Yogyakarta as its located in disaster-prone areas and in the ring of fire. According to the national disaster vulnerability index, the City of Yogyakarta is classified with a high level of vulnerability with parameters of floods, earthquakes, tsunamis, fires, droughts, hurricane, conflicts, extraordinary events, casualties, population density, and damage to buildings. The city of Yogyakarta is included in the high-hazard class with a national ranking of 135 out of 494 cities / districts nation-wide in Indonesia. Disaster threats in the City of Yogyakarta include floods, earthquakes, tsunamis, droughts, extreme weather, landslides, volcanic eruptions, abrasions, social conflicts, epidemics and disease outbreaks [6]. The level of disaster will increase if the population density is high [7]. One of the villages in the city of Yogyakarta which has the highest population density is Pringgokusuman Village. Pringgokusuman Village has a population density of 27,280 people / km², which is higher than Yogyakarta City’s population density [8]. Figure 1a and 1b shows the density of settlements in Pringgokusuman Village. Provision of optimal disaster information for the community of Pringgokusuman Village is needed to improve preparedness and reduce disaster risk.

Figure 1a. Condition of dense settlements in Pringgokusuman
Figure 1b. High population density results in limited empty land

Research on smart city and smart disaster in the geography study was carried out previously by Rini Rachmawati in 2018 with the title of Jogja Smart Province Application for the Provision of Integrated Information and Its Use, with results showing that the application has reached outside the Yogyakarta Special Region, but access to the users didn’t optimal for the community and tourists [9]. Other research by Djimesh about smart disaster with development of the Early Warning Systems towards Disaster Management in Ghana under the title Influential Factors in Creating Warning Systems towards Disaster Management in Ghana: An Analysis of 2007 Northern Flood in 2018 with the results showing that the application for flood disaster is useful for the community’s disaster information [10]. In addition, research on community optimization in the face of disaster by Khirul Anam shows that disaster information is not optimal in the community, even though disaster management is a strategic issue for regional development and government policy [11].

Through various studies, the research on optimizing the dimension of smart disaster in Yogyakarta City is important to be developed as information on optimizing technological developments in disaster information especially in the Pringgokusuman community. This research can provide input to the government in developing smart disaster management in Yogyakarta City.

2. Methods

This research conducted using qualitative research method [12]. Qualitative research examines more deeply about social phenomena by considering several aspects or situations. The social situations that need to be considered in this study include places, actors, activities, natural events, and vehicles / transportation. In this study, optimizing information on smart disaster management for the community became a study that can be done with qualitative research methods.
2.1. Research Location
The location of the research was in Pringgokusuman Village, Gedongtengen Sub-district, Yogyakarta City that has characteristics of development of smart city. Pringgokusuman Village is an urban village in the Yogyakarta City with an area of 0.46 km² and the total use of permanent building land reaches 0.3985 km² or 86.7% of its total area. In addition, Pringgokusuman Village has a high population density of 27,280 people/ km² [8]. This condition act as factor that increases people's vulnerability to disasters. Pringgokusuman Village has the risk of being hit by disasters including fires, tornadoes, floods, earthquakes, droughts, landslides, and endemic / epidemic diseases [6].

2.2. Data Collection Technic
Data collection techniques in this study are using observation method and indepth interview. Observation method involving collecting data by observing and paying attention to the object of research both directly and indirectly and recording systematically the results of these observations. Indepth interview method is using interviews to find out more in-depth things about participants in interpreting situations and phenomena that occur, where this cannot be found through observation. The advantage of interviewing is that researchers can flexibly use their knowledge, expertise, interpersonal skills to explore interests in emerging ideas or themes that are being studied. Indepth interview is conducted with key person who understand the condition of the research area. The selected interview respondents were conducted with BPBD (Regional Disaster Management Agency) in Yogyakarta, village heads, and representatives from community groups as PKK (Family Welfare Empowerment), KTB (Disaster Resilient Village), RW (Citizens Association) ,and Karangtaruna or Youth Organization in the Pringgokusuman Village.

2.3. Data Analysis
Data analysis stage including description of the data collection result after obtaining sufficient knowledge related to the object of research. Data analysis is carried out clearly, specifically, and detailed. The results of the analysis illustrate the disaster information management condition in the Pringgokusuman Village [13].

3. Results and Discussion
3.1. Disaster Condition in Pringgokusuman
Along with the existence of smart city development program in Yogyakarta City, it is necessary to carry out regional planning and development efforts in a sustainable manner. Sustainable regional development must have three main aspects, namely economic, ecological and social [14]. One important aspect is ecology, which is the interaction between living things with each other and the interaction of living things with the environment [15]. Knowledge of the conditions of the living environment is important in an effort to carry out the sustainability of regional development in harmony. Knowledge about the environment will create understanding of the condition of disaster [16].

Pringgokusuman Village is urban village in the Yogyakarta City that are included in the Gedongtengen District. Pringgokusman Village has an area of 0.46 km² with population density of 27,280 people/km² [17]. Pringgokusuman Village is the most densely populated village in Gedongtengen District. Pringgokusuman Village is also an area prone to disasters because it is located on the banks of the Winongo River. The development of the Yogyakarta smart city program must be in line with the development of information on disaster management or smart disaster management in Yogyakarta City, especially Pringgokusman Sub-District. Figure 2 shows the disaster hazard map of Yogyakarta City.
Based on the Yogyakarta City Disaster Hazard Map from BPBD shows that Pringgokusuman Village is an area that is prone to flooding (figure 2a), extreme weather (figure 2b), endemic and disease outbreaks (figure 2c) with a high hazard classification with identification with red color. Through the figure of 1d the earthquake disaster is classified as medium and high, whereas for volcanic disasters and landslide (figure 1e) have a classification of low to high, high classes in the area on the banks of the Winongo River. This condition shows that information about the condition of disaster is important to community in Pringgokusuman Village as an effort to raise awareness in disasters. In addition to natural disasters, Pringgokusuman Village also has the potential for urban fire disaster due to densely populated settlements. As recorded in 2017, fire caused by the explosion of gas canisters. According to the data from the Pringgokusuman Village office, in 2018 there were landslides occurs that killed 3 people, this condition occurred due to late information on disasters and not optimal preparedness. Knowledge of pre-disaster conditions, during disasters, and post-disaster
through technology development (ICT) is able to improve regional development in a sustainable manner in the field of disaster management [14].

3.2. Availability of Disaster Information

The availability of disaster information in Pringgokusuman Village is only through direct socialization to representatives of community leaders in each village in Pringgokusuman Village. The socialization was held once a year organized by the Community Disaster Preparedness (KSB) community group formed by the Yogyakarta City Social Service through centralized coordination originating from The Directorate General of Social Protection and Security, Ministry of Social Affairs of The Republic of Indonesia. KSB activities are to provide understanding and awareness of the community, form social networks and social interactions, organize, ensure continuity, and optimize resource potential related to disaster. At the village level there also organization named Disaster Ressilience Village (KTB) which formed by The National Agency of Disaster Management (BNPB). KTB formed as an effort to improve community-based disaster management [18]. KTB members consist of volunteers and representatives from community organizations. In addition to socialization activities directly with community representatives, disaster information is delivered through social media, namely through whatsapp groups application. Disaster information is coordinated and delivered directly by the person in charge who has received official information through the Regional Disaster Management Agency. Based on the results of the in-depth interview with Ms. Eni (Head of Pringgokusuman Village) the accuracy of disaster information, especially when a disaster occurs through whatsapp group application is accurate. Accurate disaster information is needed as an effort to increase community awareness of disasters [19]. Disaster information through technology development with social media has been developed in India as an effort to reduce the impact of disaster risk [5]. This needs to be developed also in the Yogyakarta City as part of the Smart City program of Yogyakarta City.

3.3. Assisting of Disaster Information

Urban area development needs to be in line with the development of regional information including information on disasters. Submission of disaster information includes pre-disaster, disasters, and post-disaster conditions accurately need to be conveyed to the community [20]. Based on the results of interviews with the Head of the Media Center of BPBD of Yogyakarta City, Media Center of Disaster Data Information of BPBD of Yogyakarta Special Region monitored the condition of the hazardous areas directly through the CCTV and observation posts in each Regency/ City in Yogyakarta Province. The CCTV monitors the state of the volcano (Merapi Volcano), the flood conditions on the river banks around Yogyakarta such as the Winogo River, and landslides/ earthquakes through an Early Warning System installed in Baturagung hills in Piyungan Sub-district. Media Center of Disaster Data Information of BPBD of Yogyakarta Special Region shown in Figure 3. Through Media Center of Disaster Data Information, disaster information is delivered directly to the community using social media such as twitter and whatsapp group. Through the @Pusdalops diy twitter account, it updates information on disasters in the Yogyakarta and surrounding areas. BPBD of Yogyakarta City through Media Center of Disaster Data Information is also creating an online application in progress, so that in the future the application will provides more accurate news to the community.
Disaster information that reaches the community until now is considered to be less than optimal, this is due to the limitation of disaster awareness and communication tools in the community. The information distribution using whatsapp group also become challenging because not all of the community have mobile phones that are internet based. On the other case, the availability of handy talky (HT) or amateur radio who can deliver disaster information without using internet access is very limited among the community because Pringgokusuman Village office only has 5 HT assistance as shown in Figure 4a and 4b. HT or amateur radio, act as a backup if there is an unstable internet signal on the mobile phone due to disaster occurrence. Disaster information through Twitter is also still unfamiliar among the public, because there are still many people who are not actively using social media. The use of Twitter is only limited to young people I the Youth Organization (Karang Taruna), while PKK organization, RW and KTB members are still not familiar in using Twitter. Disaster information dissemination in Pringgokusuman Village needs addition of communication tools such as HT or amateur radio in use for disaster monitoring. The socialization on using social media for dissemination of disaster information also needed to improved disaster awareness [21].

4. Conclusion
Pringgokususman Village is included in a high-risk floods, endemic, extreme weather, earthquake, volcanic eruption and landslide hazards while disaster information in the community of Pringgokususman Village is still limited. Disaster information through socialization carried out by KTB (Disaster Resilient Village) and representatives from each community group in Pringgokususman Village once a year. Dissemination of disaster information needs to be carried out through all elements of the community to the smallest Citizens Association level.
Disaster information in Pringgokusuman Village has not been optimal, the availability of communication tools to monitor the disaster, such as HT / Radio are still limited. The socialization of the use of social media to distributing disaster information is needed to cover young people and Youth Organization, meanwhile HT and Radio are the best tools for disaster information dissipation for the older and elderly people. Developing disaster information online applications are very urgent to support disaster information dissemination.

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