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Geology Information for Community-Based Landslide Risk Prevention and Mitigation

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Abstract

The research location is in the village of Wukirsari, Imogiri Imogiri, Bantul Regency, Special Region of Yogyakarta. The study was conducted quantitatively and qualitatively, with data collection by purposive and snowball. Landslide area of 7,922 m2 on 17/3/2019 was at coordinates 433409.04 mE, 9124439.00 mS, moving towards N190oE. The type of landslide is found in the form of rock flow and debris slide. Landslides are triggered by high rainfall and nonworking drainage system in the study area so that the water load increases beyond the critical limit. Until now there has been no landslide information system. Collecting the geology information, using participatory mapping, has been able to increase community-based awareness of resilience in (1) assessing landslide risk, (2) monitoring the character of landslide hazards, (3) disseminating information on potential landslides, and (4) strengthening community response capacity against landslides.

Keywords: Geology Information, Participatory Mapping, Community Landslide Management

I. INTRODUCTION

Around the world, natural disasters are unavoidable, but humans can minimize the losses caused by them. Landslides are one of them that often occur in the Special Region of Yogyakarta. BNPB recorded approximately 2426 incidents from 2014 to 2019 which caused some losses. There is one incident that recently happened, it was a landslide that occurred at the tomb of the kings which was located in the Imogiri area with coordinates 433409.04 mE, 9124439.00 mS. Precisely this occurred on the south side and resulted in a 7,922 m² landslide area. The landslide, which was triggered by high-intensity rain, had at least breached the walls of the tomb complex and buried 2 houses. Until now, Imogiri District is still one of the areas in Bantul Regency which is often affected by landslides.

II. LITERATURE REVIEW

According to Kuppuswamy and Rajarathnam (2009, 2010), Information and Communication Technology has great potential in disaster management. Collecting data and information related to past disaster events is very useful so that it can become a knowledge base in making technology for early detection of disasters. Disaster management includes preparedness, emergency response, and recovery. The use of Information and Communication Technology in disaster activities is very necessary, both during preparedness, emergency response, and recovery. For example, the use of handy talkies as a means of communication and coordination between volunteers and field command central, email as a means of communication to send reports in the form of text and audio-visual messages through the internet, social media, use of early detection tools, and remote sensing using satellites or drones.

Community-Based Disaster Risk Management (CBDRM) is one of the important pillars in today's disaster risk management jobs. So far, CBDRM has only been generally accepted by disaster experts because the approach used is a structural/physical approach only and focuses on emergencies as well as a top-down approach that rarely produces results in the realm of sustainable disaster risk reduction (DRR). CBDRM gives answers that cover several principles such as efficiency because ideally, it has low transaction costs due to maximum local intake and minimum external intake (Paripurno et al, 2014).

Of course, to continue to develop the existing potential, it is necessary to map the Information and Communication Technology that has been used. That way, in the future, Information and Communication Technology products can be developed based on the evaluation results of the mapping. Therefore, the purpose of this study is to describe and evaluate the use of Information and Communication Technology in community-based landslide disaster risk management in Imogiri District, Bantul Regency.

III. RESEARCH METHODOLOGY

The research used a field study approach, with qualitative research methods. The data analyzed were sourced from the internet and interviews in the field. The sampling of data sources in the interview was done by purposive and snowballs. Purposive is a data collection technique with certain considerations, for example, the respondent is considered to know what we expect or as a decision-maker to make it easier for research needs. Snowball is a sampling technique for data sources that initially had few respondents but were unable to provide complete data, so they had to find other respondents who could be used as sources of data information.

The location of this research is in Wukirsari Village and its surroundings, Imogiri District, Bantul Regency, Yogyakarta Special Region Province. Wukirsari Village has located about 16 km on the south side of Yogyakarta city. This village is one of 8 villages in the Imogiri District. The total area is 15,385,504 ha with a population of ±17,245, consisting of 5,428 families. This village is bordered by Segoroyoso Village and Trimulyo Village on the north side, Muntuk Village on the east side, Girirejo Village on the south side, and Trimulyo Village on the west side.

From the analysis carried out, the findings of this study will be known. The results of this study are mapping the use of geology information in community-based landslide risk management activities in Imogiri District, Bantul Regency in an effort to strengthen community preparedness through (1) assessing landslide risk, (2) monitoring the character of landslide hazards, (3) disseminating landslide potential information, and (4) strengthening response capacity.

IV. FINDING AND DISCUSSION

The research area is a mountainous area with morphology in the form of hills with moderate to strong relief, from around Imogiri in the west, extending north to Prambanan. This area is dominated by sandstone lithology, volcanic breccia, and igneous rocks from the Semilir, Nglanggran, or Wuni and Besole Formations. Wukirsari Village is dominated by 3 (three) types of soil textures, are alluvial, granular, and sandy soil. Alluvial soil texture with an area of 1,896 km2, granular soil texture with an area of 1,600 km2, and sandy soil with an area of 13,050 km2. Rainfall is a determining factor for the level of potential landslide hazards. The higher the rainfall value, then it can be ascertained that the area has the highest potential for landslides to occur. Rainfall data is obtained from secondary data, which shows has high rainfall with an average of 300-400mm.

In Wukirsari Village, there are several points prone to landslides with debris slide types. This landslide is a movement down the slope due to a mass of soil and / or rock making up the slope, through the slip plane on the slope or in the shear strain plane that develops intensively. Some data suggest that the movement occurred along the slip plane asynchronously. The speed of these landslides ranges from slow to fast. This landslide occurred in the Semilir volcanic sandstone unit.

Landslide risk mapping is carried out in a series of mapping activities to identify the character of landslide-prone areas, making landslide-prone zoning, calculating risk assets, mapping vulnerabilities, mapping vulnerabilities, assessing risks, determining risk zones. This is done so that residents understand the types and characteristics of threats that exist in their area, and natural signs before the incident.

Hazard character monitoring is carried out in high-risk areas. The monitoring of hazard characters is carried out in a participatory manner by involving residents at risk. Citizens need to ensure reliable early warning, routine monitoring of developments in threat levels, and at the right time to be able to make decisions to disseminate warnings to communities in areas at risk of landslides. It is necessary to agree with residents so that they can monitor threats regularly, determine parameters or measures of the level of danger to be conveyed to all members of the community when acting on alert, alert, or evacuation.

Dissemination of information on landslide potential is carried out by making early warning dissemination necessary to develop an inclusive landslide early warning system. Dissemination of information requires a community-centered early warning. This warning is an agreement of the residents, as a source of reference information for action, as well as a warning to decide on an independent evacuation in a timely manner. Residents are directed to have a variety of warning dissemination tools. The means of communication must be maintained and maintained in order to keep them functioning. Types of communication tools need to consider the ease of manufacture, operation, and maintenance that can be carried out by residents independently. Therefore, tools derived from local wisdom are recommended to be used.

Strengthening response capacity is carried out through a series of contingency planning activities, preparation of evacuation plans, and a series of drills. Residents are also directed to have a strategy for providing evacuation assistance by volunteers when carrying out self-rescue

Based on the field data obtained, it can be seen that there is no early warning system for landslide hazards in this area. Respondent named Afan who is one of the village officials in Wukirsari Village confirmed this, but Afan said the Disaster Risk Reduction Forum in Wukirsari Village has increased the understanding and capacity of residents in responding to disasters that occur through outreach activities. Socialization activities were carried out using digital visualization in the form of videos and presentation slides. Meanwhile, a respondent named Suwono, who is one of the resi-

dents around the landslide area, said that residents use the WhatsApp group to communicate and coordinate when there is a danger or a disaster occurs.

Although these efforts have more or less increased the capacity of the community in responding to disasters that have occurred, the absence of an early warning system in the landslide area has resulted in casualties. Azhari, a royal servant at the tomb complex of the kings of Imogiri, said that the landslide occurred at night so that none of the residents realized when it was about to occur.

Other efforts were also made by various parties to increase community resilience. Paripurno (2020), they carried out a series of activities that use geology information to achieve the expected achievement targets, namely (1) The occurrence of a community/partner prevention and mitigation process, (2) The strengthening of the preparedness of the community/partners; (3) The community/partners will disseminate their capabilities to other areas. The activities and Information and Communication Technology media used are shown in the following table 1.

Table 1. Geology information and communication technology media usage

Activities	**Information and Communication Technology media**
Disaster risk participatory mapping	GPS, ArcGIS, digital earth map
Hazard character participatory monitoring	PowerPoint slide presentations, audiovisual
Disseminating landslide potential information	Video, PowerPoint slide presentations, audio-visual
Strengthening participatory response capacity	Video, PowerPoint slide presentations, audio-visual

In disaster risk, participatory mapping, GPS, ArcGIS, and digital earth maps are used to create landslide hazard maps in the research area. Next, in the hazard character participatory monitoring activity, a group discussion forum was conducted using PowerPoint slide presentations and audio-visual as a medium of communication with participants. For Disseminating landslide potential information and strengthening response capacity activities, digital visualization media in the form of videos and PowerPoint slide presentations and audiovisual are used, so that it is hoped that participants will more easily understand the information presented and be able to spread their knowledge to the wider community. The four activities are in accordance with the four principles of an effective early warning system, so it is hoped that it will encourage the establishment of an early warning system for the people in the research area.

V. CONCLUSION AND FURTHER RESEARCH

The model of geology information using digital audio and visualization media has been able to increase community-based awareness of resilience in (1) assessing and mapping landslide risk, (2) monitoring the character of landslide hazards, (3) disseminating information on potential land-

slides, and (4) strengthening community response capacity against landslides. This point can increase the capacity of the community for prevention and mitigation.

VI. REFERENCES

Kuppuswamy, S. (2010). ICT Approaches in Disaster management: Public Awareness, Education and Training, Community Resilience in India. Advanced ICTs for Disaster Management And Threat Detection: Collaborative and Distributed Frameworks, 22- 34.

Kuppuswamy, S., & Rajarathnam, S. (2009). Women, information technology, and disaster management: tsunami districts of Tamil Nadu. International Journal of Innovation and Sustainable Development, Vol. 4, Nos. 2/3, 2009, 206-216.

Paripurno, E., Lassa, J., Pujiono, P., Magatani, A., Parlan, H. (2014). Panduan Pengelolaan Risiko Bencana Berbasis Komunitas (PRBBK). Jakarta.

Paripurno, Eko Teguh. 2006. Penerapan PRA untuk Manajemen Bencana. Yogyakarta: Pusat Studi Manajemen Bencana UPN Veteran Yogyakarta.

Sagun, A. (2010). Efficient Deployment of ICT Tools in Disaster Management Process. Advanced ICTs for Advanced ICTs for and Threat Detection: Collaborative and Distributed Frameworks, 212.

Sauvagnargues-Lesage, S., & Ayral, P.-A. (2007). Using GIS for emergency management: a case study during the 2002 and 2003 flooding in south-east France. Int. J. Emergency Management, 682-703.

Suriadi, A.B. dkk. 2014. Analisis Potensi Risiko Bencana Tanah Longsor di Kecamatan Ciamis dan Kota Banjar, Jawa Barat. Bogor : BIG.

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