

ICT application in CBDRM in Karangtengah village Bantul Regency

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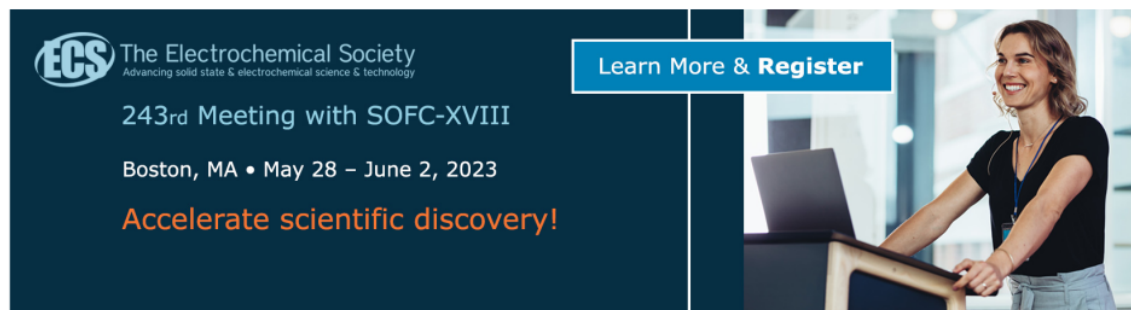
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ICT application in CBDRM in Karangtengah village Bantul Regency

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Abstract. This research was conducted in Karangtengah Village, Imogiri District, Bantul Regency, Special Region of Yogyakarta. The landslide incident that occurred in the Karangtengah Village area on November 28, 2017 then prompted several groups to take the initiative to install an early warning system and several other supporting tools at the scene. This study aims to identify what Information and Communication Technology tools already exist in the Karangtengah Village area that can support landslide hazard monitoring activities, and see how residents manage these tools. This research was conducted with a qualitative method using a Participatory Rural Appraisal tool. The results of this study show that the presence of Information and Communication Technology tools requires the community to have the capacity to synergize with existing tools and manage them independently so that there is no failure of the role of Information and Communication Technology in supporting the work of Community-Based Disaster Risk Management in Karangtengah Village. Access to data generated by existing Information and Communication Technology tools will also be useful for residents to monitor phenomena or conditions around them.

1. Introduction

One of the natural disasters that often occur in the Special Region of Yogyakarta is a landslide. One of the landslide events occurred in November 28, 2017, high rainfall caused landslides in Karangtengah Village, Bantul Regency, Special Region of Yogyakarta, precisely in the the Local Transmigration area of Mojolegi (RT 06) and Karangrejek (RT 07) Hamlets. This incident caused severe and moderate damage to 2 resident's houses. There were no fatalities in this incident, but at that time 49 families had to be evacuated as a result of the incident.

In the following landslide hazard map of Bantul Regency, it can be seen that most of the Karangtengah Village area is in the medium category, but there are also a small number of areas that are in the high category.



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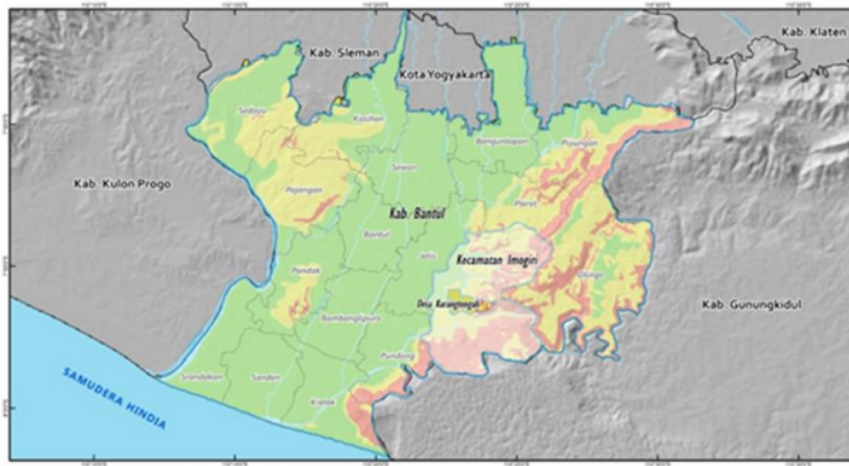


Figure 1. Bantul Regency landslide hazard map

The occurrence of natural disasters cannot be prevented, but humans can minimize losses due to disasters by managing the risks. Disaster risk management is defined as a conceptual framework which basically focuses not on managing disasters and their consequences, but on reducing threats and their potential losses.

Currently Community-Based Disaster Risk Management (CBDRM) has become an important pillar in disaster risk management affairs, using the CBDRM approach disaster risk management affairs will at least be more efficient, because by maximizing local resources and minimizing external resources, then in ideally will be able to reduce transaction costs. So far, disaster management works have shown less significant results in the field of disaster risk reduction because they still focus more on emergencies, the approach used is top-down and tends to be structural [1].

The community of Karangtengah Village itself has actually formed a Disaster Risk Reduction Forum (FPRB) as one of the efforts to implement CBDRM. In the Karangtengah Village area, several types of hazard detection tools have even been installed as a form of implementing ICT for disaster management, such as ground movement detection devices and rainfall gauges. However, it is suspected that the management of these tools is still lacking in involving the community. Therefore, a documented study is needed to identify the current application of ICT in supporting CBDRM practices in Karangtengah Village, as well as how the capacity of residents to synergize with existing ICTs.

ICT has great potential in disaster management [2]. Studies around the world show that the application of ICT by the disaster risk management agency of a region is an important aspect in relation to their disaster risk management efforts. Information is the key in disaster risk management, so ICT plays an important role in collecting and processing information dissemination on disaster risk management efforts globally, for that there must be a documented study on the application of ICT in disaster risk management efforts that have been ongoing so far [3].

In an exploratory study entitled "Redefining Community Based Disaster Risk Management (CBDRM) through Enhanced Early Warning Processes" it is stated that early warning is a trigger for actions taken by the community in responding to disasters. Therefore, it is necessary to emphasize that early warning is an important element in CBDRM. The study used a CBDRM prototype design which was systematized to be integrated with early warning tools, which was later called a community-based early warning system, the system enabled the community to take an active role in its implementation [4].

Based on the background described before, some questions can be formulated as follows:

- How is the community-based landslides risk management in Karangtengah Village?
- How is the application of ICT in community-based landslide risk management in Karangtengah Village?
- How is the community management of ICT in Karangtengah Village?

2. Methods

The approach used in this study is a qualitative method using PRA tools, the use of PRA tools is in accordance with qualitative research which basically has the aim of understanding the community with their own frame of reference [5].

PRA is a set of approaches and methods that function in learning about rural life and conditions by, together, and from rural communities, it can also be used to enable rural communities to share, improve, and analyze life knowledge and the conditions they have, to plan and act [6. This approach aims to change social reality based on deep knowledge into everyday practices obtained through participatory research by reflecting on participatory methods [7.

3. Results and Discussion

3.1. Community-based landslides risk management in Karangtengah Village

3.1.1. Landslide Disaster Risk Management in Pre-Disaster Phase. Sugito said that about a month before the landslide incident, the village held a Destana inauguration activity, in this series of activities the Destana team and residents also carried out emergency response simulations. And also coincidentally the location used for the simulation is right at the location of the landslide. However, basically the selection of the location as a simulation location was actually based on a survey conducted by the BPBD, where according to them, the location was the most prone to landslides.

Sugiman told that the Destana activities organized by BPBD Bantul Regency were overall carried out for 13 days and were attended by 30 representative participants from the Civil Service, FPRB, PKK, Karang Taruna, Linmas, and community leaders from Karangtengah Village. In this series of activities, emergency response trainings were provided to deal with earthquakes, landslides, floods and hurricanes, both in the form of training in theories and practice of evacuation simulations as well as the establishment of refugee camps and public kitchens.

3.1.2. Landslide Disaster Risk Management in the Emergency Response Phase. Sugito, who at that time served as Head of Karangtengah Village, arrived at the location when the landslide material had buried several resident's houses and roads. The situation at that time, the landslide had stopped but the rain was still falling heavily, seeing this condition Sugito immediately instructed to evacuate residents who were near the landslide point.

Evacuation was carried out by the Destana team and directly led by the Village Head, the village government provided 2 main points as evacuation sites, namely the As-Shobari Mosque in Karangrejek Hamlet which was approximately 400 meters from the location of the landslide incident, and the At-Taqorub Mosque in Mojolegi Hamlet which was located approximately 800 meters from the location of the landslide, but there were also residents who chose to flee to the homes of their relatives, who were still in the vicinity of Karangrejek and Mojolegi hamlets.

After the evacuation of the residents was under control, at around 3 pm, the Village Head and the Destana team immediately set up a public kitchen in the resident's houses which were on the south side of the As-Shobari Mosque, Karangrejek Hamlet. After all residents have been evacuated, then data collection is carried out on all displaced residents, both those who fled in evacuation sites provided by the village government or who took refuge in people's homes.

3.1.3. Landslide Disaster Risk Management in the Post-Disaster Phase. The day after the incident, a volunteer offered to conduct a study on the landslide incident which would be carried out by a team from UPN Veteran Yogyakarta. The village government accepted the offer. The next day the UPN Veterans Yogyakarta team came to the Command Post at the Village Hall and then immediately inspected the location of the landslide incident accompanied by the FPRB of Karangtengah Village. A few days later the team from UPN Veteran Yogyakarta returned to the location to conduct a further study, and produced a recommendation that approximately 6 houses were in the landslide red zone and had to be relocated because the soil conditions on the hillside on the east side of the residential area were prone to landslides, the houses belongs to (1) Hariadi, (2) Suhardopo, (3) Widodo, (4) Wahono, (5) Agus, and (6) Muji Mulyono. In addition, from the results of the study, it is also recommended for several houses in the yellow zone of landslides whose position is below the west side of the red zone to leave the location temporarily in case of heavy rains.



Figure 2. Landslide red zone map

Based on the recommendation from the UPN Veterans Yogyakarta team to relocate the residents' houses in the red zone, the village government then submitted an application to the BPBD for assistance in relocating the residents' houses. Then, in 2019 funds from the APBD were disbursed for the realization of the relocation project.

3.2. Application of ICT in community-based landslide risk management in Karangtengah Village

There are 4 ICT tools that have a function for disaster risk reduction in Karangtengah Village. These tools are (1) two landslide early warning systems, (2) soil moisture monitoring tools, and (3) automatic rainfall gauges. The flow of information processed by these tools can be seen from the working concept of these tools as follows.

3.2.1. Long Pulley Landslide Early Warning System. Mechanical linear device → analog data detector → data acquisition device → SMS gateway device → receiver & alarm.

3.2.2. Soil Moisture Monitoring Tool. Soil moisture sensor, underground temperature sensor, ground vibration sensor → Atmega 2560 16 MHz chip → Nordic chip → D-Link network module → server.

3.2.3. Automatic Rain Recorder. Tipping bucket → AVR chip → Nordic chip → D-Link network module → server.

3.2.4. Short Pulley Landslide Early Warning System. Rotary sensor → Atmega 16 MHz chip → oscillator → alarm.

3.3. Community management of ICT in Karangtengah Village

Based on field facts, it was found that the short pulley landslide early warning device was not working properly. Sugito said that the wire attached to the device is too sensitive to movement, even if it is not caused by ground movement, so that it often causes false warnings.

Widodo also said that the device often gave the wrong warning. Because incidents like this have happened several times, which caused panic among the residents, Widodo turned off the device

There were several wishes from residents regarding the management of soil moisture monitoring tools and automatic rainfall gauges that had been conveyed, Sugito wanted the village government or FPRB to have access to information obtained from these two tools so that they could also monitor soil moisture conditions and rainfall. So that when the level of landslides vulnerability increases and begins to endanger local residents, they can convey this information and prepare to take the necessary follow-up actions.

Another wish from residents for the management of ICT tools installed in the Karangtengah Village area was conveyed by Yasin, he wanted the information generated from soil moisture monitoring tools, automatic rainfall gauges, and long pulley landslide early warning tools to be compiled and presented in a single information system to facilitate monitoring. Yasin also expressed his desire for socialization to be carried out for local transmigrant residents who are around landslide-prone areas along with representatives from the village government and FPRB regarding the long pull landslide early warning tool.

Following up on the request, the researcher and the team from the Disaster Management Study Center of UPN Veteran Yogyakarta conducted a socialization activity on how the tools in Karangtengah Village work, then facilitated the community to make deals so that they were able to manage these tools independently so that they could improve its effectiveness in supporting community-based landslide risk management activities in Karangtengah Village.

The topics discussed in the community facilitation activities are inclusive early warning systems and evacuation plans. From the facilitation activities carried out, agreements were made on several things as follows.

3.3.1. Monitoring and Warning Service. Previously, residents did not have an agreement regarding monitoring and warning services, residents only relied on a few FPRB members who sometimes volunteered to monitor conditions in the field. After facilitation, residents make an agreement regarding:

- Source of danger warning
- Hazard warning form
- How to monitor danger
- How to make sure the warning is correct

3.3.2. Dissemination and Communication. In matters of dissemination and communication, residents have never made an agreement before, no one has yet been responsible for this matter. Residents only take instinctive actions spontaneously when an emergency occurs. After facilitation, residents make an agreement regarding:

- Warning sender
- Warning target
- How to send a warning
- Warning form

3.3.3. Response Capacity. Basically, in terms of the ability to respond, the village government has sufficient capacity. However, sometimes there is still misinformation so that the instructions given from the village government cannot be received correctly by the residents. From the facilitation carried out, residents made an agreement about:

- Village government actions
- Community action

3.3.4. *Evacuation Plan*. In the discussion of the evacuation plan, the following aspects were identified:

- Residents in vulnerable areas
- Evacuation place
- Equipment for evacuation owned
- Evacuation location capacity

3.3.5. *Evacuation Map*. After the evacuation plan is agreed upon, then an evacuation map is drawn. Evacuation routes are determined based on the results of the disaster risk assessment. By describing the evacuation map in a visual form, the community will be easier to understand.

4. Conclusion

4.1. ICT in Karangtengah Village:

- There are 4 units of ICT tools in Karangtengah Village, namely 2 units of tools as an early warning system for landslides, 1 unit of soil moisture monitoring tool, and 1 unit of automatic rainfall gauge.
- The four units of the tool produce data regarding natural phenomena or phenomena that occur.
- Both units of the landslide early warning system have a mechanism for disseminating information to residents around the location for the data generated. The data produced by soil moisture monitoring tools and automatic rainfall gauges have not yet been disseminated to residents.

4.2. Community management of ICT in Karangtengah Village:

- involving residents in the independent management of existing ICT tools in the form of providing access to data owned by the owner of the tool to the village party either through village officials or the village FPRB will be useful for residents to monitor natural phenomena or phenomena that occur in order to increase their awareness.
- To avoid the failure of the role of ICT that has been implemented in Karangtengah Village in realizing the success of CBDRM, the residents need to have an agreement by doing (1) Establishing hazard monitoring and warnings, (2) Determining the dissemination of hazard warnings, (3) Determining responses/actions to warnings.

References

- [1] Paripurno E, Lassa J, Pujiono P, Magatani A and Parlan H 2014 *Panduan Pengelolaan Risiko Bencana Berbasis Komunitas (PRBBK)* Jakarta
- [2] Kuppaswamy S and Rajarathnam S 2009 *Women, information technology and disaster management: tsunami districts of Tamil Nadu. International Journal of Innovation and Sustainable Development* **4(2/3)** 206-216
- [3] Wilson J and Wilson F 2018 *The use of ICT in Disaster Risk Management: A Case Study of Nema Borno State* MAT Journals **5(1)** 44–66
- [4] Pineda M V G 2015 *Redefining Community Based Disaster Risk Management (CBDRM) through Enhanced Early Warning Processes* International Journal of Information and Education Technology **5(7)** 543–548
- [5] Taylor S J, Bogdan R and DeVault M L 2016 *Introduction to Qualitative Research Methods* Wiley
- [6] Chambers R 1994 *The Origins and Practice of Rural Appraisal* World
- [7] Bergold J and Thomas S 2012 *Participatory research methods: A methodological approach in motion* Historical Social Research **37(4)** 191–222

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