

Socialization and Making of Landslide Disaster Warning Equipment in Gentan Village, Sukoharjo

Budi Siswanto¹, Aznika Putu², Bhisma Pandya³, Dewi Azizah⁴, Hafizh Rafi⁵, Safiq Prasetyo⁶, Raoul Kennan⁷, Vernanda Salsabila⁸, Vincensia Mutiara⁹, Wildan Naufal¹⁰, Yusuf Nur¹¹

Budi Siswanto (08128880905)

¹Sebelas Maret University

E-mail: budisiswanto@staff.uns.ac.id

²Sebelas Maret University

E-mail: aznikaputudhiyani03@student.uns.ac.id

³Sebelas Maret University

E-mail: bhismasuryane@student.uns.ac.id

⁴Sebelas Maret University

E-mail: dewiazizahn12@student.uns.ac.id

⁵Sebelas Maret University

E-mail: hafizhrafii@student.uns.ac.id

⁶Sebelas Maret University

E-mail: safiqqprasetyon@student.uns.ac.id

⁷Sebelas Maret University

E-mail: raoulkennan@student.uns.ac.id

⁸Sebelas Maret University

E-mail: vernandasalza@student.uns.ac.id

⁹Sebelas Maret University

E-mail: vincensiamutiara@student.uns.ac.id

¹⁰Sebelas Maret University

E-mail: wildannaufalardhi@student.uns.ac.id

¹¹Sebelas Maret University

E-mail: yusufnurwahyudii@student.uns.ac.id

Abstrak: Penelitian ini bertujuan untuk meningkatkan kewaspadaan dan kesadaran masyarakat tentang kemungkinan bencana yang dapat terjadi di Desa Gentan. Pada Desa Gentan sering terjadi berbagai jenis bencana alam, salah satunya yaitu bencana tanah longsor. Pada penelitian ini dilakukan pembuatan alat yang dipasang pada daerah rawan terjadi bencana tanah longsor. Alat ini bertujuan untuk memberikan pemberitahuan berupa suara sirine ketika terjadi bencana tanah longsor sehingga diharapkan dapat bermanfaat bagi masyarakat sekitar. Dalam pelaksanaan kegiatan ini, Badan Penanggulangan Bencana Daerah (BPBD) berpartisipasi dalam memberikan informasi tentang bencana alam dan cara menanggulungnya. BPBD dan masyarakat setempat juga mendukung dan ikut serta dalam pemasangan alat peringatan bencana tanah longsor di tempat rawan bencana tanah longsor. Dampak dari kegiatan ini mampu meningkatkan pengetahuan dan kewaspadaan masyarakat Desa Gentan tentang bencana tanah longsor. Alat peringatan bencana tanah longsor tersebut diharapkan dapat diperbanyak dan dikembangkan agar menjadi lebih efektif.

Kata Kunci: bencana, sinyal peringatan, teknologi

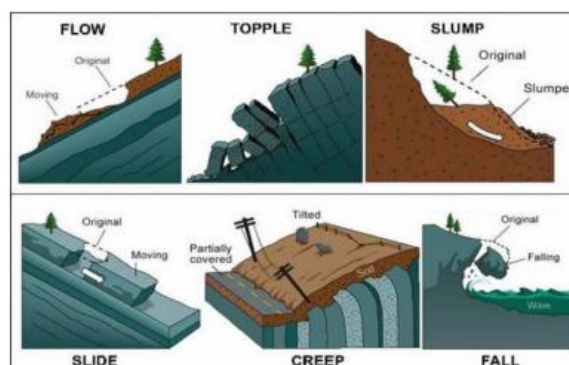
Abstract: *This research aims to enhance the awareness and consciousness of the community regarding the potential disasters that may occur in Gentan Village. Various types of natural disasters frequently occur in Gentan Village, one of which is landslides. In this study, a device was created and installed in landslide-prone areas of Gentan Village. The purpose of this device is to provide notifications in the form of a siren when a landslide disaster occurs, with the hope that it will be beneficial to the surrounding community. In the implementation of this activity, Badan Penanggulangan Bencana Daerah (BPBD) participated in providing information about natural disasters and how to mitigate them. BPBD and the local community also supported and actively participated in the installation of landslide warning devices in landslide-prone areas. The impact of this activity has been able to increase the knowledge and awareness of the Gentan Village community regarding landslide disasters. The landslide warning devices are expected to be replicated and further developed to become more effective.*

Keywords: *disaster, warning signal, technology*

Introduction

A disaster is an event or event, both natural and non-natural, which results in losses in the form of casualties, property damage, and disrupts the balance of life (Wang & Moriguchi, 2009). One example of a natural disaster that occurs in Indonesia is a landslide. Landslides are geological events that arise due to natural geological factors and human activities in land management. The impact caused by this disaster is detrimental in various aspects, both in environmental aspects and economic and social aspects (Putra et al., 2017).

A landslide is when the ground suddenly or suddenly collapses or significant movement in large quantities, especially in areas with steep and unstable slopes. Landslides, or soil movements involving rocks, a mixture of soil and rocks, can occur due to disturbances in the stability of the soil or rocks that make up those slopes (Adiwijaya, 2017). This type of soil movement can be grouped into six types, namely fall, flow, slide, slump, topple, and creep (Sidle & Ochiai, 2006). There are two main factors that affect the type of soil movement, namely the speed of its movement and the moisture content in the material that undergoes the soil movement.



Picture 1. The mechanism of occurrence of landslides

The occurrence of landslides, in addition to being influenced by internal factors on the slope, is often also triggered by other factors such as rainfall, vibration, and human activities. These provoking factors can accelerate the increase in the driving force or the force that drives ground movement, reduce the resisting force of the movement, or even both factors simultaneously. Rain is one of the natural triggering factors, while vibrations can come from natural events such as earthquakes or non-natural events such as explosions or vibrations from motor vehicles. Non-natural trigger factors can also come from human activities, such as digging or cutting on slopes and loading (Syahputra et al., 2021).

The high level of losses suffered by the community due to natural disasters is caused by the lack of knowledge possessed by the community about potential natural disasters that may occur around them (Guzzetti et al., 2008). As a result, public awareness of how to deal with disasters is still in the low category. Therefore, early information about disaster potential and risk is one way to provide a basic education to the community in dealing with disasters (Naryanto et al., 2019).

Gentan Village itself is one of the villages located in Bulu District, Sukoharjo, Central Java. This village area is in the form of hills with medium to steep slopes with rock constituents dominated by rock material and red soil which causes prone to soil shift. Especially with the entry of the rainy season which causes high rainfall to pour the region. From this situation, Gentan village is classified as an area prone to landslides.

When in the pre-disaster stage, the role of the community becomes important, especially in the mitigation aspect. Disaster mitigation involves various steps, starting from planning and implementing actions to reduce the potential impact of a disaster before the disaster itself occurs (Prastowo, 2022). This includes preparedness and long-term risk reduction measures. In carrying out pre-disaster activities, there are various ways or efforts that can be done to reduce the impact and risks that can arise if a disaster occurs, such as educating the public about disaster mitigation efforts. One of the efforts that can be done is by making a simple landslide disaster warning tool (Wibowo et al., 2022).

The landslide disaster warning system is one of the efforts that can be done by using simple tools as an early warning of landslide hazards (Somantri, 2008). Adjusted to the problems in the Gentan village area, a warning device was made to detect soil movement that caused landslides. This tool is made from easily available materials that are cheap so that they can be imitated by the public. With this tool, it is hoped that the community can be more responsive if there are indications of soil movement in their home environment (Aryani, 2020).

Based on the above phenomenon, researchers are interested in carrying out an activity to assist residents in early detection of natural signs of disaster along with knowledge and how to make landslide disaster warning tools as a means of detecting landslide disasters in Gentan Village, Bulu District, Sukoharjo.

Method

The method used in this activity is using an action research method that involves target community groups, namely people who are in areas with steep slopes such as in Gentan Village. Where in the hamlet there was a landslide disaster. This activity is divided into 2

stages, namely the preparation stage and the implementation stage. The preparation stage is carried out by observation to points that are prone to landslides. After that, ask permission from related parties to carry out socialization activities, namely to the Gentan village government and RT or RW parties to carry out socialization and ask for assistance to gather residents who are target community groups (socialization targets) to be carried out by researchers. The implementation stage is carried out with material delivery activities along with demos or practices of making landslide disaster warning tools. The material and activities carried out at the implementation stage are shown in Table 1.

Table 1. Socialization Activity Material

No	Material	Purpose
1	Read natural signs/early warnings of natural disasters	People to be more responsive when signs of natural disasters occur such as heavy rain, shaking ground, etc.
2	Introduction of simple landslide warning tools	Introducing simple tools that can be used to detect the occurrence of disasters.
3	Manufacture of simple landslide disaster warning tools	The community in order to be able to make landslide disaster warning tools independently.

Discussion

Researchers carry out community service by organizing socialization activities on the interpretation of natural signs as early warnings of natural disasters, as well as introducing the concept of TTG (teknologi tepat guna). One example of TTG introduced is a simple tool to detect landslides and how to make them. This activity involved the participation of residents of Gentan Village who had previously experienced landslides in 2017. In addition, this activity also involves the community around the disaster site as well as youth who are members of the village Karang Taruna group, which has an important role as a young pioneer in disaster response efforts in the region.

This activity took place around locations that had experienced landslides. Initially, the students conducted surveys in village areas to identify areas that were vulnerable to disasters, which would be the focus of joint activities with targeted community groups. Furthermore, they coordinate with the village administration to obtain approval for the implementation of this activity. After approval, researchers plan the tools to be used based on previous literature studies. This tool was chosen because it is easy to make and does not require large costs, making it easier for people to make it themselves in their homes.

A. Introduction of Simple Landslide Disaster Warning Tool

This simple landslide disaster warning tool has a function as a warning system that will be active when there is a landslide threat around the area where residents live. The aim is to provide early warning to the community, especially for those living in areas with steep slopes, so that they can identify potential landslide hazards and take anticipatory measures when such disasters occur. Although this device has limitations in its detection range, it is only able to

detect landslides around the area of residents' homes, but because each device can only watch one point, it is expected that every house in a potential landslide area has at least one warning device in it.

This tool is made of simple components such as power jacks and terminals, boxes and lids, sockets for batteries, sirens, batteries, siren support poles, and the last is a cable. The working principle of this tool is also simple, that is, if there is a moving ground or landslide, it will pull a steel cable or mining rope which causes the power jack to be released which will then sound the siren that has been installed at the top of the tool box.



Picture 2. Socialization of tools to residents of Gentan Village



Picture 3. Installation of tools with residents of Gentan Village

B. Demonstration of Making Simple Landslide Disaster Warning Tools

In this stage, demonstrations were carried out to make a simple landslide warning device. This stage begins by gathering targeted community groups in the same location, namely around areas that have experienced landslides. Next, the presenter began the delivery of prepared materials, including information on how to identify natural signs as early warnings of natural disasters, as well as the introduction of a simple landslide warning device. After the material has been delivered, the next stage is to introduce the components and materials used in simple landslide warning devices, as well as how they are made and used. The tools and materials required are as in Table 2.

Table 2. Tools and Materials

No	Tools	Materials
1	Multimeter	Sirine 6-14 V
2	Scissors	Jack 6.5 mm
3	Solder	Socket Jack 6.5 mm
4	Tenol solder	9 Volt Battery
5	Screwdriver	Plastic Box
6		Rope mine
7		Iron pegs
8		PVC Pipe
9		Iron Pole
10		Cement
11		Cable Insulation
12		9 Volt Battery Socket



Picture 4. Tool overview

How to make a simple landslide disaster warning tool:

1. Pair the siren with the pole provided above the box.
2. Circuit in parallel between the siren and the battery socket.
3. Install the trigger alarm (terminal power jack) to the box and connect the cable to it.
4. Install the battery with the battery socket that has been connected to the siren earlier.
5. Close the box with the existing lid.
6. Connect the power jack with the strap.
7. The rope connected to the power jack is attached to a peg that is plugged into a disaster-prone point.

Conclusion

This research was conducted in Gentan Village located in Bulu District, Sukoharjo, Central Java. This village area is in the form of hills with medium to steep slopes with rock constituents dominated by rock material and red soil which causes landslides. Therefore, a landslide disaster warning device was made to detect landslides around residents' homes. This tool is classified as a simple tool both in manufacture and use so that it is hoped that villagers around whose houses have slopes or ravines can have / make tools that have been modeled so that residents are responsive and get fast information when landslides occur around their homes. This activity began with observation to disaster-prone points then continued with socialization related to early warning of natural disasters and how to make simple landslide disaster warning tools.

Acknowledgements

This work program can be implemented well thanks to assistance from various parties, for that the researcher would like to thank the BPBD, KKN friends, Gentan village officials, and all residents of Gentan village who have provided good cooperation in the implementation of this work program.

References

- Adiwijaya, C. "Pengaruh Pengetahuan Kebencanaan dan Sikap Masyarakat Terhadap Kesiapsiagaan Menghadapi Bencana Tanah Longsor (Studi di Kelurahan Lawangintung, Kecamatan Bogor Selatan, Kota Bogor)." *Jurnal Prodi Manajemen Bencana* vol. 3, no. 2 (2017): 81–101.
- Aryani, D. A. "PEMAHAMAN RAMBU DALAM MENGURANGI KECELAKAAN LALU LINTAS DI NGUTER." *JURNAL PENGABDIAN TEKNOLOGI TEPAT GUNA* vol. 1, no. 2 (2020): 12–17. <https://doi.org/10.47942/jpttg.v1i2.704>
- Guzzetti, F., Peruccacci, S., Rossi, M., & Stark, C. P. "The rainfall intensity–duration control of shallow landslides and debris flows." *Geomorphology* vol. 97, no. 1-2 (2008): 56-71.
- Naryanto, H. S., Soewandita, H., Ganesha, D., Prawiradisastra, F., & Kristijono, A. "Analisis Penyebab Kejadian dan Evaluasi Bencana Tanah Longsor di Desa Banaran, Kecamatan Pulung, Kabupaten Ponorogo, Provinsi Jawa Timur Tanggal 1 April 2017." *Jurnal Ilmu Lingkungan* vol. 17, no. 2 (2019): 272.
- Prastowo, I. "Pelatihan PELATIHAN KEAMANAN DAN KESELAMATAN DI DESTINASI WISATA SESUAI STANDAR NASIONAL MAUPUN INTERNASIONAL BAGI PENGELOLA PARIWISATA DI KABUPATEN SUKOHARJO." *JURNAL PENGABDIAN TEKNOLOGI TEPAT GUNA* vol. 3, no. 1 (2022): 37–46. <https://doi.org/10.47942/jpttg.v3i1.829>
- Putra, A. W. S., & Podo, Y. "Faktor-faktor yang mempengaruhi tingkat pengetahuan

masyarakat dalam mitigasi bencana alam tanah longsor. ” Urecol 6th (2017): 305–314.

Sidle, R.C., & Ochiai, H. Landslides: Processes, Prediction, and Land Use. Washington, D.C.: AGU, (2006).

Somantri, R. Manajemen Bencana Alam. Jakarta: PT. Rineka Cipta, (2008).

Syahputra, T. S., Asyubi, H., & Darmawan, M. Y. “Perancangan Alat Ukur Pergeseran Tanah Skala Laboratorium.” *Jurnal Rekayasa dan Teknologi Elektro* vol.15 no.2 (2021): 83–88.

Wang, F., & Moriguchi, S. (2009). “Geohazards in humid tropics.” *Geomorphology* vol. 113, no. 3 (2009): 157-168.

Wibowo, Y., Rosita, D. N., Pardjer, M., Al Fawas, F. R. S., & Aji, R. K. C. G. “Sign System Untuk Masyarakat Di RT 04 RW 05 Dukuh Beran, Dusun III, Desa Dibal, Kecamatan Ngemplak, Kabupaten Boyolali, Jawa Tengah.” *JURNAL PENGABDIAN TEKNOLOGI TEPAT GUNA* vol. 3, no. 2 (2022): 132–143. <https://doi.org/10.47942/jpttg.v3i2.1058>