

## Disaster Education through Participatory Mapping of Abrasion Prone Areas in Sarang, Central Java

### Pendidikan Kebencanaan Melalui Pemetaan Partisipatif Daerah Rawan Bencana Abrasi di Sarang, Jawa Tengah

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**ABSTRACT** Participatory mapping of vulnerable areas has been considered a key abrasion mitigation. Compared to conventional mapping, participatory mapping is considered more effective because it can produce complete and detailed information a relatively quick process. However, given the limitations of the community, the participatory mapping process requires empowerment of the community. Participatory mapping itself acts as disaster education for the community. This research aims to provide disaster education through socialization and training on participatory mapping of GIS-based abrasion-prone areas in Sarang District, Rembang Regency based on community empowerment through a mixed-methods approach. Data are collected from interviews, observations, questionnaire, a document study, and FGD techniques. This research was also carried out as participatory mapping based on community empowerment through preparation, implementation, evaluation, and monitoring stages. The results of participatory mapping show that active involvement of the community physically and mentally, the formation of a map of the occurrence of abrasion, and increasing the capacity of knowledge, attitudes, and perceptions of the community. The resulting maps can be used as recommendations to local governments and guidelines for local communities.

**KEYWORDS** *Community Development; Disaster Education; Geographic Information System; Participatory Mapping.*

**ABSTRAK** Pemetaan partisipatif daerah rentan bencana telah dianggap menjadi kunci penting dalam mitigasi abrasi. Dibandingkan pemetaan secara konvensional, pemetaan partisipatif dirasa lebih efektif, karena melalui pemetaan ini akan didapatkan informasi yang lengkap dan detail dalam waktu yang relatif singkat. Meskipun begitu, mengingat keterbatasan yang dimiliki masyarakat, proses pemetaan partisipatif harus dilakukan melalui pemberdayaan. Pemetaan partisipatif merupakan salah satu bagian dari pendidikan bencana. Penelitian ini bertujuan untuk memberikan Pendidikan kebencanaan melalui sosialisasi dan pelatihan pemetaan partisipatif kawasan rawan abrasi berbasis GIS di Kecamatan Sarang, Kabupaten Rembang yang berbasis pemberdayaan masyarakat melalui pendekatan mixed method. Data diperoleh melalui teknik wawancara, observasi, angket, studi dokumen, serta FGD. Penelitian ini juga melakukan pemetaan partisipatif berbasis pemberdayaan masyarakat melalui tahap persiapan, pelaksanaan, evaluasi, dan monitoring. Hasil pemetaan partisipatif menunjukkan adanya keterlibatan aktif masyarakat secara fisik maupun pemikiran, terbentuknya peta kejadian bencana abrasi, serta peningkatan kapasitas pengetahuan, sikap, dan persepsi masyarakat. Peta yang dihasilkan dapat digunakan sebagai rekomendasi kepada pemerintah daerah serta pedoman bagi masyarakat setempat.

**KATA KUNCI** *Pemberdayaan masyarakat; Pemetaan Partisipatif; Pendidikan Kebencanaan; Sistem Informasi Geografis.*

## INTRODUCTION

Abrasion that occurs on the coast is one of the natural disasters that often occurs in Indonesia (Amri et al., 2016). This is because Indonesia is an archipelagic country with 3.25 of 7.81 million km<sup>2</sup> is an ocean area whose coastline stretches for 108 thousand km. The length of the coastline makes Indonesia very potential to experience abrasion. Apart from natural factors, abrasion is also caused by human factors, including people who cut mangroves and other vegetation but do not replant them, dredge sand excessively, damage coral reefs, and so on (Vatria, 2010; A Wicaksono et al., 2019). Coastal damage due to human factors has also been observed on beaches in Kragan District, Rembang Regency, as mentioned by Hamid et al. (2021), and at Marunda Beach, Jakarta, as mentioned by Rahmawati (2018).

One of the coastal areas in Central Java, Indonesia, which is prone to abrasion is Rembang Regency (Mahendra et al., 2017). The district has experienced abrasion for at least 12 years, namely in 2003 and 2004 and from 2010 to 2020 (Hamid et al., 2021). Apart from Kragan, the sub-district prone to abrasion in the district is Sarang District (Kementerian PUPR, 2018; Ronggowulan, 2015). BPBD Rembang (2017) states that Sarang District is one of four sub-districts prone to abrasion in the Rembang Regency. As a result of abrasion, the community suffered significant material losses, including the destruction of their homes, as shown in Figure 1. In addition, various fishing equipment, roads, and public facilities were also damaged. People also have to experience a feeling of anxiety for decades if signs of abrasion, such as the brunt of big

waves, begin to occur in the area where they live (Sutomo, 2019).



**Figure 1** Houses of Sarang Villagers Affected by Abrasion

Source: Sutomo, 2019

Even so, the efforts of the government and the community in dealing with it are still very minimal. On average, the community only does physical countermeasures by installing large rocks, bamboo, and sacks filled with sand (Mustofa, 2020). The lack of physical response is exacerbated by public knowledge about abrasion. It is known from the results of interviews with several people about abrasion, which generally show that people do not understand about abrasion and the things that can trigger it, so it is not surprising that in the end, people continue to carry out activities that indirectly trigger abrasion, such as by clearing mangrove forests.

Physical mitigation efforts will be more effective if the community has information or databases about disaster-prone areas and areas that have the potential for disasters to occur (Buba et al., 2021). Mapping disaster-prone areas obtain the database on areas prone to and potentially prone to abrasion. Mapping can be done in various ways, including GIS and remote sensing (Nuryanti

et al., 2018). Remote sensing can be done during a disaster by sensing but not touching the object directly (Puturu, 2015). Mapping can also be done with software in ArcGIS, which combines spatial and non-spatial data (Konnely, 2002). Previous research conducted by Rahmad et al. (2018) shows that GIS is appropriate for mapping disaster-prone areas.

Unfortunately, this mapping effort has not been carried out in various disaster-prone areas in Indonesia, especially in Sarang District, Rembang Regency (BPBD Rembang, 2017). As a result, the community does not have a database or inventory system on specific points prone to abrasion. Its impacts are making decisions or actions that may be less effective or not on target. On the other hand, if using a disaster-prone map, then decision-making or action on abrasion will be more effective so that the impact caused by the disaster can be suppressed in such a way (Subardjo and Ario, 2015; Arief Wicaksono et al., 2019).

Various parties can map disaster-prone areas, including the community that directly experienced the disaster. Therefore, the community does not need to wait for a government program to map areas prone to abrasion. Still, the community can also be proactive in carrying out disaster management efforts through mapping independently (Haryani, 2012).

Even so, people with low levels of education may not know the regional mapping. Therefore, it is necessary to empower disaster experts, geographers, and other competent experts in mapping areas prone to abrasion (Anwar et al., 2020). This mapping technique is also highly

recommended, considering that it makes disaster management more effective because its implementation involves a pro-active attitude of the local community, and the data is obtained on a bottom-up basis (Buba et al., 2021). This mapping is called participatory mapping (Sudaryanto et al., 2017).

Participatory mapping is part of disaster education for the community and provides disaster socialization and disaster preparedness training (Hamid, 2021). Participatory mapping is a part of disaster education because, in the process, the community maps their area and gets disaster information from disaster experts. Disaster experts will justify various misconceptions held by the community in handling abrasion and direct them to the correct perception and knowledge (Cadag and Gaillard, 2012).

This participatory mapping is deemed very urgent to do, considering that the Regional Disaster Management Agency (BPBD) of Rembang Regency has not made mapping disaster-prone areas a priority. The impact of the results of this study will be beneficial in disaster mitigation efforts for the people of the Rembang Regency, especially the Sarang District because this research will produce an abrasion-prone map of Sarang District that has never existed before.

The implementation of this research activity is also very much following what is written in the Strategic Plan of BPBD Rembang Regency 2016-2021, where BPBD states that current technological developments allow mapping to be carried out more effectively and efficiently, where one of the technologies in question is GIS for mapping disaster-prone areas (BPBD Rembang, 2017).

These GIS-based participatory mapping results were then used as recommendations to the BPBD of Rembang Regency as a component of abrasion management in the Sarang District. BPBD can use it as a material for consideration in deciding policies that the government and the community will carry out disaster mitigation. Through mapping, it will be known which areas deserve to be prioritized in disaster management to be more effective and efficient.

The results of participatory mapping can also be used to provide education and socialization to the community to reduce the risks due to abrasion. This benefit aligns with Amiruddin and Rozalinna (2020), which states that the results of participatory mapping can reduce the risk of natural disasters by providing information to the public.

Several previous studies have conducted participatory mapping to map the occurrence or vulnerability of natural disasters in an area. Among them are those carried out by Amiruddin and Rozalinna (2020), who mapped natural disasters in Tulungrejo Village, Batu City; Findayani (2015), which mapped the vulnerability to flooding disasters in the city of Semarang; and Wibowo et al. (2020) who carried out participatory mapping to create a tsunami evacuation route in the PagarJaya Tourism Village. Participatory mapping was also carried out in Nepal, Peru, and Mexico by Wei et al. (2018). Even so, of all the research on participatory mapping that has been carried out, no research has been conducted on abrasion, especially in Sarang District, Rembang Regency.

Based on this background, this research was carried out to know the implementation of participatory mapping of GIS-based

abrasion-prone areas in Sarang District, Rembang Regency, along with community empowerment carried out and the results obtained.

Considering that this research is based on empowerment, this research does not only produce a map of the occurrence of abrasion. However, it is also expected to provide implicit results in increasing the community's knowledge capacity, attitudes, and perceptions. It is also a novelty for this research.

This study uses a mixed research approach (mix methods). A qualitative approach describes the process and results of disaster education through participatory mapping of areas prone to abrasion based on GIS. A quantitative approach measures the community's knowledge, attitudes, and perceptions towards abrasion. The research was conducted in Sarang District, Rembang Regency, one of the sub-districts in Rembang Regency with a high threat of abrasion. Not all villages in Rembang Regency experienced abrasion, so in this study, three villages were taken, namely Kalipang Village, Temperak Village, and Karangmangu Village, as research locations.

The data in this study were collected through various techniques, including document study techniques, interviews, Focus Group Discussion (FGD), questionnaires, and observation (Creswell, 2014). Document study and interview techniques were conducted to determine the condition of the area to be mapped along with the availability of a map of abrasion in the area. The FGD technique was carried out to carry out participatory mapping, either manually using tracing paper or digitally via ArcGIS. Observation

techniques were carried out to observe the entire process during the participatory mapping activity. Essential things obtained during the mapping were recorded in the research notes.

Providing disaster education through a participatory mapping process is carried out through four main stages, namely planning, implementation, evaluation, and monitoring. Planning is carried out to prepare a plan for mapping activities to be carried out. However, preliminary research was conducted through observations in Sarang District and interviews with residents and district officials before that. The design that has been prepared is then applied to the implementation stage. After the implementation is complete, an evaluation is carried out to find out the successes and shortcomings during the mapping implementation. Monitoring is also carried out so that the researchers and the community can jointly monitor the occurrence of abrasion in the Kragan District.

The main subjects of this research are the people of Karangmangu Village, Kalipang Village, and Temperak Village. Subjects consist of population and samples. The study population consisted of all heads of households in the three villages, with 4158 households. The sample was determined using a random sampling technique, where all heads of families from the three villages had the opportunity to participate in mapping activities.

The sample used is determined using the Slovin formula as follows.

$$n = \frac{N}{N \cdot d^2 + 1}$$

Information:

n = Sample Size

N= Population Size

d = Estimation Error or degree of accuracy  
0.1

Based on the above formula, it can be seen the number of samples with the following calculations:

$$n = \frac{N}{N \cdot d^2 + 1}$$

$$n = \frac{4158}{4158 \times (0,1)^2 + 1}$$

$$n = \frac{4158}{42,58}$$

$$n = 97,7 = 98$$

The details of the sample in each village are shown in the following Table 1.

**Table 1.** Number of Research Samples in Each Village

Village	Number of Family Head	Number of Samples
Karangmangu	1473	35
Kalipang	1743	41
Temperak	942	22
Total	4158	98

Source : Researcher's Research Result (2022).

Apart from residents, this research also involved representatives of local government, BPBD, youth organizations, and volunteers.

The first data analysis was carried out on data from qualitative research results. This analysis was carried out through three stages: the analysis before the study, during the study, and after the study. The analysis before the research was carried out by knowing the condition of vulnerability to abrasion in Sarang District and the mitigation

efforts carried out, where it is known that participatory mapping has not been carried out. Furthermore, an analysis was carried out on implementing participatory mapping while in the field using the Miles and Huberman model. The analysis is carried out by collecting as much data as possible during the activity then reducing the required data according to the research objectives. The reduction results are then written into the discussion to get a conclusion (Creswell, 2014).

The following analysis was carried out on the community's knowledge, attitudes, and perceptions of the abrasion before and after the participatory mapping. The analysis was carried out in a quantitative descriptive manner. The research results will be presented descriptively by comparing knowledge, attitudes, and perceptions, before and after participatory mapping, without testing the hypothesis. Measurements were carried out before and after the participatory mapping.

The instrument used to collect data is a questionnaire containing indicators, as shown in Table 2 below.

**Table 2.** Indicators of Knowledge, Attitudes, and Public Perceptions

No	Aspects	Indicators
1	Knowledge of abrasion	Definition of abrasion <hr/> Signs of impending abrasion <hr/> Abrasion characteristics <hr/> Cause of abrasion <hr/> The impact of abrasion <hr/> Characteristics of locations that have the potential for abrasion <hr/> Abrasion preparedness

No	Aspects	Indicators
2	Attitude to abrasion	in handling abrasion <hr/> When abrasion occurs <hr/> Post-abrasion
3	Perception of abrasion	Abrasion prevention <hr/> The position of the community in dealing with abrasion <hr/> Post-abrasion recovery

Source: Hamid (2015), Hamid et al. (2021), and Jannah et al. (2013).

These three aspects have closed statements in a questionnaire with a Guttman scale, with two alternative answers, namely "Yes" and "No." If the answer is correct, it will get a value of 1, while if it is answered incorrectly, it will get a value of 0 (Creswell, 2014). Knowledge, attitudes, and perceptions aspects each have a total of 60, 40, and 30 statements. The values obtained by the community are then added up based on indicators. The average value of the entire community is searched so that the average percentage in each aspect is known. In addition to knowing each indicator's average percentage, the average percentage of each aspect is also sought. The percentage calculation uses the following formula:

$$\text{Percentage} = \frac{\text{Score Criterion}}{\text{Score Maximum}} \times 100\%$$

(Sugiyono, 2013)

The success of disaster education through participatory mapping that has been carried out in this research can be seen in the research process and results. The success of the research process that involves the active participation of the community refers to Mubyarto and Sartono (2000) is the existence of community involvement physically or by providing ideas. The success in terms of

research results based on empowerment, referring to Chambers (1992), is the harmony between humans and nature so that nature continues to be sustainable and support the lives of future generations.

## DISCUSSION

### The Implementation of Disaster Education Through Participatory Mapping Based on Community Empowerment

Disaster education through participatory mapping is done by involving and empowering the community as the subject in doing the mapping. Community empowerment is carried out by fostering public awareness about the vulnerability of abrasion in their area and then developing disaster management strategies by making abrasion maps. Previously, public awareness of abrasion was deficient, as indicated by people who considered abrasion as a common disaster so that it did not require special attention. After realizing that the abrasion is a severe disaster that must be handled, the community is invited to develop a coping strategy through mapping.

The implementation of participatory mapping based on community empowerment has been carried out by several previous researchers, including that carried out by Pradika et al. (2018) in Kepuharjo Village, Cangkringan District, Sleman Regency, DIY who carried out various disaster management efforts, one of which was through participatory mapping. In addition, Permatasari (2019) also carried out participatory mapping, which empowered the community to develop tourism in Pandowoharjo Village, Sleman

Regency. Unlike the two previous studies, participatory mapping in this study was carried out specifically on the occurrence of abrasion in Sarang District, which had never been done before.

**The implementation of participatory mapping is divided into four stages that can be detailed as follows.**

#### *Planning*

This stage is carried out by compiling the activities carried out while providing disaster education through participatory mapping. Planning is done after the preliminary research is done. The sub-district heads, village heads from several villages affected by abrasion, and several community representatives are among the parties involved in this stage. The time, place, and schedule for mapping activities are also arranged at this stage.

After completing the planning, the village head then provides information to the head of the RT and the village community about implementing mapping activities. People who have free time are expected to participate in mapping activities. The village head then fixed the community's willingness to participate in the activity from beginning to end. The fixation resulted in 98 participants spread from three sample villages, namely Kalipang, Karangmangu, and Temperak villages.

Furthermore, further preparations were made by preparing the tools and materials used for mapping. Among the tools and materials used are 1 set of maps containing a base map, a copy of the base map, and the latest satellite, tracing paper, permanent marker, pencil, cutter or cutter, large

scissors, ruler, masking tape, plastic tube, and calculator are also needed. The tools and materials had been prepared before the research was carried out.

Another preparation that must be done is to copy the base map. Copying begins by laying the tracing paper on a flat surface and pasting it with masking tape. The base map then begins to be copied along with its landmarks or essential features, given different colors. A further copy of the map is also added with basic information such as the village's name, the time of the mapping, etc. Mapping is done using tracing paper while the base map is stored. The base map will be used in case of damage to the tracing paper. Make at least two copies of the base map on tracing paper.

### **Implementation**

The provision of disaster education through mapping is carried out during September 2021. The activity begins with providing socialization related to the abrasion and various efforts made by the community to overcome it. After that, it was delivered in more detail about the mitigation efforts through participatory mapping. The next explanation is about the stages of participatory mapping activities that will be carried out, starting from preparation to implementing the mapping, which will produce a map of the occurrence of abrasions. Finally, the socialization was closed by explaining the use of the maps produced in this activity.

Participatory mapping was carried out by first circling several points in Sarang Sub-district that had experienced an abrasion—after arriving at these points, then taking

photos that will be used as completeness in identifying vulnerable areas later stage. After that, all components involved in the activity gathered at Kalipang Beach to conduct participatory mapping.

The participatory mapping was carried out using tracing paper in which the base tape was copied. Before the mapping begins, an introduction is given to the mapping activities carried out. It is because not all people understand mapping and its objectives and benefits for abrasion management. In addition, the community must first be familiarized with maps by explaining regional boundaries, several important points, and several landmarks on the map to facilitate the community in the mapping process.

Through the guidance of the researcher, the community will then show and tell about areas where abrasion has occurred. The researcher then gave signs on the map according to the instructions given by the community. The participatory mapping process can be shown in Figure 2 below.



**Figure 2.** Participatory Mapping through FGD

Source: Author, 2021

The researchers also provided the latest information about abrasion during the

mapping process. Researchers also try to provide new perspectives that the community should own to maximize abrasion prevention in Sarang District. Researchers and the community also held discussions so that in the mapping process, there was an exchange of ideas between the knowledge possessed by disaster experts and the experience of the community (Cadag and Gaillard, 2012; Cheung et al., 2016).

After getting the data through participatory mapping, the next step is digitizing the map. The information obtained is processed so that digital maps are produced as a result of Arc software processing carried out by researchers together with local communities who have adequate ICT capabilities. The resulting digital map is ready to be used as a recommendation. The government and researchers in the future can use the map as an additional means of providing disaster information and education to the community (Sriharini, 2010).

The submission can be made by printing a digital map, then pasting it at the Village Hall, in strategic places in the village, and distributed digitally through social media such as Facebook, WhatsApp, Instagram, Twitter, and so on which are owned by the village (Arisanti & Nugroho, 2018). The installation of this information is one of the most effective efforts to educate the public about abrasion-prone points in their area (Ruslanjari et al., 2019).

### **Evaluation**

This stage is carried out to evaluate the implementation of empowerment that has been carried out—the researcher evaluated with the sub-district head, village head, and

several community representatives. The evaluation results in terms of the research process show that participatory mapping through empowerment has been quite effective. It is indicated by the community's enthusiastic participation in welcoming and carrying out these activities. The community was excited to carry out this mapping activity because they realized its importance for future disaster management efforts. In addition, all activities can be planned and can provide the expected results. The community is present physically and contributes their thoughts so that the mapping process runs smoothly and effectively. The community also provides the information they have to the maximum to produce a comprehensive map. In addition, all activities can take place as planned. These results are the success of the empowerment process (Mubyarto & Sartono, 2000).

Evaluation is also carried out from the process side based on the results. This research is expected to produce a map of disaster events and increase community capacity in knowledge capacity, attitudes, and perceptions. These results are expected to support the sustainability of the coastal environment, as stated by (Chambers, 1992).

### **Monitoring**

This community empowerment activity is not only completed after mapping. Furthermore, researchers continue to monitor the development of the abrasion that occurred in Sarang District, Rembang Regency. Monitoring is carried out through WhatsApp groups. The sub-district head, village head, and several communities are members of the group. Through the group,

the community will report the abrasion in Sarang District. This information from the community is then used as data to upgrade the abrasion-prone map that has been formed previously. Through this monitoring, it is hoped that the information shown on the map can be continuously updated, considering that a disaster occurs in Sarang District every year.

### **Disaster Education Results Through Participatory Mapping**

Through mapping, disaster education produces several outputs, both explicitly and implicitly. Explicitly, the results can be seen in a disaster event map in Sarang District, Rembang Regency. This map was prepared based on information on abrasion events provided by the local community in a participatory manner.

The resulting map is then converted digitally and submitted to the Rembang Regency Government for further use to conduct disaster socialization and guide the community and government in maximizing disaster management efforts. This map hopes that the implementation of disaster management will be more effective and efficient, considering that disaster-prone areas have been identified.

The map produced in this study is a map of abrasion in the Sarang District. This map shows the areas in Sarang Subdistrict that have experienced the previous abrasion. This map provides an overview of areas that have experienced abrasion so that stakeholders can take more serious abrasion management efforts in the future. Of course, areas that have experienced abrasion will receive priority overcoming or handling that is far

more optimal than areas that have never experienced an abrasion. The map of the abrasion can be shown in Figure 3. Areas that have been affected by abrasion are shown in red.

The map of disaster events produced can guide local communities and migrants when visiting Sarang District. The local community will know more about the points of abrasion that have occurred over the last few decades. This information is critical to convey to the community, considering that not all people living in Sarang Sub-district are indigenous people who have lived for decades. Still, some people are also people who have recently moved to the sub-district. As for the immigrant community, either to travel to the beaches or to carry out various activities such as trade, religious trips, and academic trips, they can also use the map as a form of vigilance if at any time another abrasion occurs (Wibowo et al., 2020).

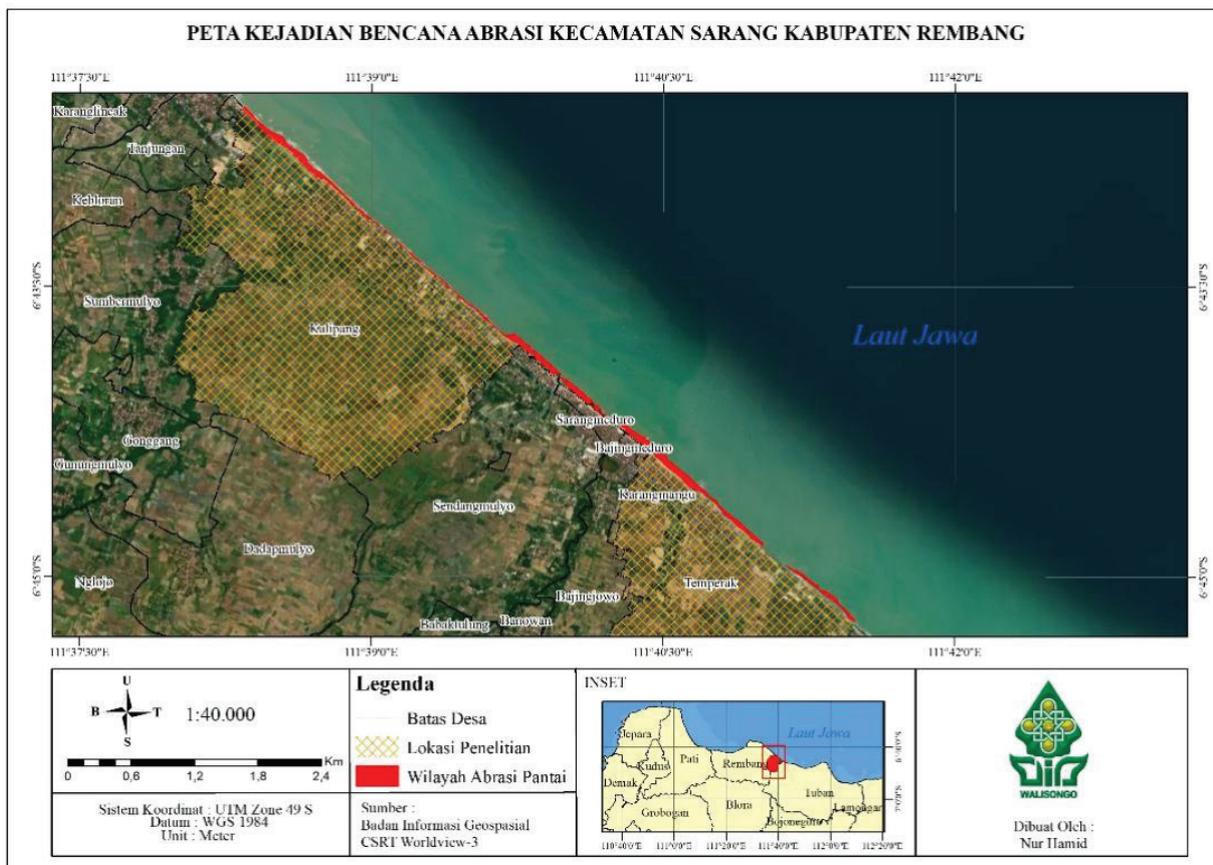
Furthermore, this study also carried out a more detailed mapping of the research sample's three villages. First, Mapping of Abrasion Events in Kalipang Village as shown in Figure 4. At least six points are most severely affected by abrasion in that village. These points are indicated by numbers 1 to 6 in Figure 4. The original areas that experienced abrasion can be shown by the four small pictures in Figure 4. Kalipang Village showed the most severe abrasion among the three villages mapped than the other two. There are six points in Kalipang village that have experienced abrasion, while the other two villages only have five points each. The abrasion incident occurred between 2003 and 2016.

The next mapped abrasion event is Karangmangu and Temperak villages, as shown in Figures 5 and 6. The total number of abrasion events in these two villages is five points, respectively, as shown by numbers 1 to 5 in Figures 5 and 6. The red area indicates the affected area's abrasion. The occurrence of the abrasion in Karangmangu Village in Figure 5 shows a wider red area than the other two villages, so it can be seen that the area affected by abrasion is the most extensive Karangmangu Village.

Except map of abrasion events, participatory mapping in this study also increases the community's knowledge, attitudes, and perceptions in dealing with abrasion. Before the participatory mapping was carried out, the community's knowledge about abrasion

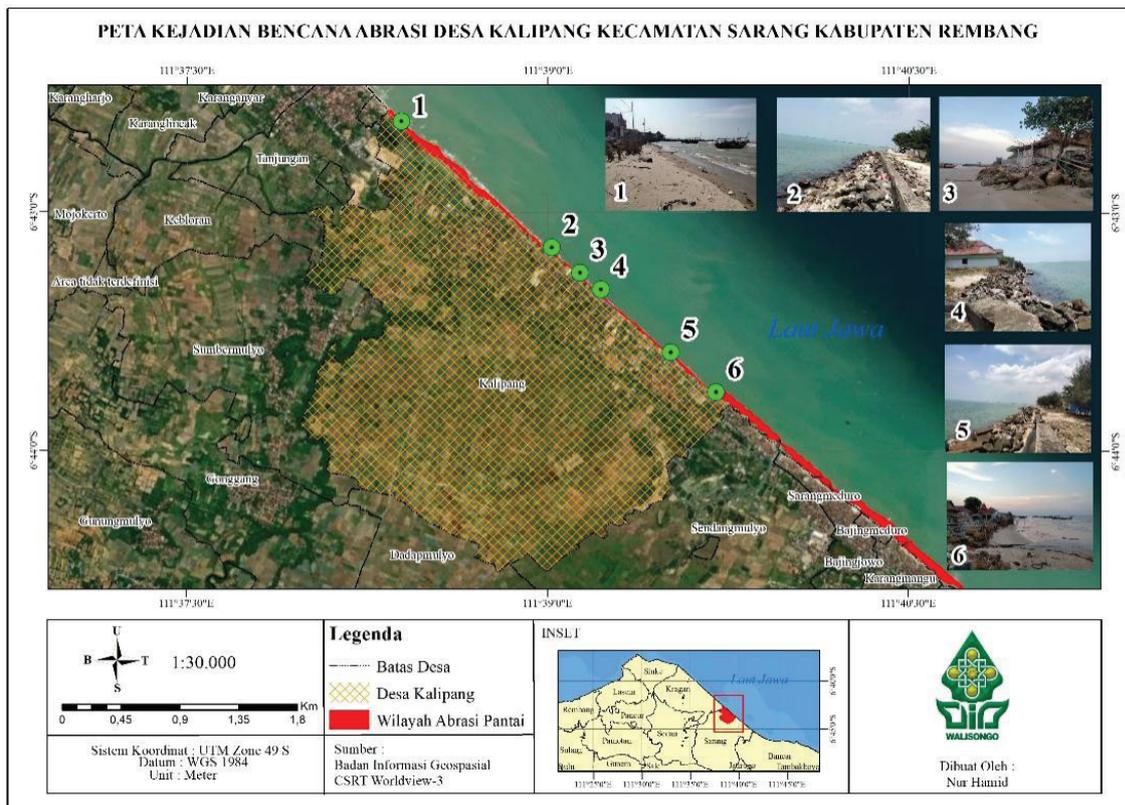
was still very minimal. This knowledge is also only owned by a few people who have participated in socialization or education. As for the other people, their knowledge is limited to experiences that have been experienced while living in the area and then provide their conclusions based on personal thoughts or opinions. Some of these thoughts are right, but some are not. Among the correct thoughts is the cause of the abrasion caused by waves, currents, and strong winds.

However, as many as 60% of the community did not know that the abrasion was also caused by coastal physical factors such as coastal typology, vegetation cover, and coastline shape (Amri et al., 2016). In addition, 50% of the community also knew



**Figure 3** Map of Abrasion Events in Sarang District, Rembang Regency

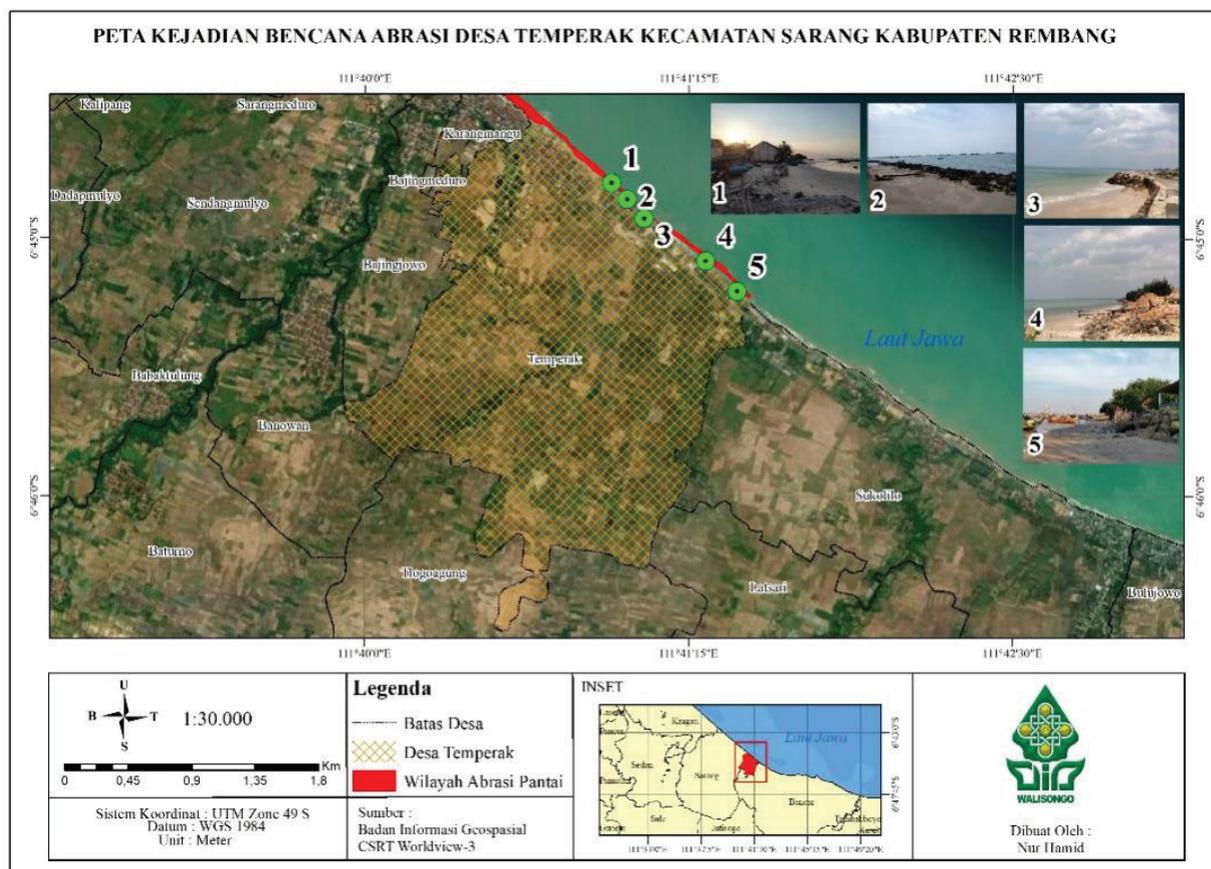
Source: Author, 2021



**Figure 4** Map of Abrasion Events in Kalipang Village, Sarang District, Rembang Regency  
Source: Author, 2021



**Figure 5** Map of Abrasion Events in Karangmangu Village, Sarang District, Rembang Regency  
Source: Author, 2021



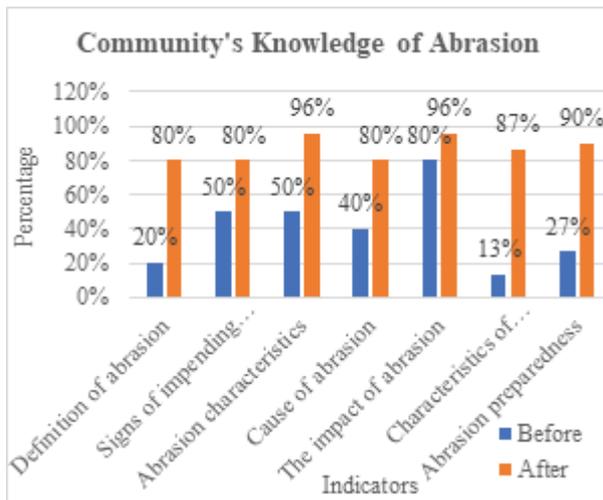
**Figure 6.** Map of Abrasion Events in Temperak Village, Sarang District, Rembang Regency

Source: Author, 2021

about the characteristics of the abrasion that occurred in Sarang Village. However, as many as 87% of the people do not understand areas where abrasion has not yet occurred, but these areas have the potential for abrasion in the future. In addition, the community also has a good understanding of the impact of the abrasion with a percentage of 80% because the community experienced the incident. Some people who do not understand are new residents of the village, so they have not experienced or seen the abrasion directly.

Other indicators of knowledge that are still misunderstood by the community include the public's understanding that an abrasion is a natural event and an annual

event that naturally occurs. As many as 80% of people have misconceptions about the meaning of abrasion. People do not understand that abrasion is also caused by human behavior that damages coastal areas. Furthermore, as much as 60% of the community only knows that the cause of the abrasion is only natural factors, even though human factors are also determined (Pinto, 2016). This misunderstanding has implications for knowledge about preparedness actions that are less precise and comprehensive, so as many as 73% of the community do not understand preparedness actions in dealing with abrasion appropriately. The indicators on preparedness are shown in more detail in Figure 7.

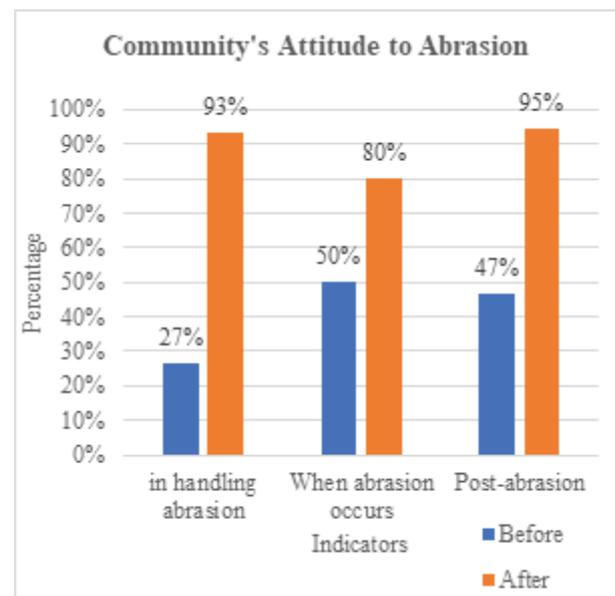


**Figure 7.** Community knowledge about abrasion before and after participatory mapping  
Source: Author, 2021

After the mapping, the community became more aware of the abrasion, both meaning, causes, and effects. People who initially do not understand the characteristics of abrasion that occur in their area can become more aware because, through this mapping, people who are fishermen and are very familiar with the signs of abrasion will provide information to other people who do not understand, for example, people who have just lived in the area in a short time. The information provided by the community is then supplemented by the researcher with materials that are deemed not to be mastered by the community, for example, namely about the characteristics of locations where future disasters can occur as well as an understanding of abrasion that is following scientific principles, not only appropriate with people's thoughts. This result follows the research results (Cadag and Gaillard, 2012) that participatory mapping allows dialogue between the community and the community and the community and experts, through which the community's knowledge will increase. In addition, the increase

in community knowledge is also due to disaster education through mapping in this study first providing socialization. However, socialization plays a very important role in shaping people's knowledge (Setyowati et al., 2021).

The second aspect that is measured in this study is the attitude aspect. The attitudes identified in this study are attitudes before, during, and after the disaster. Among the three phases, the phase with the highest percentage is at the time of abrasion, as shown in Figure 8. Attitudes during a disaster are higher than the others because, at that time, the community was faced with a critical and challenging situation, so the community-made efforts to the maximum extent possible. The community's positive attitude is shown by community activities, including collaborating with family members to save themselves and valuables at home, helping neighbors save valuables, carrying children and the elderly who cannot run to save themselves, and so on.



**Figure 8.** Community Attitude in Facing Abrasion Before and After Participatory Mapping  
Source: Author, 2021

Attitudes in dealing with disasters before the abrasion were lower than during the abrasion, as shown in Figure 8. Attitudes in this phase were lower because people were in a safer situation, so people underestimated the situation. As many as 73% of the community have not overcome abrasion to the maximum. It is indicated by the presence of people who do not want to try to move from their homes prone to abrasion, people who have not relocated their houses to be safer from abrasion, and people who have not attempted to renovate their homes to make them safer from abrasion. The community's economic condition is still minimal and even experiencing shortages. The community has also not carried out non-structural disaster mitigation efforts through self-taught learning or participating in various disaster socializations.

The community's attitude after the abrasion also showed better results than before the abrasion occurred. As in the case of abrasion, the community also shows the spirit of cooperation by carrying out rehabilitation efforts together. The community works together to make improvements to areas affected by abrasion. The community collects funds by making contributions. The proceeds from these contributions are then used to purchase building materials to renovate the affected buildings. However, the community only renovates a few buildings that the fee can still reach. As for other buildings requiring high costs, the community submits them to the government, village, sub-district, and district governments, to provide financial assistance. Even so, as many as 53% of the people still show an indifferent attitude to rehabilitation,

both independently in their place/goods and collectively in public facilities.

The community's attitude in dealing with the abrasion after participatory mapping was carried out also increased. The increase in attitudes is because people have received more complete and comprehensive information about abrasion. People no longer do things based on their personal opinions or thoughts but actual science. It is supported by Yatnikasari et al. (2020) who states that indirectly, the knowledge possessed by a person will affect attitudes and behavior, in this case, the attitude in dealing with abrasion. The better the community's knowledge about abrasion, the better the community's attitude in dealing with abrasion. Improvements in community attitudes are shown by several things, including people who are more proactive in carrying out prevention and rehabilitation efforts, are more cohesive in working together, and are more independent because they are not completely dependent on the government.

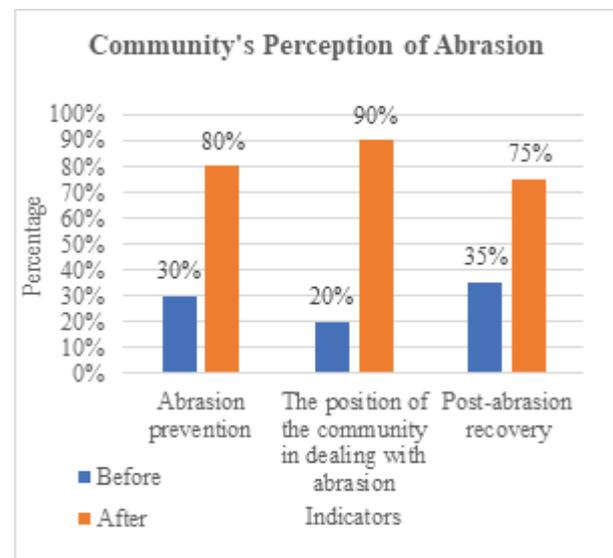
The third aspect measured in this study is the perception aspect which plays an important role in shaping community preparedness in abrasion (Findayani, 2015). Although it is still less than optimal, the indicator that shows the highest percentage is the perception indicator about post-disaster recovery. Post-disaster, people have the perception that post-disaster rehabilitation is entirely the responsibility of the government. Therefore, the community only does cooperation on things that the community can do, either in energy, thoughts, or costs. However, beyond the capacity of the community, the community did not try to seek help from other parties.

Moreover, the questionnaire results also show that some people are not responsible for damaged public facilities, especially if they are not users. These public facilities are shared property, so the damage must also be shared. In general, 65% of people have the wrong perception of post-disaster recovery efforts.

The next indicator on the perception aspect is the perception of abrasion prevention. Post-disaster public perception of prevention also shows that the community is not entirely responsible for disaster management. The community, in this case, only relies on government assistance to carry out structural and non-structural mitigation. The community is also limited to doing business according to the community's capacity but does not try to carry out mitigation more thoroughly by involving outside parties. People tend to be passive and not proactive in getting help. In addition, regarding non-structural mitigation, many people are also reluctant to delve deeper into the abrasion or undertake independent mitigation efforts by educating their families. Only a few families have done it.

The indicator with the lowest percentage in the perception aspect is related to the community's position in handling abrasion. People still position themselves as objects subject to suffering in the form of disasters. The community has not been able to position itself as a subject that plays an active role in prevention, during, and after disasters. Based on the questionnaire, 80% of people still consider themselves objects in disaster events. Not surprisingly, people always wait for help from the government or private sector to arrive, without ever wanting to

reserve food so that there is still food supply when a disaster occurs, and always waiting for government assistance and programs without being pro-active to seek. The three indicators on the aspect of perception are shown in Figure 9 below.

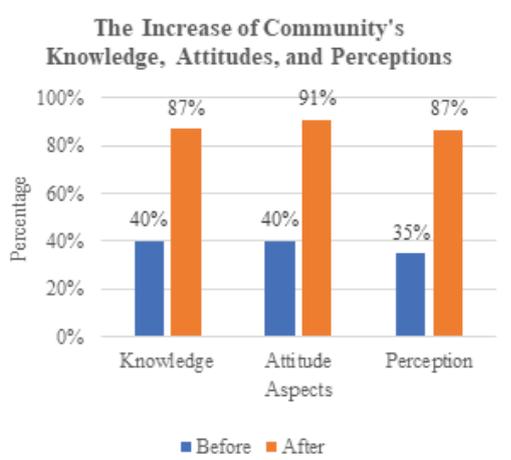


**Figure 9** Community Perception of Abrasion Before and After Participatory Mapping  
Source: Author, 2021

Public perception of abrasion has also increased. The public's perception of abrasion will affect the behavior and decisions taken in handling abrasion (Findayani, 2015). Therefore, the wrong perception of the community about the abrasion must be justified first, which in this study was carried out through FGDs between the community and disaster experts. The increase in public perception, among others, is shown by people who are starting to realize that they are the main subject or character in overcoming the abrasion that occurs in their area, so they must make maximum efforts to overcome and rehabilitate them. The community is starting to realize that in disaster management, the community must be proactive to work, not just stand still and

reason that they were victims of abrasion who had to get help from outsiders.

Based on the average value of the indicators in the three aspects measured, it can be seen that all of them experienced an increase after the participatory mapping was carried out. As shown in Figure 10, these results are higher after participatory mapping than before. The community capacity building was supported by several previous studies, including Dede et al. (2019), who stated that participatory mapping was a means to increase the knowledge and practical skills of the community; Santoso et al. (2018), who stated that participatory mapping increases community capacity; and Cadag dan Gaillard (2012) which states that participatory mapping increases knowledge and action in disaster management. Knowledge, attitudes, and public perceptions in abrasion are interrelated. The knowledge gained by the community and the perceptions formed within the community will significantly affect the attitudes or actions taken by the community in overcoming abrasion (Chotimah, 2019; Hamid, 2020; Jannah et al., 2013; Yatnikasari et al., 2020)



**Figure 10.** The increase of community's capacity in aspects of knowledge, attitudes, and perceptions in dealing with abrasion  
Source: Author, 2021

## CONCLUSION

Disaster education has been carried out through participatory mapping based on empowerment by involving the active role of Sarang District, Rembang Regency community. The stages carried out are the stages of preparation, implementation, evaluation, and monitoring. The results of the participatory mapping resulted in four maps of abrasion, namely one map of abrasion in Sarang District and three maps of abrasion in Kalipang, Temperak, and Karangmangu villages. The mapping results can be used as recommendations to local governments and guidelines for local communities. Except for maps, community-based participatory mapping can also improve community knowledge, attitudes, and perceptions in dealing with abrasion. In addition, the active participation of the community to be physically and mentally involved is also the success of this research.

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