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Transformation of Risk Communication in the Digital Age: Traditional Media to Digital Media in Maintaining Coastal Community Resilience

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ABSTRACT

Coastal communities face recurring threats from hydrometeorological disasters that are further exacerbated by climate change and land subsidence. Effective communication is needed to anticipate disaster losses. Currently, disaster communication has been transformed. What disaster transformation looks like is the subject of this research. This research was conducted qualitatively. The research took place in Demak Regency because this location is subject to flooding in Indonesia. Data was collected through in-depth interviews with communities in the district. The purpose of this research is to identify the role of WhatsApp Group Maritim BMKG in disseminating emergency information and its impact on risk perception, preparedness and collective response of coastal communities in disaster mitigation. The research found that disaster communication, which was initially conducted traditionally, has now been transformed into digital. Communication using BMKG's Maritime WhatsApp Group plays an important role in accelerating the dissemination of emergency information, building collective awareness and improving community response in disaster mitigation. WhatsApp shapes and develops the community's perception of disaster risk, which in turn influences preparedness and collective action.

1. Introduction

Disaster risk communication plays an important role in reducing the negative impacts of natural disasters, especially in vulnerable communities. In coastal areas of Indonesia, where flooding is a recurring threat, effective communication strategies are key to improving community preparedness and resilience (Widyastuti, 2021). Traditional communication mechanisms such as bells and mosque loudspeakers have long been used to disseminate information in these communities. However, with the advent of digital media, there has been a major transformation in the risk communication paradigm, particularly with the significant role of platforms such as WhatsApp in the information infrastructure in disaster-prone areas. (Rofiyanti et al., 2024).

The rapid development of digital technology presents both challenges and opportunities in the context of disaster risk communication. Social media, such as WhatsApp, is now an important tool in the rapid and relevant dissemination of emergency information, thereby increasing people's situational awareness (Guo et al., 2023). Through this platform, communities can mobilize collective action and improve disaster preparedness. (Widyastuti, 2021). However, this digital transformation also faces obstacles, especially in rural and coastal communities that still experience limitations in terms of digital literacy, access to technology, and internet networks. (Sawangnate et al., 2022).

This calls for a comprehensive strategy to not only encourage the use of digital technologies but also address the digital access and capability gaps.

A number of literatures have proven the effectiveness of digital platforms in increasing disaster risk awareness and community engagement (Wolff et al., 2021). Widyastuti (2021) explains that new media allows for more efficient disaster communication as it is able to connect communities quickly. A study by Wolff et al.) emphasized the importance of *citizen science* in building community resilience through active participation in risk management. In addition, social cohesion has been shown to strengthen the effectiveness of communication within communities, signalling that relational aspects are crucial in the context of disaster preparedness (Rofiyanti et al., 2024). However, the shift of communication to digital platforms also poses a risk of social exclusion, especially for groups with low digital literacy and limited access to infrastructure. (Sawangnate et al., 2022).

Despite the growing body of work on the use of digital media in disaster communication, there remains a gap in research on how collective action takes shape through mobile phone-based communication networks, particularly in coastal Southeast Asia. Existing research generally highlights the importance of community engagement and cohesion in disaster contexts but has not explored the dynamics of the transition from traditional to digital communication in Indonesian coastal communities. (Mostafiz et al., 2022). This study seeks to fill this gap by profoundly analyzing the transformation of disaster risk communication in Demak Regency and its impact on community preparedness and collective action in flood-prone areas.

To comprehensively understand the dynamics of risk communication, this study integrates several theoretical frameworks. Slovic's risk perception theory provides insights into how individuals interpret and respond to risk information. Meanwhile, Kasperson's social amplification of risk theory explains the role of social networks in shaping people's perceptions and responses to risk. (Allen et al., 2018; Rainear & Lin, 2021). Endsley's situational awareness framework was also used to analyze how digital tools can enhance individuals' ability to understand and respond to disaster threats. (Maibach et al., 2023). This theoretical integration is important to understand the impact of the shift from traditional to digital communication on community resilience and preparedness.

The methodology used in this research is a qualitative approach involving in-depth interviews and focus group discussions with communities, village officials, and disaster management agencies in Demak District. By exploring the experiences and perceptions of stakeholders, this study aims to provide a fuller understanding of the transformation of risk communication and its impact on community preparedness.

Finally, as Indonesia's coastal communities face challenges from climate change and natural disasters, the evolution of communication from traditional to digital media is a crucial element that can strengthen or weaken community resilience. By highlighting the role of digital media in risk communication and the challenges of its adoption, this study contributes to the discourse of disaster preparedness and strengthening community resilience in the era of digital communication.

2. Method

This study uses qualitative methods to explore the transformation of disaster risk communication from traditional to digital media in Indonesian coastal communities, with a particular focus on Demak Regency. This region frequently experiences tidal flooding, making it a relevant location to analyze the impact of communication transformation on risk perception, community preparedness and collective action. This study aims to provide an in-depth understanding of how digital tools, specifically a WhatsApp group hosted by the Maritime Meteorology, Climatology and Geophysics Agency (BMKG), influence disaster management practices in this vulnerable community. The use of digital communication technologies in disaster risk management is important to provide more precise and rapid information to communities at risk (Asteria et al., 2023). The sampling strategy was purposive, selecting participants who were directly involved in disaster communication networks and emergency response activities. Respondents consisted of village officials, affected residents, representatives of the Regional Disaster Management Agency (BPBD) at the provincial and district levels, and meteorological and climatological officers from BMKG Maritim. This selection aims to reflect the diversity of perspectives in risk communication in the context of coastal flooding.

Data was collected through semi-structured in-depth interviews, focus group discussions (FGDs) and participatory observation during emergencies. Semi-structured interviews allowed for the exploration of participants' views, experiences and insights related to the transition from traditional communication methods such as kentongan and mosque loudspeakers to digital communication. FGDs focused on opening a broader dialogue between community members and uncovering collective narratives regarding disaster preparedness and response (Widyastuti, 2021). Participatory observation is an important element of this methodology, allowing researchers to directly observe communication patterns, social interactions and community responses during emergencies. This approach provides rich qualitative data on the flow of information during disasters and how cultural practices influence communication processes. (Dwirahmadi et al., 2019).

The data collected was analyzed using a thematic analysis approach, a widely recognized qualitative framework. This procedure involves identifying, analyzing and reporting themes in the data to reveal shifts in risk perceptions and the impact of communication changes on preparedness and collective action (Ntontis et al., 2018). This analysis is reinforced by Slovic's risk perception theory, Kasperson's social amplification of risk theory, and Endsley's situational awareness model, which explains the role of communication in improving people's understanding of their environment when facing disasters (Asteria et al., 2023; Partelow, 2020). The tools and platforms used in this study include the BMKG Maritim WhatsApp group as a representation of digital communication and mosque kentongan and loudspeakers as traditional communication tools for comparison. By placing these two types of media side-by-side, this study aims to shed light on shifting risk communication practices and their impact on community resilience (Darmawan et al., 2024).

In conducting this study, ethical considerations were prioritized. All participants were fully informed about the purpose of the study and their right to withdraw at any time, and informed consent was given. Privacy and confidentiality of data were maintained throughout the entire research process (Wolff et al., 2021). The researcher also applied the principle of reflexivity, recognizing personal position and potential bias, especially given the sensitivity of the topic and the vulnerability of the affected community (Guo et al., 2023).

Evidence from past research suggests that social media and digital platforms play an important role in strengthening community resilience and the effectiveness of disaster response. (Reynolds et al., 2022; Sawangnate et al., 2022). By exploring the digital divide as well as barriers to technology adoption, such as literacy levels and internet access, this research helps to address a gap in the literature related to coastal populations in Southeast Asia. (Dwirahmadi et al., 2019; Rainear & Lin, 2021). Overall, the qualitative methodology allowed for a comprehensive exploration of the transformation of disaster risk communication in Demak District and how it influenced community preparedness and collective action in the face of tidal flooding. The findings of this study are expected to enrich the academic discourse on disaster management and communication, as well as provide practical insights for policymakers and local institutions in their efforts to increase the resilience of coastal communities.

3. Result and Discussion

3.1. Findings

Cases of Coastal Flooding in Demak Regency Indonesia

Indonesia has high levels of rainfall, ranging from 2000 to 3000 mm per year, which makes flooding very likely during the rainy season. Demak district has experienced significant impacts from the rise in sea level since the 1980s. Land use change policies and poor water absorption systems in coastal residential areas exacerbate this condition. (Nugroho et al., 2024). Significant factors contributing to flooding include global warming, which increases sea surface temperatures and leads to an increase in seawater volume (Sarah et al., 2020) (Sarah et al., 2020), as well as land subsidence due to excessive groundwater withdrawal from residential and industrial areas, which causes a permanent decrease in ground elevation. (Abidin et al., 2022).

It is reported that in 2023, the number of people affected by flooding in Demak Regency will reach about 84,008 people, and in 2024, it will increase to about 216,406 people, showing an increasing trend in the intensity and frequency of flooding in this region. Floods over the past 16 years have caused much suffering. According to reports, floods in Indonesia during that period caused an estimated 22,435 deaths and 269,737 injuries, with Demak Regency being one of the most affected areas. Floods not only caused loss of life but also property damage, impacting thousands of education and health facilities, as well as public infrastructure such as bridges and roads. This situation significantly affects the social, economic and health aspects of society (Andreas et al., 2018; Chrysanti et al., 2024).

The results of data processing from the Central Java Provincial Disaster Management Agency from seven regencies/cities show that the highest number of victims suffering from the effects of flooding with intensity every year is in Demak Regency. In 2023, 84,008 people suffered, and in 2024, 216,406 people suffered. However, this disaster took a different form on social media, where the role of social media in Demak society became very significant. Social media platforms such as Instagram and the WhatsApp groups of the Maritime Meteorology, Climatology and Geophysics Agency and the Demak District Disaster Mitigation Agency contributed greatly to sharing important information with citizens. By following BMKG's Maritime WhatsApp channel, people can receive accurate and complete information regarding weather conditions and potential disasters, helping them to make the right decisions during flood situations. Informant C explained, *"We endeavour to provide accurate weather information and early warnings through the WhatsApp channel of the Maritime Meteorology, Climatology and Geophysics Agency so that people can make informed decisions when facing floods*". In addition, the use of digital platforms enables the dissemination of information at a higher speed, which is much needed in emergencies, as timely and accurate information is essential to reduce the impact of a disaster (Widyastuti, 2021). The Demak District Disaster Management Agency played an active role in assisting residents affected by the floods. Together with the Demak District Social Service, it set up a public kitchen to provide refugees with ready-to-eat meals, clean water, and other logistical materials needed during the floods. To ensure aid was available, the Demak District Disaster Management Agency partnered with humanitarian organizations and local communities to raise donations and additional logistical support. They also opened a complaint post for residents who needed special assistance or faced obstacles in the evacuation process. With this joint effort, it is hoped that flood victims can receive adequate protection and assistance until conditions return to normal.

Transformation of Risk Communication from Traditional to Digital Media

Mosque kentongan and loudspeakers (toa) began to be used as risk communication tools in 1999 during the initial coastal flooding in Demak District. Coastal communities began to face significant challenges in disaster risk communication, especially in disseminating early information related to coastal flooding. In some areas, such as coastal Demak and Central Java, the use of traditional media such as kentongan and mosque loudspeakers (toa) is still an important part of the disaster early warning system. These two media are used to convey warnings to the community quickly and effectively (Widyastuti, 2021). Informant D explained, *"We used to rely on the kentongan and mosque toa as an early warning system for disasters. The distinctive beat of the kentongan is a signal that the community understands, especially when coastal floods come at night. We still use the kentongan because it can immediately give warnings to residents."* The kentongan serves as a danger signal that is widely recognized by the community. The distinctive beat of the kentongan signals various levels of emergency, from flood early warning to evacuation to coordination of emergency assistance.

In the context of coastal Demak, which often experiences coastal flooding due to rising sea levels, the pattern of the kentongan beats is an important sign for residents to prepare or evacuate immediately, especially if coastal flooding occurs at night. Informant E explained, *"If we hear the kentongan ringing in a certain pattern, we already know that there is danger, and we must prepare immediately. The mosque's toa is also very helpful because it can convey clearer information, such as the location of the flood and evacuation routes"*. However, despite its proven effectiveness, the kentongan has a limited range of sound when disseminating information. To overcome this limitation, the mosque toa is a complement to disaster risk communication. In the event of a flood threat, official appeals from the village government can be broadcast directly through the mosque

toa, which can reach a wider community, allowing information to be heard by the community in a larger radius than the kentongan. In addition, toa is also used in two-way communication, where the community can coordinate with village officials and volunteers directly (Widyastuti, 2021). The application of modern media in disaster communication has the potential to improve the accuracy and speed of information delivery to communities at risk.' This suggests that the use of mosque toas in the dissemination of official information can significantly support community preparedness for disaster threats.

Informant D explains, *'We started to switch from old and new ways in disaster risk communication. Since 2020, we have discontinued the use of bells and toas, but now we utilize the BMKG Maritime WhatsApp group to provide more detailed information, such as water levels and weather early warnings. This way, the community can be better prepared for flooding."*. From the perspective of social theory, the mosque's kentongan and toa undergo a process of externalization in coastal communities. Communities collectively construct meanings for these traditional communication systems, making them part of social construction in disaster preparedness. However, in the midst of social change and modernization, there is a dialectic between tradition and technological innovation in disaster communication. From the perspective of communication science, the phenomenon of using traditional media in disaster risk communication can be explained through the Diffusion of Innovation Theory proposed by Everett Rogers (2003). This theory explains how an innovation, whether in the form of technology or communication methods, is adopted in a society. In the context of flooding in Demak District, the use of mosque bells and toa can be understood as a form of *"early adopters"* of local communication systems that have been internalized in the community culture. However, along with the development of digital technology, there is an adaptation process where social media and WhatsApp BMKG Maritim enter as innovations in disaster communication, providing more detailed information, such as water levels, locations of evacuation points, and safe routes through digital technology.

Local communities consider traditional communication to be less accurate in disseminating information related to flood disasters. In response to the need for more accurate and *real-time* information, the Maritime Meteorology, Climatology and Geophysics Agency developed a WhatsApp Group-based communication system involving village officials, disaster volunteers and local communities. This communication model allows for a more structured, organized and verifiable dissemination of disaster information, thereby reducing uncertainty and information delays. (Asteria et al., 2023). Informant D explained, "*In the past, flood information was often late in reaching residents because they only relied on bells and mosque callers. Since the Maritime Meteorology, Climatology and Geophysics Agency's WhatsApp Group, we can immediately receive early warnings based on predictions of tides and extreme weather so that people are better prepared for flooding".*Through the Maritime Meteorology, Climatology and Geophysics Agency's WhatsApp Group, communities receive early warnings of coastal flooding, which are provided based on predictions of tides, rainfall and potentially extreme weather so that they can prepare earlier. In addition, the system provides water level updates obtained from water level gauges, enabling live monitoring of flood developments and the level of threat to communities. Informant E explained, "This WhatsApp Group is beneficial to *us. We can see real-time updates on water levels, so we know when to start preparing to evacuate. In addition, the information on evacuation routes and evacuation points is also always updated, so we are not confused about where to go when the flood comes"*. To help with the evacuation process, the system provides an evacuation route guide with information on safe routes for both vehicles and pedestrians to avoid areas that have been affected by flooding. In addition, the WhatsApp Group also facilitates coordination between residents, village officials, search and rescue teams, and BMKG officials, enabling a faster and more efficient response in disaster management efforts.

Effectiveness and Benefits of Digitalisation in Risk Communication

The application of digital-based communication in Demak coastal disaster risk management brings significant benefits. Compared to bells or announcements at mosques, digital information can be delivered within seconds to the various community groups connected to the system, ensuring faster and more accurate information dissemination. In addition, digital media enables the delivery of more comprehensive information, including water levels, estimated flood times and safe evacuation routes, so that people can take more appropriate action. Another advantage of

digitalization in risk communication is the reduction of misinformation and panic. With a more structured and data-driven communication system, people are less susceptible to hoaxes or information with unclear sources. Informant E explained, *"This digital system is beneficial. The information we receive is more accurate because it comes directly from BMKG and village officials, so we can be calmer and know what to do when flooding occurs."*In addition, this digitalization also increases participation and coordination between communities, village officials and experts, allowing them to obtain clearer information and discuss mitigation strategies to be carried out.(Asteria et al., 2023). With the integration of digital media, the risk communication system in coastal Demak becomes more effective, responsive, and adaptive to technological developments, thus improving community preparedness for the threat of coastal flooding. Informant F explained*, "With digital media, coordination between residents and rescue teams is easier. We can immediately share safe locations, evacuation routes and logistical needs through WhatsApp groups so that aid can be quickly channelled to the area's most in need".*

Social Unity and Recovery Initiatives in the Context of Coastal Floods in Demak Regency

Social media, dominated by user content, can be used to make individuals feel part of a particular initiative. In the context of the floods in Demak District, platforms such as WhatsApp became an effective tool in building social solidarity and accelerating the recovery process. Social media allows affected communities to share experiences, coordinate assistance and support each other in dealing with the impact of disasters. Informant E explained, *"We rely on WhatsApp to share information with neighbours and volunteers. That way, we know where to get help and who still needs help."* This shows that communication in social groups serves not only as a means of sharing information but also as a means of organizing collective action, building solidarity, and improving the effectiveness of decision-making in the face of emergencies (Allen et al., 2018). This was also the case in Demak District, where local communities and humanitarian organizations used social media to strengthen social ties, coordinate relief efforts and provide information on evacuation points and logistics distribution. Informant E explains, *"When the flood hit, I could not contact my family by phone because the electricity was switched off. However, with WhatsApp, I can upload photos of the condition of my house and let them know that I am safe."* said one of the affected residents in Demak Regency. In addition, social media can be utilized to encourage volunteerism by increasing the connectivity of volunteer groups. Community-based initiatives in Demak, such as donation-raising and relief campaigns, are often promoted through social media. In this way, social media became not only a means of communication but also a tool to mobilize collective action and strengthen the morale of disaster-affected community members. As such, social media played a crucial role in strengthening social unity and facilitating post-flood recovery initiatives in Demak District. Apart from being a medium of information, social media has also become a platform for the community to contribute to recovery efforts through disseminating information, mobilizing aid, and strengthening solidarity in the midst of emergencies.

3.2. Discussion

Implications of Digitalisation on Public Risk Perception

(Slovic, 1987) "Perception of Risk" states that risk perception not only depends on objective data but is also influenced by people's psychological, social, and cognitive factors. The theory emphasizes that individuals tend to assess risk based on personal experience, information received, and social interaction within the community (Slovic, 1987). (Slovic, 1987). Kahneman and Tversky (1979), through Prospect Theory, also showed that humans often use heuristics in assessing risk, which leads to cognitive biases in decision-making. (Goldstein & Einhorn, 1987). In this context, understanding of risk is not always rational but is also influenced by subjective factors such as past experiences and trust in information.

In Demak District, the information provided by the WhatsApp Group of the Maritime Meteorology, Climatology and Geophysics Agency has played an important role in shaping people's understanding of risk. Prior to this group, people relied solely on direct observation or information from neighbours, which was often limited. According to the Social Amplification of Risk theory developed by Kasperson et al. (1988), risk perception in a community can be amplified or attenuated by social communication mechanisms. Risk perception within a community can be strengthened or weakened by social communication mechanisms (Slovic, 1987). (Slovic, 1987). Without access to

objective data, perceptions of risk tend to vary and do not always reflect the proper level of threat. With WhatsApp groups providing data-driven information, communities now have a more accurate and reliable source of information for assessing extreme weather threats and potential disasters so that decisions are based on data rather than intuition.

Flooding in coastal Demak District is not just a seasonal threat but has become part of people's daily lives. Prior to access to technology-based early warning systems, many residents did not realize the magnitude of the danger of tidal flooding and were often ill-prepared for its impact. The BMKG Maritime WhatsApp Group serves as an innovative channel that helps communities understand the threat level and potential impact of disasters through data-driven early warning. Providing accurate and timely information through effective communication channels can increase public awareness and facilitate preparatory actions. (Asteria et al., 2023). With greater access to information, communities can take more effective mitigation measures than relying solely on subjective experience or informal information from the social environment. People's understanding of risk is not only shaped by individual experiences but also by social interactions within the community. The BMKG Maritime WhatsApp Group allows people to share information, discuss potential threats and build a collective understanding of risk. This creates a more data-driven and objective information dissemination mechanism, in contrast to the traditional model that relies more on personal narratives or sources of information that are not necessarily accurate.

Thus, access to communication technology has changed the dynamics of risk perception in coastal communities, making them more evidence-based rather than just intuition or personal experience. This finding suggests that in the digital era, risk perception is no longer solely subjective, as argued by (Slovic, 1987). However, it can also be significantly shaped by the availability of data-based information. Communication technology plays an important role in reducing subjective bias by providing objective and easily accessible sources of information. Therefore, Slovic's theory needs to be expanded to consider how information technology can be a determining factor in shaping fact-based risk perceptions, especially in communities that previously had limited access to scientific data. The integration of information technology in risk communication can increase transparency and enable communities to make more rational and evidence-based decisions in the face of disasters.

From Situational Awareness to Collective Action

The preparedness of coastal communities in Demak Regency is highly dependent on early warning systems and access to fast and accurate information. Communication technology plays an important role in improving community preparedness for the recurring threat of tidal flooding. The WhatsApp Group of the Maritime Meteorological, Climatological and Geophysical Agency has provided significant benefits by providing real-time information on weather forecasts, tides, and recommended actions to take before a disaster occurs. Before access to this data-driven information, people tended to be reactive to disasters. However, with more accurate and structured information, they began to adopt preventive measures such as securing valuables, preparing small boats for evacuation, and building higher house foundations to reduce the impact of flooding. In the theory of Situational Awareness, developed by (Endsley, 1995) According to Endsley, situational awareness is formed through three main stages: (1) perception of environmental elements, i.e. recognizing existing threats; (2) understanding of the meaning of those threats; and (3) prediction of future developments in the situation. This model is widely applied in the context of decision-making in emergencies and disaster management. While the theory explains how individuals or groups understand risk, it does not explicitly address how situational awareness translates into organized collective action. In the case of the coastal communities of Demak District, the situational awareness formed did not stop at understanding and prediction but also resulted in coordinated concrete actions, such as preparing evacuation boats, sharing evacuation information through WhatsApp Groups, and coordinating assistance with village officials and volunteers.

This transformation from situational awareness to collective action in coastal communities shows that Endsley's theory needs to be expanded to include the social action dimension as an integral part of situational awareness. This is in line with the view of (Veazie et al., 2022) (Veazie et al., 2022) which emphasizes that communities or organizations facing high risks tend to develop effective communication mechanisms to respond to threats quickly and in an organized manner. In this context, the WhatsApp Group of the Maritime Meteorology, Climatology and Geophysics Agency serves as a medium that allows communities to not only understand the threats they face but also

coordinate mitigation measures collectively. In other words, in communities facing recurring disasters, it is not enough for awareness to stop at understanding the risks; but a concrete and structured response must accompany it. From the perspective of collective communication theory, communication in social groups serves not only as a means of sharing information but also as a means of organizing collective action, building solidarity, and increasing the effectiveness of decision-making in dealing with emergencies. (Widyastuti, 2021). In the context of the flooding in Demak District, the BMKG Maritime WhatsApp Group has become the primary medium for collective communication between residents, village officials and volunteers. Through this communication, the community can quickly identify affected locations, coordinate assistance and take joint action in rescue efforts. With more structured and data-driven communication, the evacuation and aid distribution process become more efficient compared to the slower and less organized traditional communication methods.

This finding confirms that digital communication technologies play a role in expanding the concept of situational awareness to include dimensions of social action and collective coordination. By utilizing the BMKG Maritime WhatsApp Group, the coastal communities of Demak Regency are not only able to understand disaster risks more accurately. However, they can also take more effective and community-based mitigation measures. Therefore, situational awareness theory needs to be further developed by considering how communication technology can change the dynamics of decision-making in emergencies. This is in line with the findings of (Müller et al., 2021), which states that effective information systems can improve situational awareness and accelerate decision making in critical conditions (Müller et al., 2021), which states that effective information systems can improve situational awareness and accelerate decision-making in critical conditions. With widespread access to communication technologies, further research is needed to explore how these technologies can be integrated more systematically into risk management strategies and community preparedness in disaster-prone areas.

Discussion

Based on the above analysis, (Slovic, 1987) in Perception of Risk states the psychological and social factors influence risk perception. In these not just objective data, individuals often assess risk based on personal experience or information from the social environment, which can lead to perception bias. However, in the case of Demak District's coastal communities, the use of BMKG's Maritim WhatsApp Group has contributed to reducing this subjectivity by providing more accurate data-based information. Access to information from a more structured source, such as BMKG, allows communities to understand risks more objectively rather than relying solely on individual experiences or information circulating within their communities.

The development of communication processes in the formation of situational awareness in the coastal communities of Demak District is further enhanced by the BMKG's Maritime WhatsApp Group, which provides real-time information on weather forecasts, tides and early disaster warnings. With access to accurate and up-to-date data, communities can not only better understand risks but also make faster and more coordinated decisions in the face of coastal flooding threats. Situational awareness does not only consist of three main stages: perception, understanding and prediction, as proposed by Endsley, (1995). In the context of communities facing recurrent disaster risk, situational awareness includes the dimension of collective action in response to recognized and understood threats. This collective action reflects not only individual preparedness but also community coordination in taking more effective mitigation measures.

4. Conclusion

The transition from traditional to digital communication tools in coastal communities of Demak Regency, Indonesia, provides important insights into disaster risk communication practices. This qualitative research aimed to analyze how the change impacted community preparedness, risk perception, social cohesion and collective action. The results showed that while traditional tools such as kentongan and mosque loudspeakers have cultural value and local relevance, they are limited in reach and speed compared to evolving digital platforms.

Rapid information dissemination through tools such as WhatsApp proved instrumental in increasing situational awareness and proactive community response, particularly in the face of tidal

flooding. This change encouraged a shift in risk perception through *real-time* information updates, which facilitated organized evacuation and more efficient distribution of aid. Digital platforms provide space for active participation for communities in preparedness efforts, changing attitudes from passive to participatory.

This research also emphasizes the importance of social capital and community solidarity in strengthening the effectiveness of disaster communication. Interconnection between citizens facilitated by digital platforms not only accelerates information dissemination but also fosters a culture of mutual assistance in emergencies. This finding is in line with collective communication theory, which emphasizes the importance of community engagement in disaster risk management.

Overall, this study contributes to the discourse of disaster communication and community resilience by offering important insights for policymakers, disaster management practitioners and communication scholars. Initiating a dialogue on adapting communication practices in the context of evolving digital technologies is a crucial step to preparing vulnerable coastal communities for the challenges of increasingly intense and frequent natural disasters.

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