



Portraying Risk Communication of Maritime Meteorology Station to Fishermen in Semarang City

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Abstract. This study explores the Extended Parallel Process Model (EPPM) applied in risk communication by the Maritime Meteorology Station Tanjung Mas, Semarang, for the safety of local fishermen. EPPM focuses on the perception of threat and efficacy, which is essential for understanding fishermen's responses to weather warnings. This research use qualitative method with observations, interviews, and secondary data are analyzed to find how risk communication is implemented to fishermen. The data are analyzed according to EPPM that stressing out how people respond to risk information. The findings reveal that response efficacy increase preventive measures, highlighting EPPM's effectiveness for risk communication in maritime contexts. The fishermen were able to process the risk information cognitively and exercise action based on the information and the knowledge they earn before in the training. The fishermen also experienced behavioral change that tended to more dependent on the information provided by the Maritime Meteorology station before conducted their daily economic activities.

Keywords: Portraying Risk Communication, Maritime Meteorology Station, Fishermen, Semarang City

1. Introduction

According to Covello, risk communication is the exchange of information between interested parties about the nature, magnitude, significance, control or control of a risk. Risk identification is the topic of risk communication, and then messages are designed that aim to reduce or avoid risks [1]. Later Sellnow et al explained that risk communication is an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not

strictly about risk, that express concerns, opinions, or reaction to risk messages or to legal or institutional arrangements for risk management [2]. Risk communication itself intertwined with the term disaster communication that, according to Hutomo, the awareness of the importance of communication in dealing with disasters has increased recently [3].

Risk communication is critical in maritime contexts, where weather conditions pose significant threats to the safety and livelihood of those who depend on the sea. In Indonesia, the fishing industry forms a vital part of the coastal economy, and fishermen face unique risks due to variable weather patterns. Reliable and effective communication regarding weather hazards can be life-saving. Consequently, the Maritime Meteorology Station Tanjung Mas in Semarang has adopted a structured approach to risk communication with local fishermen, aiming to enhance their preparedness and safety.

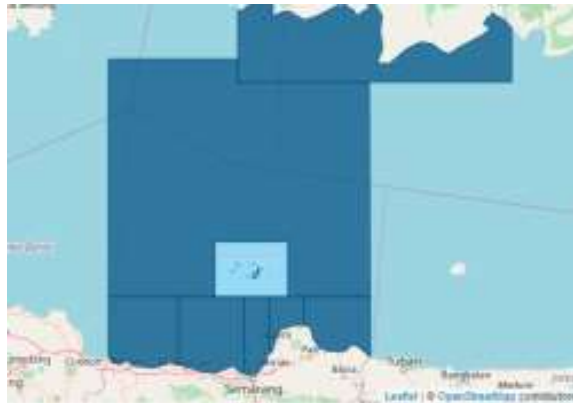


FIGURE 1. The Working Area of Maritime Meteorology Station Tanjung Mas [4]

The focus of this study is to examine the effectiveness of the Extended Parallel Process Model (EPPM) as a framework for risk communication in this context. Developed by Kim Witte in 1992, the EPPM suggests that individuals' responses to risk messages are largely influenced by two factors: perceived threat and perceived efficacy. Perceived threat refers to how severe and personally relevant an individual views a given risk, while perceived efficacy encompasses both response efficacy (belief that the recommended action will reduce the threat) and self-efficacy (belief in one's own ability to carry out the action). The interaction between these components determines whether individuals engage in protective behaviors or adopt defensive stances, such as ignoring or denying the message [5].

In the setting of maritime weather warnings, these EPPM components offer a valuable framework. Fishermen in Semarang need information that not only highlights the potential dangers of adverse weather but also reinforces their capacity to mitigate these risks effectively. In recent years, however, challenges in risk communication have emerged due to the varying levels of digital literacy among fishermen, with older generations particularly less familiar with the digital tools through which much of the communication is delivered.

Digital platforms, like WhatsApp groups, social media channels, and dedicated mobile applications (e.g., Iwanis) used by the Maritime Meteorology Station, allow for rapid information dissemination but are not universally accessible to all fishermen.

Table 1. Number of Capture Fishery Households in Semarang City

Subdistrict	Marine Fisheries	
	2019	2020
Genuk	43	45
Semarang Utara	734	753
Semarang Barat	12	12
Tugu	219	258
Ngaliyan	3	0
Semarang	1.011	1.068

Source: Dinas Perikanan Kota Semarang [6]

Additionally, face-to-face initiatives, such as the Sekolah Lapang Cuaca Nelayan (Weather Field Schools for Fishermen), have become an essential part of the station's strategy. These programs provide hands-on training for fishermen, equipping them with the skills to interpret weather information accurately and apply it practically. However, resource constraints and geographical limitations restrict the reach and frequency of these in-person trainings.

Understanding the communication strategies employed by the Tanjung Mas Station, particularly through the lens of EPPM, sheds light on the nuances of risk communication in a complex, high-stakes environment. This study aims to assess the effectiveness of these strategies by examining how threat perception and efficacy impact fishermen's behavioral responses. Additionally, we explore how the EPPM framework can guide improvements in the communication methods used by the Maritime Meteorology Station, particularly in balancing digital and face-to-face interactions to maximize impact.

The Meteorological Station itself was already being researched by another researcher up until 2024. Gamadika for example already did research on 2019 that focus on how the station role in sending weather information to coastal radio [7]. Enggar in 2022 also made research to the station that focus on how the public service conducted in the station [8]. Chodijah in 2020 also made research about weather socialization, but this time to the farmer located in Deli Serdang [9]. Last, Novitasari made research in 2021 about BMKG socialization but this time with dramatism theory perspective [10].

From all the research conducted before we could saw that no research focused in the EPPM model. Through a qualitative methodology involving interviews, observations, and document analysis, this study contributes to the broader discourse on risk communication by highlighting the role of EPPM in shaping behavior. Findings from this research are intended to inform future strategies in maritime risk communication, not only for Indonesia

but also for other maritime regions facing similar challenges. By focusing on both the perceived threats and efficacy, the EPPM framework provides a roadmap for designing communication interventions that resonate across demographics, thus enhancing safety outcomes among fishermen in coastal regions.

2. Method

This study adopts a qualitative research design to explore the effectiveness of the Extended Parallel Process Model (EPPM) in enhancing risk communication for fishermen. Qualitative methods are particularly suitable for this context as they allow for an in-depth understanding of individuals' perceptions, motivations, and responses to the risk messages provided by the Maritime Meteorology Station Tanjung Mas in Semarang. The study integrates multiple data collection techniques, including interviews, observations, and document analysis, to comprehensively evaluate the communication strategies used and their alignment with EPPM principles.

Participants in the study include two primary groups: 1. Meteorology Station Officials: Three officials from the Tanjung Mas Maritime Meteorology Station who are directly involved in developing and disseminating weather-related risk communication to fishermen. These officials provide insight into the station's strategies for implementing EPPM and the operational challenges they face. 2. Local Fishermen: Twenty fishermen from the coastal areas around Semarang who actively rely on weather forecasts and warnings for their daily activities. Participants were selected to represent a range of ages and familiarity with digital tools, from younger fishermen comfortable with mobile applications to older fishermen who are more accustomed to traditional communication methods.

Three main data collection methods were utilized. First, In-depth Interviews: Semi-structured interviews were conducted with both meteorology station officials and fishermen to gather insights into how risk communication is perceived and acted upon. Questions for the officials focused on the design and delivery of risk messages, the challenges of implementing EPPM, and specific examples of risk communication events. Fishermen were asked about their perceptions of weather-related risks, the usefulness of the information they receive, and their confidence in using the recommended safety measures.

Second, Observations: Observational data were collected by examining the tools and channels used by the Tanjung Mas Station for weather communication. Observations focused on WhatsApp groups, social media posts, mobile applications like Iwanis, and the physical layout and instructional setup of the Weather Field School sessions. This method provided a clear view of how messages were structured, the types of visual aids used, and the degree of accessibility for various demographic groups.

Third, Document Analysis: Key documents, such as station reports, weather warning protocols, and other relevant materials, were analyzed to understand the formal strategies and policies that govern risk communication. Previous studies and academic literature on

EPPM in risk communication were also reviewed to ground this study's approach and to interpret the effectiveness of the strategies used by the Maritime Meteorology Station.

3. Result and Discussion

EPPM Analysis

The EPPM analysis could be divided into analysis of threat perception, efficacy perception, and behavioral outcomes. The overall analysis itself could be seen in the figure 3.

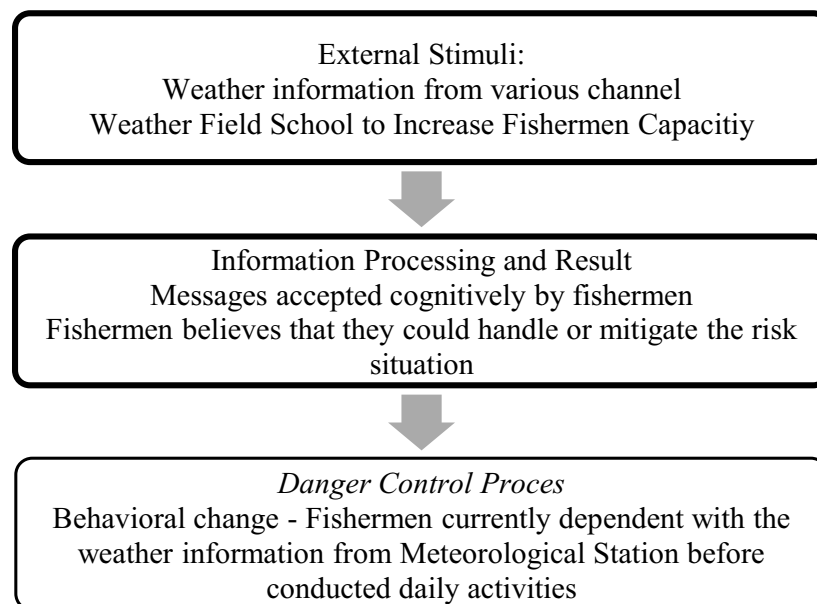


FIGURE 3. Risk Communication with Extended Parallel Process Model

The risk perception among fishermen is generally high, as they are acutely aware of the dangers posed by adverse weather conditions. Interviews reveal that most fishermen perceive both the severity of weather threats (such as storms, high tides, and waves) and their susceptibility to these dangers. The station's communication strategies aim is not only to highlight the severity and potential consequences but also clarified information that could incite panic or disinformation among the fishermen. For example, the WhatsApp group updates and SLCN sessions consistently raised fishermen awareness while also increase their capacities to gain correct and useful weather information.

In terms of efficacy perception, response efficacy and self-efficacy are crucial components that significantly influence fishermen's behaviors. The study found that

fishermen who believe that following station recommendations (such as avoiding sea routes during high tides) will effectively protect them from harm are more likely to adopt safe practices. WhatsApp updates and Iwanis app features both serve to reinforce this efficacy by providing clear instructions on safe navigation and real-time weather updates. Fishermen who use these tools report higher confidence in the recommended actions, showing a strong alignment with the response efficacy aspect of EPPM.

Self-efficacy also varies significantly by age and digital literacy. Younger fishermen, who are generally more comfortable using digital tools like the Iwanis app, report higher confidence in their ability to interpret and act on weather information. On the other hand, older fishermen benefit more from in-person training sessions, like SLCN, where they gain hands-on experience in understanding weather data. This method has successfully increased self-efficacy, but resource limitations restrict its accessibility.

The results emphasize the importance of strengthening self-efficacy across all fishermen demographics. While digital communication is effective for younger users, additional face-to-face interactions and simplified communication may be required for others. The disparity in efficacy perception highlights the need for a tailored approach to enhance self-efficacy effectively.

According to EPPM, a balance of high threat and high efficacy perceptions leads to protective behaviors. This study observed that fishermen with high efficacy levels indeed tend to engage in proactive behaviors, such as adjusting their schedules, securing equipment, and reporting back on conditions through WhatsApp. These protective actions are particularly prominent in younger fishermen, who readily engage with digital channels and show higher trust in the recommendations provided.

A notable finding is the role of feedback loops. Through the WhatsApp group, fishermen frequently report real-time weather observations back to the station, which helps in validating information accuracy and building mutual trust. This interactive approach not only reinforces threat and efficacy perceptions but also enhances the station's credibility and the fishermen's willingness to engage with risk messages actively.

Challenges, Limitations, and Implications for Future Risk Communication Strategies

While the application of EPPM has proven effective, several challenges remain. First, Digital Literacy Gaps. Older fishermen face difficulties in using digital tools, limiting the reach of mobile applications and social media-based warnings. These literacy gaps mean that, although the EPPM model can effectively engage younger users through digital channels, additional strategies are necessary to ensure equal efficacy perceptions across age demographics. Second, Consistency of Message Interpretation. Fishermen sometimes interpret warnings inconsistently, especially if the instructions are complex or presented in technical terms. This inconsistency can lead to unintended risk-taking behaviors, highlighting the need for clear, easily interpretable messages. Third, Resource Constraints for In-Person Training. Despite the effectiveness of in-person training for improving self-efficacy among older fishermen, limited resources restrict the frequency and reach of

programs like SLCN. Expanding these training sessions would allow for broader engagement and more comprehensive efficacy-building efforts.

The findings from this study suggest that the EPPM framework offers valuable insights for structuring risk communication in the maritime sector. For broader application, the Tanjung Mas Station could consider the following recommendations: First, Expanding Digital Literacy Initiatives. Introducing digital literacy workshops alongside SLCN can help bridge the digital literacy gap among older fishermen, making tools like the Iwanis app more accessible. Second, Simplifying Message Delivery. Standardizing message language and incorporating visual aids could improve consistency in message interpretation, minimizing miscommunication and encouraging safer practices across all demographic groups. Third, Enhancing Face-to-Face Interactions: By increasing the frequency and reach of in-person training, the station can further improve self-efficacy across a wider population of fishermen, ensuring that even those with limited digital access can benefit from risk communication efforts.

4. Conclusion

The application of EPPM by the Tanjung Mas Maritime Meteorology Station has effectively fostered risk-awareness and preventive actions among fishermen, though further adjustments to digital literacy support and message delivery may enhance these outcomes. Balancing digital and in-person communication methods will allow the station to leverage EPPM principles more fully, helping fishermen navigate weather risks and improve safety practices in maritime environments.

5. Acknowledgments

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