Implementation of Preparedness Efforts for Rip Current Hazard at Pangandaran Beach

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Abstract. Rip currents are powerful current that flow from the shore through the surf zone and out to deeper waters. These currents play a critical role in coastal dynamics but they are also of significant concern for beach safety, as they pose a threat to swimmers and beachgoers. The number of fatalities due to rip current every year at Pangandaran Beach raises the question of whether the beach management is ready to face this hazard. Therefore, this study aims to assess the preparedness efforts against rip current hazard in Pangandaran Beach. The benchmarks of preparedness that will be studied include trainings, campaigns, supporting instruments, and beach closure. This qualitative research will use data from interviews with BPBD, Balawista, and Basarnas of Pangandaran Beach, supported by data from field observation. The findings indicate four criteria and eighteen metrics for evaluating rip current preparedness, applicable to beach stakeholders. The stakeholders engaged in rip current hazard management at Pangandaran Beach have undertaken preparedness initiatives that can be categorized as adequately effective. The execution of both routine and non-routine training, the distribution of campaigns via several media, the acquisition of supporting equipment, and the closure of the beach have been completed to date. Nevertheless, feedback concerning the quantity and condition of warning signs, together with the enhancement of materials and platforms for distributing information specifically about rip currents, requires further refinement.

Keywords: Rip current, preparedness, hazard, beach, Pangandaran.

1 Introduction

Rip current is one of the most dangerous and unpredictable coastal hazards, leading to numerous drowning and injury annually. According to National Weather Service (NWS), rip currents are the most serious hazard to beach safety in the United States, as well as causing more deaths on average than lightning, tornadoes or hurricanes [1]. A rip current is a narrow, swift, seaward moving current that flows from the shore to the ocean. Triatmodjo (1999) states that rip currents arise from discrepancies along the shoreline and the elevation of breaking waves. A rip current comprises multiple components: the feeder current, the neck of the current,

and the head of the current. The velocity of a rip current can attain 1 m/s and may potentially reach 2 m/s. This current can extend up to 61-762 meters length but typically has a width of less than 9 meters. The combination of waves, currents, and coastal morphology can generate rip currents. Rip currents frequently arise in shallow waters, where individuals are more like to swim. Nevertheless, the lack of awareness among several domestic and international visitors of beach safety and their lack of knowledge about rip currents leads to their ability to understand the hazard system or warning signs accurately. This increases the number of rip currents victim, particularly during the vacation season when tourist numbers peak. Rip currents have carried thousands of individuals out to sea, and in Australia, they are regarded as the primary hazard for beachgoers, accounting for 90% of maritime rescue incidents and instances of individuals being swept away. In Florida, rip currents account for 80% of sea rescues and are deemed a significant natural hazard [2], resulting in over 100 fatalities annually in the United States [3]. In England, the Royal National Lifeboat Institution (RNLI), which offers rescue services for 69% of the country's beaches, documented that 68% of maritime incidents from 2005 to 2007 were attributable to rip currents. During the period from 2005 to 2007, it was documented that 80% of beach incidents along the Atlantic coast of England were attributable to rip currents. Rip currents pose a significant threat due to their unpredictable patterns, which render them challenging to anticipate. Multiple elements contribute to the formation of rip currents, such as wave height, wave period, wind data, and tidal conditions.

Pangandaran Beach is a famous tourism spot located on a peninsula on the south coast of West Java, Indonesia. This beautiful beach is an attractive place for visitors due to natural landscape and water sport area such as swimming, surfing and other water activities. However, the currents and waves in Pangandaran coastal area at certain periods can be a potential danger for visitors. According to the Regional Board for Disaster Management (Badan Penanggulangan Bencana Daerah, BPBD) in Pangandaran Regency, there were 102 drowning victims during the holiday season in 2007 [4], and 10 beachgoers drown during the New Year holiday in 2010 [5] . During the 2016 holiday season, there were 50 accidents; in 2017, there were 20 accidents, resulting in one fatality. This underscores the significant threat posed by rip currents. Rip current accidents continue to occur in designated "safe areas" of the beach at Pangandaran, as these currents are unpredictable, and visitors either remain uninformed about this phenomenon or ignore the numerous warning signs posted along the beach [6]. The comprehension of rip currents by beachgoers and the readiness of beach managers regarding rip currents significantly contribute to reducing casualties at Pangandaran Beach.

Mucerino et al [7] stated that large and rapidly growing tourism activities in coastal environments impose an urgent need for both beach safety and risk zone at the sea. Local managers should provide information to beachgoers about rip current hazards to reduce the level of danger for visitors to Alassio beach, Italy. Locknick et al. [8] advocate for the regular annual documentation of rescues, aid, and drowning incidents, including precise times and places, to enhance data regarding beachgoers behaviour. The data can further be assessed to forecast the degree of rip current hazard [9]. The Korea Meteorological Administration has enhanced beach user safety by anticipating rip currents and supplying data from numerical models like HAECUM. Nevertheless, these initiatives are still inadequate to guarantee the protection of beachgoers. Effective hazard management strategies should focus on areas susceptible to rip currents, and comprehensive life-saving actions must be executed.

However no attempts have been made to assess the preparedness of stakeholders for rip current risk management in Pangandaran beach. Therefore, this research is focused to evaluate the current initiatives undertaken by stakeholders about the significance of management in hazard mitigation, as evidenced by multiple prior studies, as well as to develop various improvement strategies for future advantages.

2 Methodology

The qualitative research was mainly conducted through in-depth interviews with many stakeholders, including BPBD, Water Tourism Rescue Agency-Lifeguard (Badan Penyelamat Wisata Tirta, BALAWISTA) as the beach manager, and National Search and Rescue Agency (Badan Nasional Pencarian dan Pertolongan, BASARNAS). Six respondents comprise two individuals from each of the stakeholders. The interviews addressed the following subjects: job descriptions, current initiatives or programs, as well as the barriers and challenges encountered. Furthermore, a literature review of previous studies was employed to support this research, in conjunction with field observations conducted between July 2022 and December 2024 in prominent areas to achieve a more thorough understanding of the daily situations. The observations was performed at

those two intervals due to the rise in visitors during the school holiday season, thereby enhancing the understanding of the preparedness of the stakeholders and tourists involved.

3 Case Study

Pangandaran Beach is a favored location for both local and international tourists that can be accessed by vehicle, train, or airplane. The journey from Jakarta, the capital of Indonesia, requires up to 7 hours by car or 1 hour by airline. The tourism infrastructure of Pangandaran Beach has been enhanced with numerous hotel alternatives, hostels, and pleasant homestays to ensure a comfortable stay for visitors. The coastline measures around 91 kilometers and the beach is oriented towards the Indian Ocean. The morphological structure along the southwestern coast of Java Island is highly intricate, comprising bays, headlands, shallow waters, and steep shorelines. The tourist areas are situated in many beach locations, namely Pantai Barat, Pantai Timur, Batu Karas, and Pasir Putih. Each beaches exhibits distinct characteristics, resulting in different functions. Pantai Barat is regarded as a secure location for swimming, Pantai Timur is allocated for fishing, Batu Karas is an optimal site for surfing, while Pasir Putih is characterized by its white sandy beach. Lifeguards are stationed at two locations which are in Pantai Barat Beach and Batu Karas Beach. This research will concentrate on Pantai Barat Beach, as it attracts more visitors than other beach areas. There are five lifeguard observation stations as show in **Figure 1**, positioned 400 meters apart from one another, except for the distance between posts 4 and 5, which is around 500-600 meters.

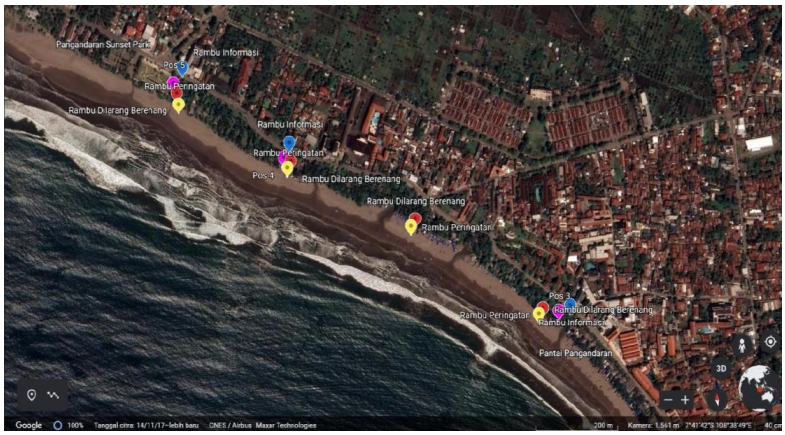

Figure 1 Lifeguard Stations at Pangandaran Beach (Google Earth, 2023)

4 Result and Discussion

4.1 Stakeholders of Hazard Management at Pangandaran Beach

In contrast to Search and Rescue (SAR) Barakuda, which oversees the fishermen of Pangandaran Beach, or the Pangandaran Marine and Air Police Unit that concentrates on criminal activities, the BPBD of Pangandaran Regency, BASARNAS, and BALAWISTA of Pangandaran Beach are the stakeholders that directly engage with tourists. Consequently, this research will concentrate on the last three parties. These three stakeholders play an important role related to hazzard preparedness, especially rip current. The policy makers have their respective roles whose ultimate goal is to provide safety to the public or tourists.

BPBD is a governmental body responsible for disaster management in certain regency or city in Indonesia. The vision is basically to create resilient communities to perpetually prepared to confront a disaster. Specifically, the objectives of BPBD of Pangandaran Regency are: 1) to enhance the disaster risk reduction system, 2) to improve disaster emergency services and outreach, and 3) to expedite post-disaster recovery services. In other hand, BASARNAS envisions the execution of efficient and dependable search and rescue operations. This concept seeks to instil a sense of security throughout the community regarding their actions. To achieve this aim, the BASARNAS has established numerous missions, including: 1) to maintain continuous vigilance in search and rescue operations, as well as in the evacuation of the public during accidents, disasters, and situations that pose a threat to human safety, with reliability, efficacy, speed, efficiency, and security, 2) to collaborate with national and international agencies/organizations to execute SAR operations and promote

SAR awareness to enhance SAR capabilities, 3) to enhance the organization's technical and managerial competencies and to perpetually advance, evolve, and refine all facets, 4) to implement capacity building and enhance human resource preparedness, together with ongoing coordination, to ensure optimal execution of search and rescue operations at all times, and 5) to supply operational facilities and infrastructure, communication apparatus, and SAR information systems as required to achieve the vision and goal. Meanwhile, BALAWISTA of Pangandaran Beach is an organization affliated with the Pangandaran Regency Tourism and Culture Office, and is directly responsible to the Pangandaran Regent. The vision of Balawista itself is *We Are There For You - We Are Nothing Without You*. The mission of Balawista itself is to save lives on the beach and other marine tourism through education, prevention and rescue services. Members of Balawista are lifeguards tasked with supervising and rescuing, ensuring a sense of security and comfort for tourists at Pangandaran Beach. BASARNAS and BALAWISTA has distinct focuses and responsibilities, although both are vital to disaster response and emergency relief, complementing one another. BASARNAS oversees extensive search and rescue operations encompassing natural disasters, transportation incidents, and various emergencies across Indonesia, whereas BALAWISTA concentrates on the rescue and monitoring of tourists at beaches and recreational areas, primarily aimed at mitigating accident risks in these locations. BALAWISTA also engages in socialization and safety education for tourists to mitigate the risk of accidents in tourist locales, particularly those associated with water activities or dangerous outdoor activities.

4.2 Identification of Parameter for Hazard Preparedness

Table 1 presents a few of hazard preparedness parameters that have been effectively determined from diverse sources or experts, including from Indonesian National Agency for for Disaster Management (Badan Nasional Penanggulangan Bencana, BNPB) (2008), Mucerino et al. (2021) [7], Litzinger and Leatherman (2021) , Llopis et al. (2018) [10], Locknick and Houser (2021) [8], and Lee et al. (2016) [9].

Tabl*e* 1 Parameter *for Hazard Preparedness*

No.	Criteria	Parameter	Reference
1	Trainings	a) Activation of disaster preparedness units along with all its supporting components	BNPB (2008)
		b) Preparedness training, simulations, drills, and technical exercises for each sector, including disaster response (SAR, social services, health, infrastructure, and public works)	
		c) Inventory of emergency support supplies	
2	Campaigns	a) Preparation of assistance and mobilization of resources and logistics	
		b) Development of a swift and cohesive information and communication system to facilitate disaster operations	
		c) Establishment and deployment of early warning system instruments	
		d) Formulation of a contingency plan	
		e) Mobilization of resources (people and infrastructure/equipment).	
		f) Provision of information on the dangers of rip currents to beachgoers	Mucerino et al (2021)
3	Supporting Instruments	a) Procurement of safety signs	Mucerino et al (2021)
		b) Improvement of lifeguard skills	

Table 1 Parameter *for Hazard Preparedness*

No.	Criteria	Parameter	Reference
		c) Provision of ring buoys and guidelines for their deployment	Litzinger & Leatherman, (2021)
		d) Warning signs redesign to include instructions for escape	Llopis Et al (2018)
4	Beach Closure	a) Consistent annual reporting on rescues, assistance, and sinkings with information on specific times and locations	Locknick & Houser (2021)
		b) Allocation of warning signs and flags	
		c) Placement of beach access points for swimming and surfing	
		d) Alert regarding the rip current hazards in beach promotion	
		e) Beach closure (due to potential hurricane and elevated tidal conditions)	Lee et al., (2016)

4.2.1 Training

The American Academy of Paediatrics (AAP) Committee on Injury and Poison Prevention Drowning, an autonomous organization dedicated to water safety and security, asserts that drowning ranks as the fourth leading cause of unintentional death. Annually, about 4,000 individuals succumb to drowning, with one-third being children under 14 years of age. Proficiency in swimming is crucial for mitigating the risk of drowning. Likewise, for individuals engaged in rip current preparedness, swimming proficiency is essential for rescuing people at sea. Consequently, a primary training activity undertaken by the three parties is swimming training. Given BPBD's primary function of supporting BASARNAS and BALAWISTA, swimming training and additional programs will be organized upon request. In contrast to BPBD, the training has frequently been executed by BASARNAS and BALAWISTA in a systematic manner and is planned on an annual basis. Trainings are largely conducted to enhance skill and ability in managing various emergency situations, especially those related to rescue, assistance, and disasters. Standard training sessions encompass SAR training, natural disaster management, maritime and terrestrial rescue operations, SAR operation management, health and first aid, mapping, and the application of technology including drones and GIS, as well as simulations and collaborative exercises between the two teams. Training is compulsory for all new members, whereas standard training, such as swimming and first aid, is advisable for volunteers.

4.2.2 Rescue and Evacuation

Knowledge regarding the rescue and evacuation of victims is a key sign of preparedness against rip currents. The subsequent document delineates the Standard Operating Procedures (SOP) for the rescue phase executed by the three interconnected entities:

1. Rapid response
   Lifeguards will promptly intervene to rescue drowning victims using supportive equipment, including a rescue tube and spine board. Should the victim lose consciousness, the lifeguard personnel will collaborate with one another.
2. A jet ski is employed when the sufferer is situated at a significant distance.
3. In the event of a reported drowning victim, the lifeguard will inquire about the reporter's name and the sequence of events pertaining to the occurrence. This reporting also pertains to BALAWISTA (lifeguards) who execute rescue operations.
4. If the victim sustains minor injuries, the BALAWISTA team will provide urgent assistance; if the victim incurs major injuries, they will be swiftly transported to the nearest hospital.

5. Should the victim remain unfound after 7 days, the BALAWISTA will collaborate with BASARNAS to initiate a search for the victim. BASARNAS will work alongside with BPBD to secure evacuation routes, provide emergency medical assistance, and implement broader disaster management if required.
6. In the event of a drowning occurrence occurring outside of working hours, the BALAWISTA will still perform a rescue if notified by the public.
7. Throughout the vacation season, the BALAWISTA will partner with BASARNAS and volunteers for beach patrols. Volunteers must have undergone training and possess swimming proficiency.

BALAWISTA must possess the capacity for self-recognition while rendering support. In the event of an accident involving a victim being carried away by a rip current, lifeguards, namely BALAWISTA members, must assess their capabilities to see if they can directly assist the victim. If they are unable to execute the rescue or feel apprehensive, a lifeguard must initiate an emergency call or solicit immediate aid from fellow lifeguards. Furthermore, lifeguards must be capable of recognizing indicators that a victim requires aid. Five lifeguard stations positioned around the Pangandaran Beach are essential to provide guidance to guests swimming in the designated area. In the event of an accident or emergency, BALAWISTA members coordinate among watch posts, activate the danger siren, and notify people via loudspeakers to vacate the beach, thereby aiding the rescue operation. Direct statements from the BALAWISTA indicate that the readiness and cooperation for drowning victims are commendable. The lifeguards will collaborate to rescue the victim. The collaboration among the lookout guards dictates whether they can independently execute the rescue. When it cannot be managed independently, BALAWISTA will facilitate the involvement of BASARNAS to go to the site. Subsequently, first aid and evacuation of the casualties must be executed in accordance with the existing conditions. If the victim is beyond rescue, which is often the case, BASARNAS will place them in a corpse bag provided at the guard post and transport them to the hospital for an autopsy. The assertions from both parties suggest that they are deemed to have comprehended the management of drowning victims through the training provided.

4.2.3 Supporting Equipment

Interviews with the three parties reveal a summary of their supporting equipment, as detailed in **Table 2**.

Table 2 Supporting Equipment

No	Supporting Equipment	BPBD	BASARNAS	BALAWISTA
1	Buoy	✓	✓	✓
2	Lifeguard Car	✓	✓	✓
3	Speed Boat	✓	✓	
4	First Aid Kit	✓		
5	Drone	✓		
6	Safety Cap		✓	
7	Aqua Eye		✓	
8	Body Bag		✓	
9	SAR Boat		✓	
10	Snorkle Set		✓	✓
11	Whistle			✓
12	Surfboard			✓
13	Inflatable Boat	✓	✓	

4.2.4 Rip current Hazard Sign

The BPBD, BASARNAS, and BALAWISTA collaborated to develop a unified program aimed at conducting a campaign and disseminating information to the public. They recognize the significance of this campaign to inform the public and visitors about the attributes and hazards of this stream. Online campaigns can be executed using social media, print media, and electronic media. Simultaneously, direct campaigns may

be executed through various initiatives aimed at educating beachgoers or the community. The interviews with BPBD, BASARNAS, and BALAWISTA indicate that the web campaign has been insufficiently effective due to its failure to reach all media outlets. Furthermore, the educational materials supplied are inadequate for effectively reaching the audience. Campaigns performed directly are distinct. They will be able to immediately access several beachgoers present at the place during that time. The campaign's readiness requirements involve redesigning warning signs to include escape instructions and highlighting the dangers of rip currents.

Indonesia National Disaster Management Agency (BNPB) in has a regulation on signs and disaster information boards, disaster signs consist of guidance signs, warning signs, prohibition signs and information signs. The signs explain the types of disaster signs used for types of disasters such as earthquakes, tsunamis, volcanic eruptions, land movements, floods, and forest fires. However, for rip current hazard, there are no regulated signs because it has not been categorized as a disaster.

At Pantai Barat Pangandaran there are several signs for tsunami evacuation, assembly point sign if tsunami occur, red flag to indicate rip current and "no-swimming warning" board. The red flag is a non permanent sign consist of long stick and red flag with "Danger current" sign. Lifeguard (Balawista) will place this red flag if there is a rip current at their observation post. **Figure 2** shows red flag and warning sign condition

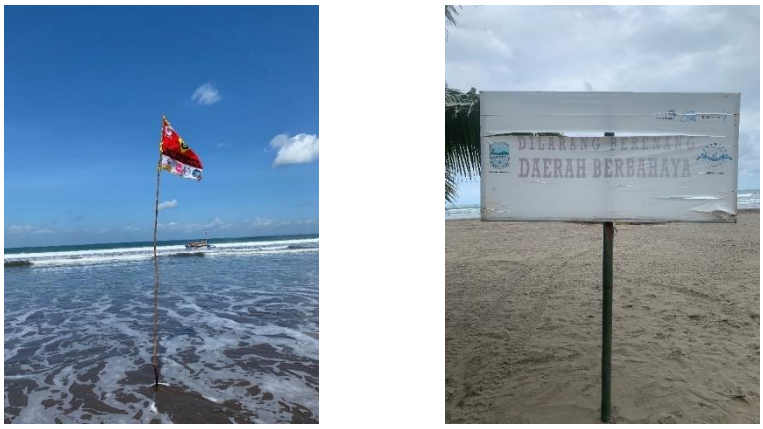

Figure 2 Red flag and warning sign condition

From the interviews with lifeguards that prohibitory signs and warning signs are needed more than information signs. Therefore, the design of prohibition signs will be recommended as well as warning signs. These warning signs were developed from rip current information image in National Weather Service, National Oceanic and Atmospheric Administration (NOAA) . The images present multiple indicators for recognizing rip currents such as 1) A narrow channel of darker, calmer water surrounded by breaking waves and foam; 2) A rotating water current distinct from the surrounding water; 3) A difference in water color, such as an area of muddy-appearing water, and 4) A consistent area of foam or seaweed being carried through the surf. This design also adapt from traffic sign to ensure people about the importance of this information.

a. "No Swimming" Warning Sign
   This recommendation warning sign based on BNPB regulation No 7 Year 2015 about sign and disaster information sign and Ministry of transportation regulation No 13 Year 2014 on traffic sign. These information consist of color, dimension, font type and also material with warning sign in bahasa Indonesia "Dilarang Berenang, Arus Kuat" which means "No swimming, strong current" as shown in **Table 3** and **Figure 3**.

b. Rip Current Hazard Sign
   This sign based on NOAA rip current sign which indicates rip current can moves people away from shore. The yellow color contains warnings of possible dangers or vulnerable places. To make it easier to read, yellow is the basic color of this sign. For the text and images use black color so that it is easier to see.

c. Rip Current Information Sign
   This recommended sign consist of fact about rip current, how rip current form in the nearshore, rip current speeds and the danger of this current in Bahasa Indonesia.

Table 3 "No Swimming" Warning Sign Dimension

"No Swimming" Warning Sign	BNPB Regulation No. 07 Year 2015	Ministry of Transportation Regulation No. 13 Year 2014	Recommendation design
Color	Red	Red	Red
Board Sign Length	120 – 160 cm	120 – 160 cm	120 cm
Board sign width	160 – 400 cm	160 – 400 cm	200 cm
The sign pole height	-	175 - 265 cm	175 cm
Font type	Clearview Highway	Clearview Highway	Clearview Highway
Sign pole material	-	-	Galvanized Iron
Sign material	-	Almunium sheet	Almunium sheet

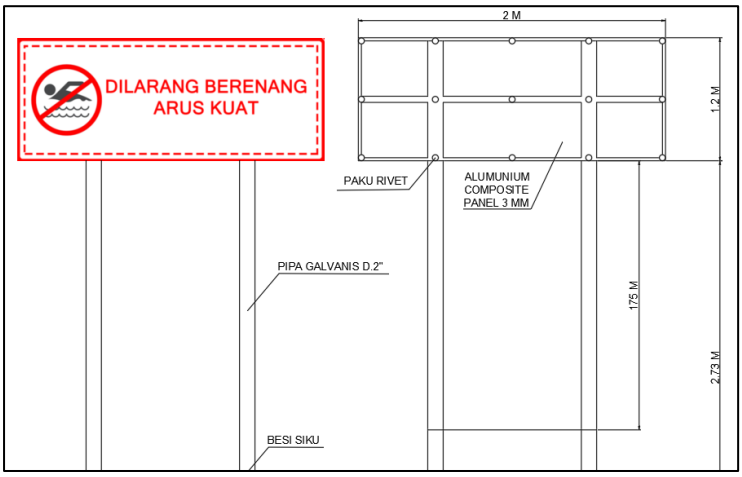

Figure 3 ""No Swimming" Warning Sign Design

Table 4 Rip Current Hazard Sign Dimension

Rip Current Hazard Sign	BNPB Regulation No. 07 Year 2015	Ministry of Transportation Regulation No. 13 Year 2014	Recommendation design
Color	Yellow	Yellow	Yellow
Board Sign Dimension	45 – 90 cm	45 – 90 cm	60 cm
The sign pole height	-	175 – 265 cm	175 cm
Font type	Clearview Highway	Clearview Highway	Clearview Highway
Sign pole material	-	-	Galvanized Iron
Sign material	-	Almunium sheet	Almunium sheet

Table 5 Rip Current Information Sign Dimension

Rip Current Information Sign	BNPB Regulation No. 07 Year 2015	Ministry of Transportation Regulation No. 13 Year 2014	Recommendation design
Color	Yellow	Yellow	Yellow
Board Sign Length	140 cm	140 cm	140 cm
Board Sign Width	105 cm	105 cm	105 cm
The sign pole height	-	175 - 265 cm	175 cm
Font type	Clearview Highway	Clearview Highway	Clearview Highway
Sign pole material	-	-	Galvanized Iron
Sign material	-	Almunium sheet	Almunium sheet

(a) (b)

Fig*ure* 4 (a) Rip Current Hazard Sign and (b) Rip Current Information Sign

4.2.5 Beach Closure

Beach closure is an action to closing the beach that must be taken if there are hazard in coastal areas. This is done to maintain public safety. The proposed beach closing is to consider the possibility of high waves that result in many rip currents along the coast even for the beach that is considered safe will become dangerous. This beach closing is necessary to urge tourists not to swim in the beach area due to high wave conditions. Wave height is a key factor in the probable formation of a rip current. Wave height can be measured directly or assessed using existing wind data. The quantity of wave reflections manifested as bays and depressions serves as the primary indicator of rip current formation. Concerning the beach closure, the three involved parties often coordinate with multiple media outlets, including print, online, and electronic, to notify the public about the closure within a specified timeframe, supported by compelling justifications. It is anticipated that the public would exercise greater caution when visiting the beach in the future, as natural occurrences can arise unexpectedly.

In general, the implementation of rip current preparedness efforts at Pangandaran Beach can be classified as adequate. The evaluation results are summarized in **Table 6**.

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Table 6 Evaluation Results

No.	Criteria	Parameter	Description
1	Trainings	a) Activation of hazard preparedness units along with all its supporting components	Available
		b) Preparedness training, simulations, drills, and technical exercises for each sector, including disaster response (SAR, social services, health, infrastructure, and public works)	Available
		c) Inventory of emergency support supplies	Available
2	Campaigns	a) Preparation of assistance and mobilization of resources and logistics	Available
		b) Development of a swift and cohesive information and communication system to facilitate disaster operations	Re-design
		c) Establishment and deployment of early warning system instruments	Re-design
		d) Formulation of a contingency plan	Available
		e) Mobilization of resources (people and infrastructure/equipment).	Available
		f) Provision of information on the dangers of rip currents to beachgoers	Re-design
3	Supporting Instruments	a) Procurement of safety signs	Re-design
		b) Improvement of lifeguard skills	Available
		c) Provision of ring buoys and guidelines for their deployment	Available
		d) Warning signs redesign to include instructions for escape	Re-design
4	Beach Closure	a) Consistent annual reporting on rescues, assistance, and sinkings with information on specific times and locations	Available
		b) Allocation of warning signs and flags	Re-design
		c) Placement of beach access points for swimming and surfing	Available
		d) Alert regarding the rip current hazards in beach promotion	Available
		e) Beach closure (due to potential hurricane and elevated tidal conditions)	Available

5 Conclusion

This research successfully formulated four criteria and 18 assessment parameters for rip current preparedness by relevant stakeholders, namely BPBD, BASARNAS, and BALAWISTA. Furthermore, an overview of the execution of rip current hazard management can be acquired through interviews with the three relevant parties. All parties are cognizant of and comprehend their individual roles and the interrelations among them. They have undertaken several initiatives to date, including fundamental training, engagement in self-improvement programs, acquisition of supportive materials, and installation of warning signs along the beach, despite their state being suboptimal or partially compromised. General campaigns about beach safety efforts have also been publicized through various print and electronic media. Unfortunately, the program has failed to address the hazards of rip currents in specific way. Consequently, several enhancement initiatives may focus on improving the campaign materials and their distribution channels, in addition to increasing the number of warning signs along the beach. The assessment of preparedness initiatives against rip currents conducted by all stakeholders can be categorized as adequate.

Acknowledgement

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