

# PREPAREDNESS STUDY OF KETAPING BEACH TOURISM OBJECT VISITORS AGAINST EARTHQUAKE AND TSUNAMI DISASTERS IN PADANG PARIAMAN REGENCY

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**ABSTRACT:** West Sumatra has promising tourism potential because it has the potential for natural beauty, cultural and culinary attractions. One of them is Padang Pariaman Regency which has seven beach and island tourist attractions. Besides having tourism potential, West Sumatra Province also has a very high potential disaster risk. Padang Pariaman Regency has a very high level of tsunami disaster risk. The fact that the potential risk of tsunami disaster is very high and the potential for beach tourism is also high can hamper and disrupt the lives and livelihoods of the community. The purpose of the study was to determine the level of preparedness of visitors in facing a tsunami disaster along the coast, in this case the research locus was Panjang Beach Nagari Ketaping. This research method is descriptive quantitative with purposive sampling calculation technique using tourism object visitor preparedness index analysis which consists of four parameters which include knowledge and attitude factors, emergency response plans, warning systems, and resource mobilization. The results showed that the level of preparedness of visitors to Ketaping Beach tourism objects against earthquake and tsunami disasters was dominated by the level of preparedness "less prepared" with a percentage of 42%. While the smallest is the "very prepared" preparedness category with a percentage of 2%. Thus it can be concluded that there are still many visitors to Ketaping Beach tourism objects who have not prepared themselves for earthquake and tsunami disasters that can occur at any time. So that visitors to the Ketaping Beach tourist attraction are expected to make mitigation efforts both actively and passively by increasing capacity independently such as training and disaster socialization and already knowing information on the level of risk of earthquakes and tsunamis at the location of the tourist attraction they will visit.

*Keywords: Disaster; Earthquake and Tsunami; Preparedness; Mitigation; Padang Pariaman Regency*

## 1. INTRODUCTION

West Sumatra has promising tourism potential due to its natural beauty, cultural and culinary attractions. No less than eight recognitions and awards have been obtained by West Sumatra related to the tourism sector. In 2012 Nagari Pariangan Tanah Datar Regency was named the world's most beautiful village by Travel Budget Magazine. Next, Mentawai waves were named one of the world's best waves for surfing by Surfer Magazine in 2013. In 2016 West Sumatra was awarded the best culinary destination and the best halal tourist destination from World Halal Tourism Abu Dhabi. Furthermore, in 2017 rendang was named the best food in the world by CNN and in 2018 West Sumatra has 11 geopark sites and three of them have national geopark status.

West Sumatra is also the province with the

most tourist villages and four of them are included in the top 30 Indonesian Tourism Village Awards held by the Ministry of Tourism and Creative Economy in 2021. In terms of religious tourism, the Great Mosque of West Sumatra in Padang City has been named one of the mosques with the best architecture in the world by Abdullatif Al Fozan Awar. Furthermore, the Ombilin coal mining heritage in Sawahlunto has also been named a UNESCO world heritage in the field of heritage [1].

It is undeniable that the tourism sector is the locomotive of West Sumatra's economy because it has a wide multiplier effect. A number of regions in West Sumatra also have unique cultural attractions such as Hoyak Tabuik in Pariaman, Pacu Jawi in Tanah Datar to religious tourism to a number of mosques. One of the regencies in West Sumatra Province is Padang Pariaman Regency,

which has seven beach and island tourist attractions, namely Angso Duo Island, Kasiak Island, Gondoria Beach, Mirror, Kata Beach, Ketaping Beach and Oyster Beach [2]. Ketaping Beach in Batang Anai District Nagari Ketaping is one of the relatively new beach natural attractions with a very attractive long beach and is growing from time to time. The results of previous research [1-3], the level of visits on weekdays averages 50 - 100 people while on holidays or big days it can reach 500 people or even more. The level of visits from time to time has increased significantly along with the existence of a new tourist attraction, namely the religious tourist attraction Pondok Mengaji Az-Zikr on Ketaping Beach.

Besides having tourism potential, West Sumatra Province also has a very high potential

disaster risk. The location and geographical conditions of West Sumatra include disaster-prone areas, especially natural disasters such as earthquakes, landslides, floods, tsunamis, volcanic eruptions and others that can cause environmental damage, property losses, psychological impacts, and casualties [4].

The level of coastal vulnerability to tsunamis is determined by several factors including: elevation (topography), land use, population density and infrastructure. The tsunami hazard is represented by the tsunami height at the coast obtained from the results of the precalculated tsunami database for all of Indonesia for each coastal district/city in West Sumatra is as follows [5].

**Table 1.** Tsunami Hazard Levels in Each Regency / City of Coastal West Sumatra

No	Regency/District Name	Tsunami		Tsunami Hazard Level
		Height	Time Arrival	
1	Kep. Mentawai	14	5	Extremely High
2	Pesisir Selatan	11	5	Extremely High
3	Padang Pariaman	11	35	Extremely High
4	Agam	9	35	High
5	Pasaman Barat	9	35	High
6	Kota Padang	9	35	High
7	Kota Pariaman	9	35	High

Source: Hamzah Latief, 2012.

There are 7 coastal districts and cities that have high to very high tsunami potential. Likewise, the results of the tsunami risk assessment show that generally along the west coast of West Sumatra has a high and very high level of risk, especially in inhabited areas, this is due to road infrastructure and tourist attractions that are generally located close to the coast. Tsunami mitigation efforts need to be carried out with a forward-looking approach and cross-sectoral solutions. This is absolutely necessary considering that tsunami hazards are real and the projected occurrence and intensity of earthquakes and tsunamis are difficult to predict. The relationship between threat, vulnerability and capacity contained in disaster risk is an approach to show the potential negative impacts that may arise due to a potential disaster [6]. The formula shows the relationship between threat, vulnerability and capacity. The greater the level of threat and vulnerability of an area, the greater the level of disaster risk, while the higher the capacity to deal with disasters in an area, the lower the level of disaster risk [7].

The pre-disaster stage consists of preparedness, mitigation, and early warning, the second is during a disaster/emergency response, and the third is post-disaster which consists of rehabilitation and reconstruction [8]. Preparedness aims to minimize the adverse effects of disaster hazards through effective, timely, adequate, and efficient

preventive measures for emergency response and disaster relief [9]. Preparedness efforts also aim to ensure that the resources needed to respond in a disaster event can be used effectively at the time of the disaster and know how to use them [10].

The resolution of disaster and tourism issues (cross-sectoral) is a must because coastal and marine areas are one of the supports of various activities of other sectors (including tourism) with an interest. The fact that the potential risk of tsunami disaster is very high and the potential for coastal tourism is also high can hamper and disrupt the lives and livelihoods of the community, the implementation of development (tourism actors including visitors and managers) so that anticipatory efforts need to be made, one of which is mitigation efforts. One of the mitigation efforts (pre-disaster) carried out in the tourism sector which is a leading sector is to see how far the preparedness of visitors in facing disasters, in this case a tsunami disaster along the coast, in this case the research locus is Panjang Beach Nagari Ketaping.

## 2. RESEARCH METHODS

This research method is Quantitative Descriptive research with purposive sampling calculation technique with the category of Family

Heads or Housewives who visit Ketaping beach. The tool used is a questionnaire instrument for measuring the preparedness index. The data collection methods used are primary data and secondary data. Primary data in the form of questionnaires, observation, and visual documentation. Secondary data is data obtained from relevant agencies such as from BAPPEDA Padang Pariaman Regency in the form of RTRW documents and from BPBD Padang Pariaman, BPS in the form of data on Ketaping Subdistrict / Nagari in Figures. In addition, secondary data is also obtained from literature such as journals, books and websites.

The distribution of questionnaires was carried out around Ketaping Beach, Padang Pariaman Regency where the research administrative boundary map can be seen in (Figure 1). The steps taken in researching the level of preparedness of visitors to the long beach of Nagari Ketaping in the face of earthquake and tsunami disasters begins with the survey stage, namely taking a sample, namely visitors to the Ketaping beach tourist attraction who are heads of families or housewives who can represent visitors. The sample collection method is random (purposive sampling) where the sample group is targeted to have certain attributes [11-12], namely the head of the family or housewife. The determination of this data collection method is used because visitors who come to Ketaping long beach are predominantly

families and groups so this method is used. Another attribute is that the distribution of questionnaires was carried out on holidays and weekdays totaling 100 respondents with the consideration that the more samples taken, the better the research results.

Then the analysis stage where at this stage measuring the level of preparedness of visitors to Ketaping beach tourism objects against earthquake and tsunami disasters according to the results of respondents' answers to the questionnaire, namely using the tourism object visitor preparedness index consisting of four parameters including knowledge and attitude factors, emergency response plans, warning systems, and resource mobilization. Preparedness index analysis is used to identify the level of community readiness in facing disasters [13].

The results of the preparedness index calculation were carried out for each parameter. The higher the index number means the higher the level of preparedness of the subject under study and vice versa. Referring to the Community Preparedness Study developed by LIPI, 2006 to determine the level of preparedness of visitors to Ketaping beach tourist attraction, the combined index of several parameters is calculated using a weighted combined index, meaning that each parameter has a different weight.

**Table 2. Weighting Of Visitor Preparedness Parameters**

No	Parameters	Weight (%)
1	Knowledge and Attitude (KA)	45
2	Emergency Response Plan (ERP)	35
3	Resource Mobilization (RM)	15
4	Disaster Warning System (DWS)	5
Total		100

Source: LIPI Community Preparedness Study, 2006

Disaster Preparedness Index = 0.45 (KA) +0.35 (ERP) +0.15 (RM) +0.05 (DWS). To determine the value of the community preparedness index of parameter, the following formula is used:

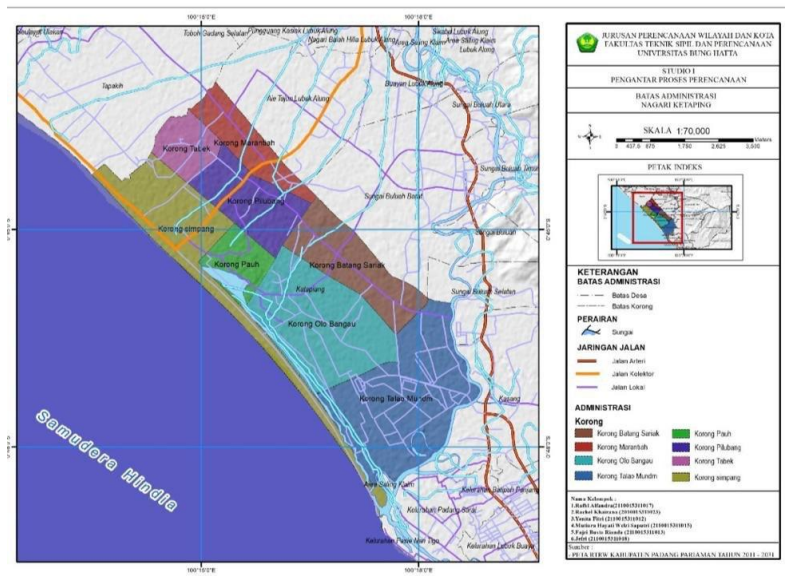
$$\text{Preparedness Index} = \frac{\text{Total Real Score} \times 100}{\text{Maximum Parameter Score}}$$

The level of preparedness of visitors to Panjang Beach in this study is categorized into 5 categories as follows.

**Table 3. Visitor Preparedness Level**

No	Score Interval	Category
1	80 – 100	Highly Prepared
2	65 – 79	Prepared
3	55 - 64	Almost Prepared
4	40 – 54	Less Prepared
5	< 40	Not Ready

Source: LIPI Community Preparedness Study, 2006



**Fig. 1** Map of Administrative Boundaries Nagari Ketaping

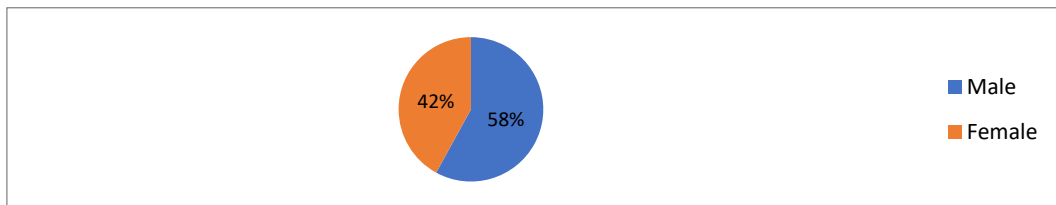
### 3. RESULTS AND DISCUSSION

#### 3.1 Visitor Characteristics

Visitor characteristics are categorized based on gender, age, latest education level, frequency of Ketaping Beach visits, number of family members, and region of origin. It is important to know

whether tourists who visit Ketaping Beach have preparedness in facing these disasters where the area has the potential for tsunamis and earthquakes.

##### a. Gender

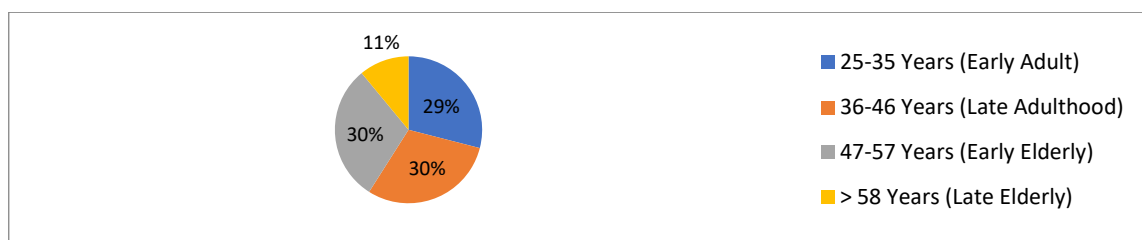


**Fig. 2** Percentage of Gender of Ketaping Beach Visitors

Observations showed that the percentages were relatively similar between females and males. The comparison between these two types of groups is 42% for the female gender and 58% for the male

gender. So it can be concluded that the Ketaping Beach tourist attraction is in demand by all genders.

##### b. Visitor Age

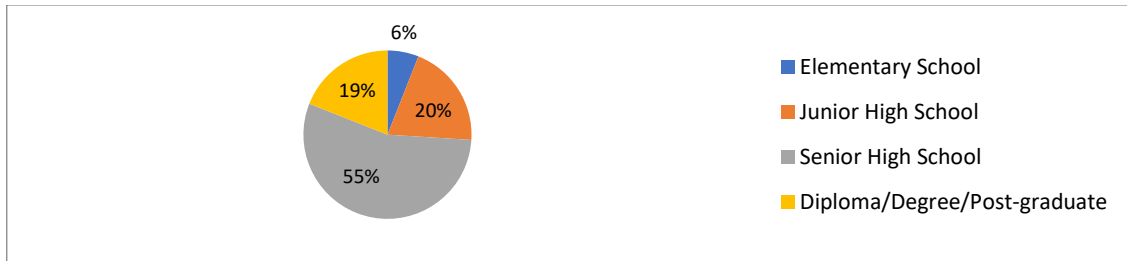


**Fig. 3** Percentage of Age of Ketaping Beach Visitors

The level of earthquake and tsunami disaster preparedness at Ketaping Beach is influenced by the age factor. The observation results show that the age range of visitors who come to the Ketaping Beach tourist attraction is grouped into 4 groups. Each visitor aged 36-46 years and 47-57 years is 30%. Visitors or tourists aged 25-35 years were 29%, and the smallest was

visitors aged >58 years by 11%. The age range of visitors between 25-47 years and above is the age range of adults to early elderly (25-57 years). This is because there are various activities and natural beauty that are still good, besides that this tourist spot is easily accessible to men and women of mature age because they can travel together with their families.

c. Education Level

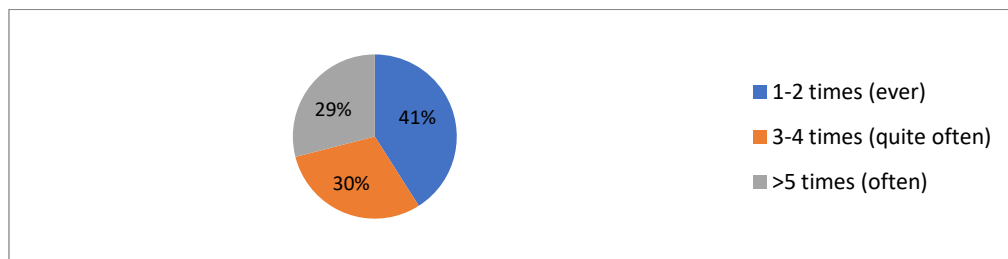


**Fig. 4** Percentage of Last Education of Ketaping Beach Visitors

The last level of education of respondents visiting Ketaping Beach tourist attraction is very diverse, ranging from elementary school to postgraduate level. From the percentage, it is known that visitors to Ketaping Beach tourism

objects are dominated by visitors with the last education level of SMA / SMK with a percentage of 55%. For the least level of education is the elementary school level with a total of 6 visitors (6%).

d. Visit Frequency

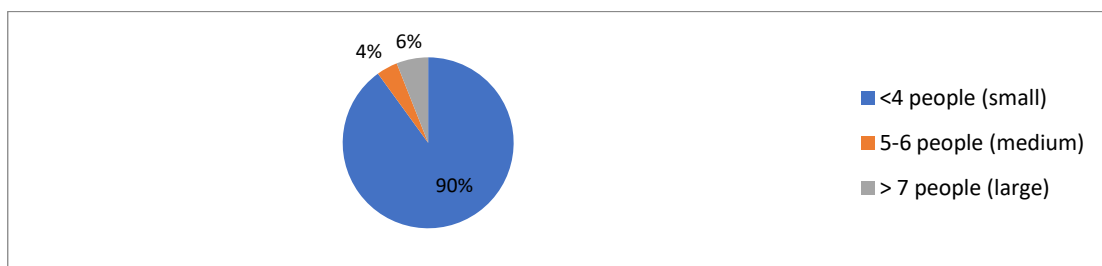


**Fig. 5** Percentage of Frequency of Visit to Ketaping Beach

There are 41 visitors (41%) who have visited Ketaping Beach once or 1-2 times. However, there are also many visitors who visit

Ketaping Beach quite often with 30 visitors (30%) and often go to Ketaping Beach with 29 visitors (29%).

e. Families (type)



**Fig. 6** Percentage of Family Members of Ketaping Beach Visitors

The characteristics of Ketaping Beach tourism visitors based on the category of the number of family members who dominate the most, namely the number of family members of 4

people who are included in the small family type at 90%. As for the medium family category with a percentage of 4% and the large family category with a percentage of 6%.

f. Visitor Origin Area

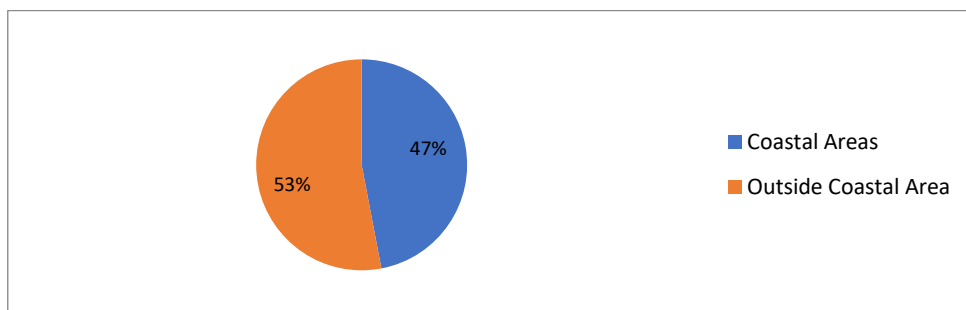


Fig. 7 Percentage of Area of Origin of Ketaping Beach Visitors

Ketaping Beach is not only attracted by visitors from within the coastal area itself (Ketaping, Lubuk Alung, Pasar Usang, Padang, Duku, Padang, Pariaman, and surrounding areas). But it is also in demand by visitors from outside the coastal area (Bukittinggi, Payakumbuh, Solok, Malalak, Kamang Agam, Pasaman, Manado and

surrounding areas). Based on observations, Ketaping Beach visitors who come from outside the coastal area are more visitors (53%). While visitors who come from the coastal area are 47 visitors (47%).

3.2 Visitor Preparedness Index

The preparedness index aims to determine the level of community preparedness in facing disasters (LIPI Community Preparedness Study, 2006). There are four parameters to measure the level of preparedness of Ketaping Beach tourism

visitors against tsunamis and earthquakes, namely knowledge and attitudes, emergency response plans, early warning systems, and resource mobilization.

Table 4. Preparedness Level of Ketaping Beach Tourism Object Visitors Against Earthquake and Tsunami Disasters

No	Score Interval	Preparedness Level	Pengunjung	
			Total	(%)
1	80-100	Highly Prepared	2	2
2	65-79	Prepared	23	23
3	55-64	Almost Prepared	28	28
4	40-54	Less Prepared	42	42
5	<40	Not Ready	5	5
Total			100	100

Source: Analysis Results, 2023

It is known that the level of preparedness of visitors to Ketaping Beach towards earthquake and tsunami disasters is included in the five categories of preparedness levels. Where the level of preparedness of visitors to Ketaping Beach tourism objects against earthquake and tsunami disasters is dominated by the level of preparedness

"less ready" with a percentage of 42%. While the smallest is for the "very ready" preparedness category with a percentage of 2%. Thus it can be concluded that there are still many visitors to Ketaping Beach who have not prepared themselves for earthquake and tsunami disasters that can occur at any time.



### 3.3 Correlation of Visitor Characteristics with Preparedness

The high risk of potential earthquake and tsunami disasters at Ketaping Beach needs to be addressed with self-preparedness for disasters that will come suddenly. Therefore, visitors to Ketaping Beach need to have preparedness as an effort to anticipate potential earthquake and tsunami disasters so that the risk of earthquake and tsunami disasters can be minimized. Some things

that can affect disaster preparedness include gender, age, education level, frequency of beach visits, number of family members, and region of origin. In this case, it is seen that there is a relationship between visitor characteristics and preparedness for earthquake and tsunami disasters, especially at the level of preparedness with the characteristics of visitors who are categorized as "less prepared" and "not ready" because visitors with a level of preparedness in that category need more attention.

#### a. Correlation between Age and Level of Visitor Preparedness

**Table 5.** Correlation between Age and Level of Visitor Preparedness

No	Preparedness Level	Age Group								Total	
		Early Adult (25-35 years old)		Late Adulthood (36-46 years old)		Early Elderly (47-57 years old)		Late Elderly (>58 years old)			
		Total	(%)	Total	(%)	Total	(%)	Total	(%)	Total	(%)
1	Less Prepared	11	26,19	17	40,48	10	4,29	4	35,71	42	100
2	Not Ready	0	0	4	80	1	20	0	0	5	100

Source: Analysis Results, 2023

Based on the table above, the level of preparedness "less ready" is dominated by the late adult age group (36-46 years) of 17 visitors with a percentage of 40.48%. As for the late elderly age group (>58 years), there are only 4 visitors with a percentage of 35.71%. Similarly, the 5 visitors who belonged to the "not ready" level of preparedness were dominated by the late adult age

group (36-46 years) totaling 4 visitors with a percentage of 80%. This shows that the older the age, the better the level of maturity and life experience so that they are more prepared to prepare themselves for earthquake and tsunami disasters.

#### b. Correlation of Region of Origin with Level of Visitor Preparedness

**Table 6.** Correlation of Region of Origin with Level of Visitor Preparedness

No	Preparedness Level	Region Of Origin				Total	
		Coastal Areas		Outside Coastal Areas			
		Total	(%)	Total	(%)	Total	(%)
1	Less Prepared	14	33,33	28	66,67	42	100
2	Not Ready	2	40	3	60	5	100

Source: Analysis Results, 2023

Based on the table above, visitors who have a level of preparedness "less ready" are dominated by visitors who come from outside the coastal area who generally come from Bukittinggi, Payakumbuh, Solok, Malalak, Kamang Agam, Pasaman, Manado and surrounding areas, namely 28 visitors with a percentage of 66.67. While visitors who come from coastal areas who generally come from Ketaping, Lubuk Alung, Pasar Usang, Padang, Duku, Padang, Pariaman, and surrounding areas are 14 visitors with a

percentage of 33.33%. Likewise with the level of preparedness "not ready" where of the 5 visitors there were 3 visitors with a percentage of 60% who came from outside the coastal area. However, there are still 2 visitors from coastal areas who are not ready to be alert to earthquake and tsunami disasters with a percentage of 40%. This shows that visitors' awareness of disaster threats in the area where they live is still low, even though the area has the potential for earthquakes and tsunamis.

c. Correlation between Education Level and Visitor Preparedness Level

**Table 7.** Correlation between Education Level and Visitor Preparedness Level

No	Preparedness Level	Education Level										Total	
		Out of School		Elementary School		Junior High School		Senior/Vocational High School		Bachelor/Diploma			
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
1	Less Prepared	0	0	2	4,76	9	21,43	24	75,14	7	16,67	42	100
2	Not Ready	0	0	1	20	3	60	1	20	0	0	5	100

Source: Analysis Results, 2023

Based on the table above, of the 42 visitors who are included in the level of preparedness "less ready" have different levels of education. Visitor education is dominated at the high school / vocational high school education level of 24 visitors with a percentage of 75.14%. However, there are still visitors at the bachelor /

diploma level of education who are at the "less prepared" level of preparedness of 7 visitors with a percentage of 16.67%. While for the level of preparedness "not ready", the education level of many visitors is dominated by the junior high school level of 3 visitors with a percentage of 60%.

d. Correlation between Education Level and Visitor Preparedness Level

**Table 8.** Correlation between Gender and Level of Visitor Preparedness

No	Preparedness Level	Gender				Total	
		Women		Men			
		Total	(%)	Total	(%)	Total	(%)
1	Less Prepared	26	61,90	16	38,10	42	100
2	Not Ready	3	60	2	40	5	100

Source: Analysis Results, 2023

Based on the table above, out of 42 visitors, 26 of them were dominated by women with a percentage of 61.90% who were declared "less prepared" in earthquake and tsunami disaster preparedness. While men are 16 visitors with a percentage of 38.10%. Similarly, the level of preparedness was "not ready" where there were more women, namely 3 visitors with a percentage of

60% than men, namely 2 visitors with a percentage of 40%. This can be caused because women tend to have less access to disaster preparedness due to their roles and social construction. Because men have more roles in the public sphere and have the greatest opportunity to access information related to disasters.

e. Correlation between Family Type and Level of Visitor Preparedness

**Table 9.** Correlation between Family Type and Visitor Preparedness Level

No	Preparedness Level	Family Type						Total	
		Small (<=4 people)		Medium (5-6 people)		Large (>=7 people)			
		Total	(%)	Total	(%)	Total	(%)	Total	(%)
1	Less Prepared	36	85,71	2	4,76	4	9,52	42	100
2	Not Ready	5	100	0	0	0	0	5	100

Source: Analysis Results, 2023

Based on the table above, the 42 visitors were dominated by small family types with a total of 36 people with a percentage of 85.71% who were declared "less prepared" in earthquake and tsunami disaster preparedness. The level of

preparedness of "not ready" also shows that the small family type is 5 people with a percentage of 100%. This shows that there are still many families, especially small families, who are not prepared for earthquake and tsunami disasters.



f. Correlation of Visit Frequency with Visitor Preparedness Level

**Table 10.** Correlation of Visit Frequency with Visitor Preparedness Level

No	Preparedness Level	Frequency of Visit to Ketaping Beach						Total	
		Ever (1-2 times)		Quite Often (3-4 times)		Often (≥ 5 times)			
		Total	(%)	Total	(%)	Total	(%)	Total	(%)
1	Less Prepared	16	38,10	16	38,10	10	23,81	42	100
2	Not Ready	4	80	0	0	1	20	5	100

Source: Analysis Results, 2023

Based on the table above, the level of preparedness "less ready" is dominated by visitors who have been and quite often to Ketaping Beach tourism objects, namely with 16 visitors and a percentage of 38.10%. Likewise with the level of preparedness "not ready" where visitors who are not ready for earthquake and tsunami disasters are

visitors who only 1-2 times to Ketaping Beach tourism objects with the number of visitors 4 people and a percentage of 80%. This shows that visitors who do not often travel to Ketaping Beach are still many who have not prepared themselves for earthquake and tsunami disasters.

**3.4 Earthquake and Tsunami Disaster Mitigation Efforts for Ketaping Beach Tourism Objects**

The level of preparedness of visitors at Ketaping Pariaman Beach towards earthquake and tsunami disasters is still mostly classified as less ready to not ready, which means that efforts need to be made to improve community preparedness, both mitigation with structural and non-structural measures such as training and community capacity building. To minimize losses in the event of an earthquake and tsunami disaster by paying attention to both active and passive disaster mitigation activities [14].

In improving these pre-disaster measures, communities need to think about how to cope with disasters or pre-disasters both actively and passively to make a conducive environment, thus providing a good quality, comfortable and productive life for the community in carrying out their activities [15]. Earthquake and tsunami disaster mitigation efforts at Ketaping Beach are carried out in the form of Passive Mitigation and Active Mitigation. Active Mitigation that can be carried out by the government, namely preparing evacuation routes, shelters, and early warning against tsunamis or (sirens) known as the Tsunami Early Warning System (TEWS) is expected to be a means of increasing the survival rate when a tsunami disaster occurs. InaTEWS is a tsunami early warning system in Indonesia that is managed by BMKG. In order to reduce disaster risk, tsunami early warning systems such as InaTEWS must issue and disseminate warnings quickly, on target, scientifically tested, and clearly so that they

are easy to understand and comprehend [16]. Tsunami hazard information boards should be installed in every area that can be seen directly by visitors to Ketaping Beach tourist attraction. Then Pokdarwis can hold disaster mitigation educational attractions such as the socialization of knowledge about disaster, as well as the introduction of tourist attractions and tourist attractions planting pinago trees that are native to Pariaman in the context of greening Ketaping Beach. The community and visitors to the Ketaping Beach tourist attraction planted pinago trees where this vegetation has a strong, sturdy root system, and is suitable for growing on the characteristics of the sandy beach of Ketaping Beach. Coastal communities are encouraged to participate in cultivating and planting Pinago trees so as to reduce environmental vulnerability due to coastal abrasion and reduce the impact of tsunamis that threaten Ketaping Beach Tourism Objects.

Passive Mitigation efforts that must be carried out by both the community and the government of Pariaman City include making a map of potential disasters that will occur in coastal areas, the community around the Ketaping Beach tourist attraction and visitors are expected to increase the capacity of visitors independently such as training and disaster socialization and already know information on the level of risk of earthquakes and tsunamis at the location of the tourist attraction they will visit.

#### 4. CONCLUSION

The level of preparedness of visitors to Ketaping Beach in Padang Pariaman, West Sumatra, in facing disasters such as earthquakes and tsunamis is still low. This can be seen from the results of the study, which show that the majority of visitors to the beach are at the "unprepared" level in facing disasters. Therefore, active and passive mitigation efforts are needed to improve visitor preparedness and reduce disaster risk for the tourism industry and local communities. Such mitigation efforts include education and training, provision of early warnings, provision of evacuation routes, shelters and planting of Pinago trees to reduce environmental vulnerability to tsunamis. In addition, the importance of community understanding and awareness of the risks and potential impacts of disasters, as well as the critical role of early warning systems such as InaTEWS in reducing disaster risk in coastal areas.

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