Perceptions and strategies of sendang Biru Tourists Towards Climate Change

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Abstract: Tourism is one of the strategic sectors in development in Indonesia. The tourism sector is expected to bring economic benefits to both the community and the state, also in terms of regions and cities. The purpose of this study was to analyze the perception of tourists and the community towards climate change in Sendang Biru and analyze the adaptation strategies of tourists and the community towards climate change in Sendang Biru. This research was conducted at Sendang Biru beach tourism, Sumber Manjing Wetan District, Malang Regency. The results of the study found that most tourists have an understanding of climate change and easy access to daily weather information through technology. Nevertheless, the impact of climate change and extreme weather conditions on Sendang Biru beach is not significantly felt by tourists, especially since the majority come from outside the area. Therefore, it is recommended to increase education, develop concrete adaptation strategies, and collaboration between the government, tourism stakeholders, and the community in dealing with climate change in order to maintain the sustainability of tourism in the destination.

Keywords: Climate Change, Fishermen, Fishermen's Perception, Adaptation Strategy.

1. Introduction

Tourism is a phenomenon of activity that is physically, visualized into a form of fun activities. Nowadays, traveling in developed countries has become a very important need. Indonesia is an archipelago that has natural and cultural wealth. Its potential has caused the Indonesian nation to be recognized in the tourism sector in the international world. The tourism sector is expected to bring economic benefits to both the community and the country.

Climate change is an event that occurs due to global warming which has a negative impact, namely rising sea surface temperatures, extreme weather intensity, changes in rainfall patterns and large waves. Negative impacts have a sustainable impact on the pattern of life of fishermen in fulfilling their needs. Climate change also has an impact on the potential for natural disasters. Based on the results of a search of the International Disaster Database, there are 345 natural disasters that fall into the category of global disasters.

About 60% of these natural disasters are natural disasters due to extreme climate events such as floods, droughts, forest fires, and others. Various human activities such as burning fossil fuels and land use change, increase the greenhouse effect (CO_2, CH_4, N_2O) which has an impact on increasing global temperatures, melting ice sheets, rising sea levels, and changes in rainfall (Aldrian *et al.*, 2011). Indonesia as an archipelago and located in the tropics is very vulnerable to the impacts of climate change (Bappenas, 2014). The impact of climate change is not only limited to changes in the rainy-dry season, sea level rise, but has also affected various aspects of life, ranging from economy, health, food security, and also environmental damage. Climate change is a phenomenon that is not easily identified and accurately assessed by the general public, especially if only based on personal experience. Information gaps between scientists, policy makers and the public about climate change often lead to different perceptions (Surmaini *et al.*, 2011). Therefore, it is important for governments

and scientists to understand public perceptions of climate change.

Good tourism planning can have a positive impact on the country's economy. An important thing to consider in tourism planning is the sustainability of a tourist destination. The sustainability of tourist destinations is influenced by weather and climate (Weaver, 2011). According to NASA (2011), weather is the condition of the atmosphere at a certain time in a short period of time, while climate is how the atmosphere behaves over a relatively long period of time. Climate change has the potential to have a negative impact on the tourism sector. To deal with climate change, adaptation is necessary. Adaptation in tourism requires tourism planning and development that considers and studies climate change. Scott *et al.* (2008) suggest that planning and decision-making by stakeholders in the tourism sector tend to be more influenced by perceptions of climate change.

Sendang Biru is one of the tourist destinations in Malang Regency. Sendang Biru is already famous as a tourist destination in South Malang, seen from its attractive beaches, which annually brings in many tourists, both domestic and international. The purpose of this study is to 1. Analyze the perceptions of tourists and the community towards the impact of climate change in Sendang Biru; 2. Analyze the adaptation strategies of tourists and the community towards climate change.

2. Literature Review

2.1. Maritime Tourism

Tourism is defined as all the activities of people who travel to and stay in a place outside their daily environment for a period of not more than a year for leisure, business and various purposes. There are several types and forms of tourism, such as: 1) tourism to enjoy traveling; 2) tourism for recreation; 3) tourism for culture; 4) tourism for sports; 5) tourism for trade business; and 6) tourism for conventions. Climate change is a change in climate elements in the long term (50 to 100 years) influenced by human activities that produce greenhouse gas (GHG) emissions. The impact of climate change is very slow but definite and permanent, so the future of the earth will be threatened in the future. Especially if there is no serious effort to curb the rate of climate change, as well as Indonesia, which is a country with tens of thousands of small islands, is suffering from climate change (Diposaptono, 2009).

2.2. Sustainable Tourism

Tourism is one of the largest economic contributors to regional and city development (Wijaya & Furqan, 2017). Tourism is one of Indonesia's strategic sectors because it is able to provide economic benefits to both local communities and the country, in terms of regions and cities. This is an important reason to plan and develop destination tourism, both by the public, private and community sectors. According to González-Morales (2016), the development of the tourism industry depends on the condition of its ecosystem. Although on the one hand, the presence of tourism can have a negative impact on the ecosystem, tourism also provides positive economic and financial incentives for the government and other stakeholders involved either directly or indirectly.

González-Morales (2016) explains that tourism is a complex activity, involving many different stakeholders. Sustainable tourism strategies involve the participation of many stakeholders, including (a) the public sector, which determines regulations, incentives, and public investments; (b) the private sector, in the form of Corporate Social Responsibility and the active participation of others, such as cooperation with the public sector; and (c) tourists as active stakeholders.

2.3. Weather and Climate

According to NASA (2011), weather is essentially how the atmosphere behaves, and that behavior affects human activities. Weather and climate are not the same, where climate is a condition observed over a longer period of time. NASA revealed that observing climate takes about 30 years. Weather can change in minutes, hours, days, months, and seasons. Climate, on the other hand, is the average of the weather at a given point in time. Weather components consist of many things, including sunlight, rain, cloud cover, wind, snow, hail, floods, storms, lightning, temperature, and others. Change is the component of weather that is observed over a period of time. Although the component consists of many things, in this study the components observed are limited to those that affect tourism and tourism activities, and are easily felt and recognized by tourists.

2.4. Climate Change

Climate change is basically a change in climatic conditions consisting of many elements, including temperature, humidity, rainfall, and wind speed. NASA (2011) also revealed that climate change is a change in average daily weather over the long term. Climate change is a phenomenon that occurs widely in various parts of the world. It is predicted as a result of uncontrolled and irresponsible development. Every development activity in various sectors results in long-term climate change. The development of tourism is no exception.

2.5. Tourism and Climate Change

Today, tourism is considered to be strongly linked to weather and climate conditions, with travel decisions

heavily influenced by images of sun, sand, sea and snow. Due to these natural commodities, the perception of climatic conditions is important to tourism. According to Gossling *et al.* (2012), the impacts of climate change on tourism can be divided into four, namely direct impacts, indirect impacts, impacts on mitigation policies and tourist mobility, and social changes related to decreased economic growth (Figure 1).

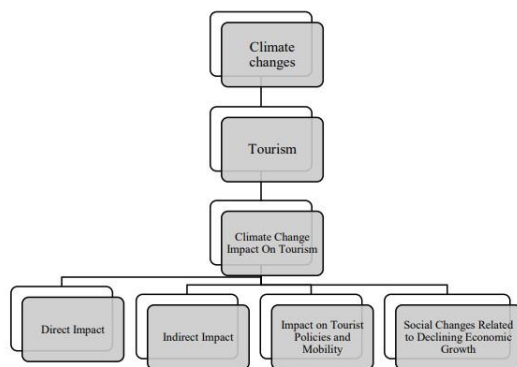The Impact of Climate Change on Coastal Tourism Destination: Case of Kuta Beach, Bali, Indonesia

Figure 1. Schematic Impact of Climate Change.
Source: Gossling et al, (2012)

WTO-UNEP-WMO (2008) describes the main forms of climate change, consisting of changes in temperature, reduced snowfall, increased frequency of storms, changes in precipitation, sea level rise, changes in sea surface temperature, changes in marine biodiversity, increased frequency of forest fires, and changes in soil conditions that have a huge impact on the tourism sector. Becken (2016) mentioned that sea level rise, extreme weather, temperature rise, precipitation change, and environmental change as the matrix of climate impacts of coastal tourism change.

Temperature is the most important climatic variable in tourism demand analysis, generally affecting the comfort of traveling. In addition, there are also other climate variables, which are also important in research on the effects of climate change on tourism. Many studies combine temperature and precipitation to examine the impact of climate change on tourism demand (e.g. Scott & McBoyle 2006 in Sukram, 2009). Many researchers, e.g. Maddison (2001), Gosling *et al.* (2013) suggest that the impact of climate change greatly affects the development of tourism. Climate change can have both negative and positive impacts for tourism. For example, in temperature changes; tourists who were initially cold become somewhat warmer can be a tourist attraction so that many are visited, this situation is a positive impact of climate change. But another situation can also occur, which is a hot destination, if it becomes hotter, it can have an impact on reducing the number of tourists because the weather is no longer friendly to tourists,

then this is a negative impact of climate change.

Travelers' perception of climate change, Lise & Tol (2002) argue that although they are very responsive, tourists may not pay much attention to climate change. Travelers can easily substitute one destination for another or change the time of travel if the conditions of the tourist destination do not match their preferences. Although tourists do not pay much attention to climate change, if they change their travel destinations, the number of visitors to a tourist destination will decrease. From a regional development perspective, this can be detrimental to the local economy in the destination.

2.1. Community Perceptions of Climate Change

Community perceptions of climate change will affect the adaptation strategies that will be carried out by the community in the face of climate change. Research related to community perceptions of climate change has been conducted by Manandhar *et al.* (2018), which was conducted in the local population of the mountains of Northern Thailand. The results show that about 45% of the surveyed households have personally perceived climate change. This perception occurs because agricultural livelihoods depend on the weather so it is important for farmers to pay attention to changes in local weather and climate. Another study conducted by Touch *et al.* (2017), which was conducted in Cambodia. The results showed that the majority of people have felt changes in rainfall patterns, then the start of the rainy season, a decrease in annual rainfall, increased frequency of droughts and dry spells, and warmer temperatures. This resulted in a decrease in crop yields by 16-27%.

Farmers perceive that climate change has potential adverse impacts on their crop production. While the majority of farmers are not familiar with taking action to address the adverse impacts of climate change, some have suggested measures to adjust the growing season. The results of a study conducted by Shrestha *et al.* (2017), the direct and indirect impacts of climate change were seen in upland agriculture. Climate change has a major impact on reducing rice yields, while increasing temperatures affect fruit crops, such as cherries and lychees. Decreased crop yields, soil fertility and water availability are other impacts felt by respondents. These impacts have led farmers to require autonomous adaptation of changing conditions. On the other hand, there are some people who understand that the climate change that has occurred over the past few decades is caused by human activities.

The level of perception and knowledge of the community will affect the strategies that will be carried out by the community in dealing with the negative impacts of climate change. Similar research

has also been conducted by Ahmed & Haq (2019), which was conducted in Bangladesh, especially in communities that depend on forest resources. The results showed that climate change is still not a familiar concept for all respondents in both indigenous communities, but they reported various experiences. Respondents heard about climate change from television, newspapers, radio and visiting researchers. Respondents have observed recent changes in temperature and rainfall patterns (increasing and decreasing gradually), but respondents showed different levels of concern about climate change issues and beliefs about forest resource management. Local communities are trying to cope with the adverse impacts of climate change by relying on their own traditional knowledge.

Research related to public perception of climate change has also been conducted by Herminingsih & Rokhani (2014), which was conducted on Indonesian tobacco farmers. The results showed that there is still a lack of knowledge and information obtained by farmers about climate change and adaptive measures that farmers must take to anticipate it. The final result is a conventional strategy that is commonly done by farmers, namely safety first behavior and resistance to changes or something that is out of the ordinary and has not been tested for success. Risk aversion has led farmers to inefficiency in the use of optimal inputs so that the yield and productivity obtained are not maximized. This indicates that Indonesian tobacco farmers in general are not ready to face climate change, so the government and related institutions need to immediately provide assistance to provide farmers with easy access to information and the application of adaptive methods related to climate change.

3. Research Methods

3.1. *Research Location*

This research was conducted at Sendang Biru beach tourism, Sumber Manjing Wetan District, Malang Regency.

Image 1. Field Research Location.
Source: google earth, 2022.

3.2. **Population and Sample**

Population is a generalization area consisting of subjects or objects that have certain qualities and characteristics that have been previously determined by researchers to study and then draw conclusions. While the sample is a part of the number and characteristics possessed by the population (Sugiyono, 2016). The population of this study were tourists who were visiting Sendang Biru Beach tourism. As for sampling using *accidental sampling*. Incidental Sampling/Accidental *Sampling* is a sampling technique based on chance, that is, any patient who happens to meet the researcher can be used as a sample, if it is deemed that the person who happened to be met is suitable as a data source (Sugiyono, 2016).

The determination of the number of samples is divided into samples for tourists and samples for fishermen. In determining the number of tourist samples calculated using the *Linear Time Function* (LTF) formula, the reason for using this formula is because in determining the sample the population is still unknown. *Linear Time Function* is used to determine the number of sample sizes when the population size is not known with certainty (Yolanda *et al*., 2020). Linear Time Function is formulated as follows:

$$n = \frac{T - t0}{t\,i}$$

$$n = \frac{21{,}45 - 12}{0.216} = 44$$

So that the number of sample sizes used in this study were 44 respondents who were Sendang Biru beach tourists.

The slovin formula is used in determining the number of fishermen samples. The reason for using this formula itself is because in determining the number of samples with the Slovin formula, the population of a research object is known with certainty, as for the formulation as follows:

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

Description:

n = Specified sample size   N = Population

e = desired limit of accuracy

The critical value used in this research is 0.15. So that the calculation is shown in the following formulation:

$$n = \frac{N}{1 + Ne^2}$$
$$n = \frac{3746}{1 + 3746(0{,}15)^2}$$
$$n = \frac{3746}{85{,}29}$$
$$n = 43{,}92 \,/\, \mathbf{44}$$

The calculation results obtained the number of samples used in the study as many as 44 fishermen samples.

3.3. **Data Retrieval Technique**

The data collection technique is used to provide complete data/field information, data collection techniques in this study include:

3.3.1. Observation

Observation is observing directly at the research site and systematically recording what is needed in the research by using research instruments such as a check list to determine the physical condition of the object under study, or the condition of access roads and other supporting facilities.

3.3.2. Interview Method

Interview method by asking questions directly to the person who will provide the information needed in conducting research, such as interviews with managers or administrators of the objects under study to find out information about these objects. Distribution of questionnaires, by giving a list of questions (questionnaires) to tourists visiting Sendang Biru Beach.

3.3.3. Documentation

Documentation is a method of collecting data by utilizing various documents related to the information needed in the research conducted.

3.3.4. Literature Study

Literature study is data collection using books or other literature such as the internet that contains data or information related to the research conducted which can be a theoretical basis or reference as a guide in conducting research.

3.3.5. Questionnaire

The questionnaire data used in the study were 44 respondents. The questionnaire itself consists of a tourist questionnaire and a fisherman questionnaire. The questionnaire sheet will contain questions that provide an overview/ point of view of tourists and fishermen on climate change that occurs in Sendang Biru Malang, which is a closed and open questionnaire. Closed is determined by setting a scale of 1 to 5, while the open questionnaire is optional. From the results of the questionnaire data, data analysis will then be carried out to produce the perception of fishermen and tourists towards climate change that is happening in Sendang Biru beach tourism.

3.4. **Data Analysis**

Data analysis can be done when data from all respondents or other data sources have been collected. Analysis techniques in qualitative and quantitative research are different. In quantitative research, the data obtained will have a stage of data grouping, tabulation, data presentation, and calculation. While qualitative research the data obtained is generally qualitative data but sometimes also quantitative data, so that the data analysis techniques used have no clear pattern (Sugiyono, 2013). The data is presented in the form of explanations or data exposure, tables and figures to see the tourists' assessment of the object under study. Furthermore, data analysis is carried out with statistics using average value analysis. Stages of data processing to be carried out: a. Tabulating respondent data from survey results using questionnaires about tourists' perceptions of climate change. b. Determining Assessment Criteria Assessment of respondents' answers about climate change, using a Likert scale. Likert scale is a scale that can show consumer responses to the characteristics of a product (very good, good, enough, less) (Duranto *et al*, 2001). Respondents were asked to determine the answer to each question by choosing according to the score on the Likert scale.

Table 1: Likert Scale Scoring Criteria

Alternative Answer	Score
Strongly Agree (SS)	5
Agree (S)	4
Moderately Agree (CS)	3
Disagree (KS)	2
Disagree (TS)	1

Source: Sugiyono 2013

4. **Results and Discussion**

4.1. **Sendang Biru Beach Tourism Profile**

Sendang Biru beach tourism is one of the attractions that is currently owned and managed by the Independent Business Unit (KBM) Environmental Services and Other Products (JLPL) Unit II and cooperates with the community in its development. The sendang biru beach area itself is a protected area and sempu island as a conservation forest area under Perhutani.

Sendang Biru Beach is one of the beaches that is an alternative route to get to Sempu Island with a distance of around 4 km. Tourists entering the Sendang Biru beach tourist environment will be charged a fee of Rp. 12,000 with an additional parking fee of Rp. 3,000 for motorbikes and Rp. 5,000 for cars. When tourists want to travel to sempu island, they will be charged an additional fee of Rp. 160,000/ maximum 10 people as the cost of renting a fishing boat to go around the inner sempu island or just lean on the beach of the sempu

island area. The existence of sempu island, makes sendang biru beach has relatively calm waves.

The facilities and infrastructure in the sendang biru beach area consist of: entrance pass posts for tourist arrivals, motorcycle and car parking lots, stalls, sendang biru tourist service post buildings, tourist stalls, restaurants, and toilets. The Sendang Biru beach tourist area is a tourist attraction that has 2 entrances, where one entrance is on the east and another door is on the west which will be able to penetrate into the Pondokdadap beach fishing port area where in the port there are fishing fish stalls with affordable prices. Each entrance is guarded by a ticketing guard. The following is a description of the east tourist entrance.

4.2. Climate Change in Recent Decades

The following illustrates the changes in Indonesia's average temperature that occurred from 1981 to 2022.
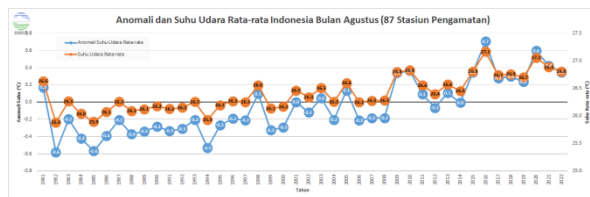
Anomalies and average air temperature for Indonesia in August (87 observing stations)
Source: BMKG, 2022

Anomalies and average air temperature in Indonesia per August from 1981 to 2022 as a whole experienced fluctuating changes and relatively increased air temperature. From 1981 to 2022, the air temperature in Indonesia has the lowest average air temperature of 25.9°C until 2022 has the highest average air temperature of 27.2°C.

Global climate change will impact the unpredictability of the world's seasons. Air temperature data across the Earth's surface, currently shows global warming is happening and will continue to take place. Therefore, climate change has recently been in the spotlight, this is because it has caused many disasters, as well as causing damage to both nature and building infrastructure. High sea waves and winds that blow very strong and usually occur during the west season can have a significant impact on the fishing community. They cannot go to sea to fish and are forced to affect the economy. This is due to the extreme and unfriendly weather during the western season (Suprapto, 2011). The wave action also resulted in the paralysis of fishing activities and abrasion along the coast of Sluke Subdistrict (Hanan, et al., 2015).

Coastal communities are among the most vulnerable to climate change. Small changes to their environment can have a direct impact on the lives of coastal communities, especially on livelihood systems.

Fishermen, for example, will find it difficult to go to sea in uncertain weather situations. This situation is also experienced by various other livelihoods in coastal areas, such as salt and fish farmers (Munadi, 2021).

Comfortable climate conditions combined with beautiful natural tourism attractions are very important and most influence tourists to visit tourist destinations. This shows that the role of climate in the field of tourism is quite large and important which can determine tourist destinations. A tourist area has beautiful nature but the climate and weather are not good, it can cause tourists to discourage visiting so that the number of tourists and income from tourists decreases in the area (Kurnia, 2016).

4.3. Travelers' Perception of Climate Change

Based on the results of Likert scale analysis on question/statement items regarding knowledge related to climate change terms, 44 respondents stated that Sendang Biru beach tourists have a level of understanding of climate change of 85%. This means that Sendang Biru beach tourists understand and know what the term climate change is related to. Regarding the ease of accessing daily weather forecast information, 44 respondents of Sendang Biru beach tourists stated that respondents could easily access daily weather information with an ease level of 80%. As for the source of daily weather forecast information itself, most tourists access information from cellphones/ androids and others information sourced from ports and individual weather predictions.

Regarding the sensitivity of tourists when they want to travel whether they will see the weather conditions first, 44 respondents of Sendang Biru beach tourists stated that the respondents checked the weather first before doing tourism activities with an agreement level of 85%. The tourists mostly check / access information via cellphones and based on individual weather predictions. Regarding the experience of climate change that occurred in Sendang Biru in the last 10 years, 44 tourist respondents stated that the respondents did not feel any real climate change in the last 10 years with an ease level of 48%. This is evidenced based on the results of interviews with tourists saying that most of them are tourists who have only traveled to Sendang Biru beach once or twice, so they do not know for sure the climate change that has occurred at Sendang Biru beach.

Regarding the experience of extreme weather changes that have occurred at Sendang Biru in the last 10 years, 44 tourist respondents stated that the respondents did not feel any real extreme weather in the last 10 years with an ease level of 40%. This is proven based on the results of interviews with tourists saying that most of them are tourists who have only visited/ toured the

blue sendang beach once or twice, so they do not feel what extreme weather has occurred on the blue sendang beach. Regarding the limitations of tourist activities while traveling, 44 respondents stated that Sendang Biru beach tourists declared themselves that they did not have obstacles or limitations to the weather while traveling with a percentage of 41% limitation level. This means that tourists have no obstacles or limitations at all related to climate change.

Regarding knowledge related to tourist adaptation, 44 respondents stated that Sendang Biru beach tourists understand well what the term tourist adaptation is by having a knowledge level of 69%. As for the adaptation of tourists when traveling, most of the tourists when the tourist destination is in bad weather conditions, the form of adaptation carried out is by choosing to go home and will travel again at a later time, while the rest will choose to continue traveling at the same time and choose to travel to other tourist destinations at the same time.

Figure 6: Tourist Perception.
Source: Primary Data.

Weather conditions are one of the supporting factors for tourists in making travel visits. Weather can also pose a threat/risk to the safety of a tourist. In this study, tourists are the object of research, where the point of view/ perception of tourists towards climate change and weather in the tourist destination of Sendang Biru beach. In this case, so that it can be seen what the perception of tourists is and what kind of adaptation is done by Sendang Biru beach tourists when feeling/ experiencing the weather conditions that are happening.

The results showed that there were 85% and 69% of Sendang Biru beach tourists who had knowledge and understanding of the terms climate change and adaptation. Climate change itself is defined as weather conditions that change over a long period of time (5 years). Seeing daily weather conditions makes it a very necessary thing to do before traveling. 80% of Sendang Biru beach tourists stated that, currently, weather forecast information can be easily accessed/obtained. Tourists can easily access information related to weather conditions through

telephone devices and hunches, each of which has a percentage of 75% using telephone devices and 25% only using hunches as shown in the following table.
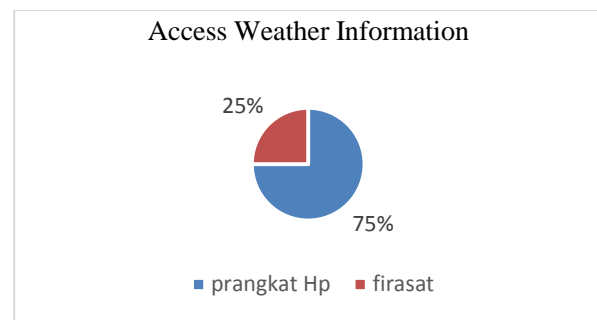

Figure 7: easy access to weather information.
Source: Primary data.

As for the results of the analysis of tourists in terms of the experience of feeling climate change and extreme weather conditions on Sendang Biru beach, it has a value of 48% and 40%. This means that as long as tourists visit sendang biru beach tourism, tourists do not feel climate change and extreme weather conditions in the sendang biru beach area. As many as 14% of tourists outside the District and City/ Regency stated that they did not feel any climate change and extreme weather conditions while traveling, this was because the respondents had only visited Sendang Biru beach once. There were 14% where local tourists stated that they had known and experienced beach tide up to the buildings along the beach, and this often happened every year. 36% of tourists stated that when traveling to see the condition of the beach experiencing the phenomenon of tides, 14% of tourists felt that there would be hot weather, 23% of tourists stated that they felt that there were strong and relatively cool wind conditions in the tourist area.
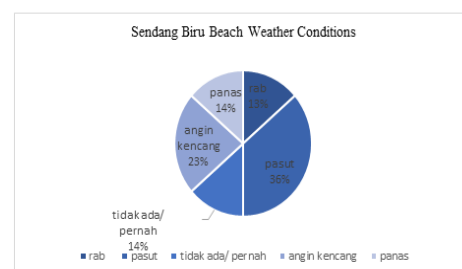

Figure 8: beach condition of sendang biru.
Source: Primary Data.

The impact of climate change and extreme weather conditions causes limitations on tourist activities in traveling. Based on the results of the study, the impact of climate change and extreme weather conditions on Sendang Biru beach is 41%, which means that many tourists do not feel there is a significant climate change and extreme weather conditions in Sendang Biru. However, climate change itself is characterized by

changes in air temperature that affect the rainfall and heat conditions of an area.

4.4. Fishermen's Perceptions of Climate Change

Based on the results of Likert scale analysis on question/question items regarding knowledge related to climate change terms, 44 respondents stated that Sendang Biru beach fishermen stated that they had knowledge related to climate change terms by 76%. This means that fishermen around Sendang Biru beach tourism know what the term climate change is.

Based on the results of the Likert scale analysis on the question/question item regarding the ease of access to weather forecast information on Sendang Biru beach, 44 respondents stated that Sendang Biru beach fishermen can easily access weather forecast information with the analysis results showing a value of 88%. This means that fishermen understand and know what the term climate change is. When accessing information on weather changes/forecasts, the majority of Sendang Biru beach fishermen themselves often rely on the basis of seeing weather conditions individually and directly (hunches), but there are also fishermen who access weather forecast information via android and information boards from the port. Regarding the testimony/experience of fishermen on climate change, as many as 44 respondents stated that in the last 10 years there were climate changes that were quite pronounced on the sendang biru beach with a value of 64%. One of them is the irregularity of the season that has occurred recently (pancaroba) this is directly an obstacle and has an impact on the opinion of the blue sendang beach fishing community. Usually when the fish season will last from months 3 - 11 with peak crowds usually occurring in months 6 - 8.

Regarding the understanding of the term adaptation, 44 respondents stated that Sendang Biru beach fishermen understand what the term fisherman adaptation is. the analysis results show a value of 64%, this means that the dominance of the fishing community understands and knows what the term adaptation is. Regarding the assumption that weather factors greatly affect the catch, 44 respondents stated that Sendang Biru beach fishermen agree that the weather affects the catch. the analysis results show a value of 67%, this means that the fishing community agrees and agrees that it is true that the weather factor has a high influence on the catch.

Regarding the assumption that weather factors greatly affect income results, 44 respondents stated that Sendang Biru beach fishermen strongly agree that weather affects income results. the analysis results show a value of 98%, this means that the fishing community feels that weather changes have a high influence on the income of fishermen because of the

decreased fish catch and constrained to go to sea. Regarding knowledge related to the term fishermen adaptation, 44 respondents stated that Sendang Biru beach fishermen agreed that they understood related to the term adaptation. the analysis results show a value of 99%, this means that almost all Sendang Biru beach fishing communities understand.
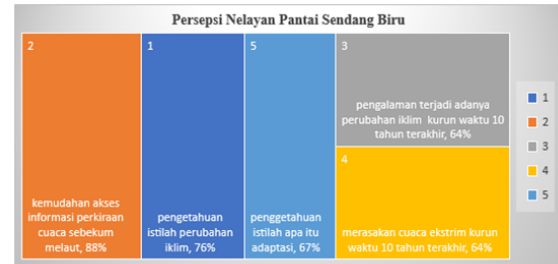

Figure 9: Perception of Sendang Biru Beach Fishermen.

Source: Primary Data

The results showed that 76% of fishermen knew the term climate change and 67% knew the term adaptation. This is because sendang biru beach fishermen often get information and socialization from the port related to weather forecasts before going to sea including wind speed conditions in the ocean, the height of ocean waves and the intensity of the collection/ distribution of clouds in the ocean. In terms of access to weather forecast information itself, a value of 88% was obtained, stating that sendang biru beach fishermen can easily get access to daily weather forecast information.
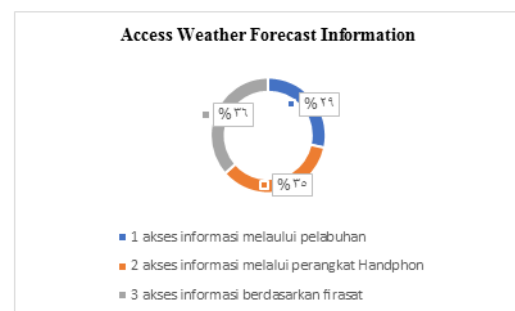
Access Weather Forecast Information

Source: Primary Data

Based on the results of the fishermen questionnaire, Sendang Biru beach stated that weather forecast information itself can be accessed easily through the port information board, information from mobile devices and based on the results of each individual's own hunch. The results of the analysis prove that fishermen of Sendang Biru beach more often access weather forecast information based on the hunches of each individual with a percentage value of 36%. This is because the fishermen of Sendang Biru beach have a

long experience in terms of going to sea. As for the response of other blue sendang beach fishermen worth 35% stated that they accessed weather forecast information by using a handphone device that was installed with the Windy application, BMKG and could be accessed from the wheater channel that was already on the telephone device itself. 29% of Sendang Biru beach fishermen access weather forecast information through weather info displayed on digital billboards/ digital weather forecast information boards.

The results of the study found that the climate change that occurred at Sendang Biru beach was clearly known to have a major economic impact on the fishing community on the amount of catch and income. Based on the results of the questionnaire, 99% of sendang biru beach fishermen stated that when the daily weather was uncertain and not good for fishing, the number of fish catches decreased. Likewise, the income of 98% of respondents of Sendang Biru beach fishermen stated that uncertain and unfavorable weather for fishing will reduce income.
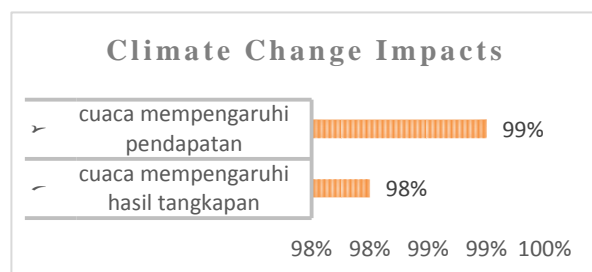

Figure 11: Impacts of Climate Change

Source: Primary Data

4.5. Adaptation Strategies Employed by Fishermen and Tourists

Adaptation is formed because of the mismatch of expectations and desires so that in this condition it is necessary to find alternatives/ other solutions to be able to fulfill these desires, as for the adaptation of tourists and fishermen to climate change in the tourist destination of Sendang Biru beach as follows:

4.5.1. Travelers

Based on the results of the study, adaptations made by tourists when there are extreme and erratic weather conditions, 61% of tourists stated that it is better to go home and not travel to tourist destinations. 23% of tourists stated that they would continue to travel according to tourist destinations even though the weather was rainy or hot, 14% of tourists stated that it was better to postpone or cancel traveling and move to other tours that had better weather conditions. 2% of tourists stated that they would do other activities around tourist destinations.
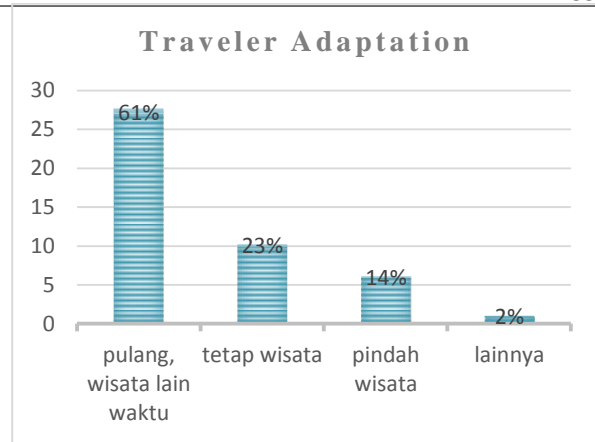

Figure 12. Tourist Adaptation

Source: Researcher Data

4.5.2. Fisherman

The adaptation of sendang biru beach fishermen in responding to climate change that occurs on the sendang biru beach based on the results of data analysis itself obtained a value of 22% which illustrates that there are only a few fishermen who have other replacement jobs when there is a lack of fish and are hampered by weather conditions, for example as farmers, breeders, food/beverage sellers, work and so on. While the value of 78% illustrates that the majority of sendang biru beach fishermen when the low season of fish and constrained by weather conditions then they do not have other replacement jobs, fishermen only wait for the high season of fish/ weather conditions to improve or still force themselves to go to sea. As for the adaptations made by sendang biru beach fishermen when the weather is bad and prevents them from going to sea, the fishermen will change the type of fishing gear that will be used to fish on the beach.
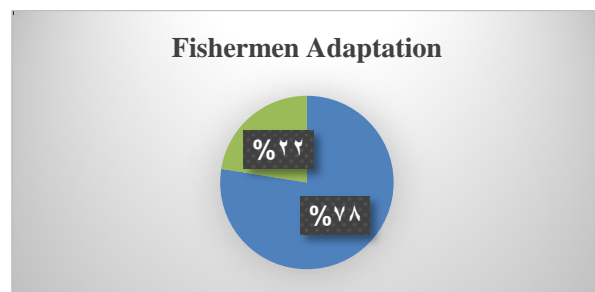

Figure 13: Fishermen's adaptation

Source: Primary Data

5.   Conclusions and Suggestions

5.1.   Conclusion

Based on the above results, the following conclusions were reached.

1. Most Sendang Biru beach tourists have good knowledge and understanding of climate change and adaptation. This shows a fairly high level of

awareness among tourists on the issue of climate change. Climate change is interpreted as a weather condition that changes over a long period of time by Sendang Biru beach tourists. This shows a fairly good understanding of the concept of climate change among tourists.

2. Adaptation strategies of tourists and fishermen to climate change in Sendang Biru destination need to be improved. With a better understanding of the impacts of climate change, more effective adaptation measures can be implemented to maintain the sustainability of tourism in the destination.

5.2. Advice

Suggestions from the results of this study are as follows.

1. Increased traveler education and awareness on climate change
2. Development of concrete adaptation strategies for tourists and local communities.
3. Collaboration between the government, tourism stakeholders, and communities in the face of climate change.

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