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# Analysis Of Climate Change Based On Fishermen's Perception At TPI Lempasing Teluk Betung Timur

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***Abstract***

*The aim of this research is to find out the impact of climate change on fishermen's income at TPI Lempasing Teluk Betung Timur.The research method used in this research is a field study with a qualitative approach, the data itself comes from primary and secondary data,, in the analysis process the stages of reduction, data display and conclusions are used. Based on the results of the analysis that has been carried out, it can be concluded that the impact of climate change in the Lempasing area of East Betung Bay has greatly influenced fishermen's income, which on average usually reaches between 2 million and 5 million per month. When bad weather strikes, such as frequent storms and increased extreme rainfall, fishermen are often unable to go to sea and receive no income at all. This causes significant economic uncertainty for them, with the possibility of facing difficulties in meeting their daily needs and maintaining the survival of their families.*

***Keywords:*** *Climate Change, Fishermen's Perception, fishermen's perceptions*

## 1. Introduction

Climate change is a consequence of global warming in different regions of the planet. Because it touches many aspects of human life, climate change is becoming very complicated and affecting various sectors of society. Rising sea surface temperatures, more frequent and intense extreme weather events, changes in rainfall patterns and freshwater runoff caused by El Niño and La Nina phenomena, changes in ocean circulation patterns, and sea level rise are all consequences of climate change in the marine sector.

Fisheries resources are one of the most important resources for people's lives and have the potential to become the main engine of the U.S. economy. This is based on the following things: first, Indonesia has abundant and diverse fishery resources. In addition, there is a connection between the fisheries industry and other businesses. Third, national resources, or national resource-based industries, are the foundation of the fisheries sector. In addition, the resource potential that Indonesia currently possesses indicates that Indonesia has a strong comparative advantage in the fishing industry. (Utami & Hamid, 2021).

According to the Ministry of Environment's geographical and geological records, Indonesia has many geographical and geological features that make it vulnerable to climate change. This includes being an archipelagic country with 17,500 small islands, having a long coastline (81,000 km), having a large coastal area and a large population living there (65% of the population of Java Island lives there), having vast forests but also facing the threat of forest destruction, being vulnerable to extreme weather events such as long droughts and floods, has a high level of pollution in urban areas, and has fragile ecosystems such as peatlands and mountainous areas (Ministry of Environment and Forestry, 2023).

The Ministry of Research and Technology of the Republic of Indonesia classified coastal areas and small islands as areas that are highly vulnerable to the impacts of climate change in 2009, based on research conducted by the Research Team of the Deputy for Utilization and Correctional Services of Science and Technology. Sea level rise, sea level variations, changes in weather patterns, and local climate are some of the impacts it causes. This condition causes a number of other problems, including increased coastal erosion, seawater intrusion, flooding that damages public infrastructure and productive land, damage to wetland ecosystems, changes in rainfall patterns, and an increase in the frequency and severity of storms, especially in the Lampung region which is directly adjacent to the sea (BPS, 2022).

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According to Wahyono (2014) in a journal written (Chandra et al., 2020) The rotation of the planet causes seasonal variations. Autumn is marked by a drop in temperature. The western or eastern seasons can follow changing patterns as a result of the seasons. There are no rules that fishermen must follow in determining the fishing season. They cannot catch fish in the sea because the western season coincides with the season of big waves. The western season, which lasts from October to March, is characterized by high rainfall and a rainy season throughout Indonesia. This can lead to a decrease in fishermen's catches due to unfavorable conditions in the middle of the sea, such as high waves caused by the surrounding currents and winds that force the fish to swim deep enough to avoid fresh rainwater.

The dry season, which lasts from April to September, is when the eastern season takes place. During this month, a heat wave swept across Indonesia, and as a result, the dry season affected the number of fish caught due to the favorable weather, good air circulation around the sea, and lower sea levels, making it easier for fishermen to find fish. According to (I. M. Sudarma & As-syakur, 2018) There are many different types of biodata, or organisms, in the ocean that differ in terms of size, type of life, and activity. One type of marine biodata that is difficult to obtain is fish. This is a challenge for fisheries scientists to predict trends because not only do fish migrate or move with the seasons, but their populations can also rise or fall.

The same thing also happens to fishermen who are unable to provide enough income when they catch fish. This happens because of the difficulties faced by fishermen in understanding the market mechanism. Fishermen are not physically on the beach all the time, which contributes to this obstacle. Based on this explanation, the researcher will hereby analyze the related. "Climate Change Analysis Based on Fishermen's Perception at TPI Lempasing Teluk Betung Timur"

The theories used to support this research include: Climate Change Theory, A combination of weather-related activities over a long period of time that is statistically significant to show the variation between periods is referred to as climate (BMKG). Shifts in the statistical distribution of weather patterns over a long period of time are referred to as climate change (Chandra et al., 2020). The process of increasing the average temperature of the atmosphere, oceans, and land of the earth as a result of the increase in the concentration of greenhouse gases caused by human activities is known in other terms, global warming. Residents in areas whose production processes are highly dependent on natural resources will have their businesses disrupted due to this phenomenon. As a result of climate change caused by global warming, the lower layers of the atmosphere – especially those closest to the Earth's surface – have become unstable. (A. R. A. Sudarma, 2020). Changes in climate indicators, such as rainfall, sea level, and extreme weather and climate conditions, can be used to detect climate change. (Yogiswara & Sutrisna, 2021): 1. Sea Surface Temperature Sea Surface Temperature (SPL) is the amount of seawater temperature that is very important for the survival and spread of marine organisms. SPL is one of the oceanographic physical parameters used to analyze fishing grounds. The temperature of the surface layer in Indonesian waters ranges from 26oC to 30oC. 33 2. Rainfall Rainfall is the amount of rain that occurs in a period of time when rainwater concentrates in a flat place expressed by the height or volume of rainwater. The criteria for monthly rainfall are 0 - 100 mm considered low, 101 - 300 considered moderate, 301 - 400 mm considered high and >400 mm considered very high. 3. Sea Wave Height Wave height, is the movement of water up and down in a perpendicular direction of the sea level that forms a sinusoidal curve/graph. The criteria for the danger level of sea waves according to BMKG are 1.25 - 2 meters dangerous for fishing boats, 2 - 3 meters dangerous for fishing boats and barges, 3 - 4 meters dangerous for fishing boats, barges and ferries, >4 meters dangerous for all ships.

The formulation of the problem in this study is how are the fishermen's perception of climate change in TPI Lempasing Teluk Betung Timur ?. The purpose of this study is to analyze fishermen's perception of climate change in TPI Lempasing Teluk Betung Timur.

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## 2. Method

In this study, the approach used is qualitative descriptive. Where this method intends to understand the phenomenon that occurs by the research subject. The data sources used are primary data from interviews with researchers and secondary data from documents, papers, books, and articles from the internet.

The data analysis technique uses a descriptive point test, validity test, reliability test and then qualitative analysis, where this analysis is divided into three flows according to (Miles & Huberman 1992: 16) which are data reduction, data presentation, and conclusion drawn/verification.

## 3. Results and Discussion

Table 1. Indonesia's Fishery Production in 2018-2022 (million tons)

| Types of fisheries | Year | | | | | Average growth |
|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2020 | 2021 | 2022 | |
| **Aquaculture** | | | | | | |
| Marine aquaculture | 2.718 | 3.182 | 4.722 | 5.891 | 8.872 | 24.23% |
| Pond | 920 | 1.211 | 1.524 | 1.672 | 2.762 | 28.91% |
| Pool | 552 | 558 | 653 | 738 | 920 | 26.20% |
| Cages | 120 | 156 | 189 | 201 | 208 | 14.41% |
| Floating net | 210 | 281 | 372 | 421 | 480 | 16.41% |
| Paddy | 80 | 84 | 89 | 91 | 98 | 2.20% |
| **Capture fisheries** | | | | | | |
| Marine fisheries | 4.120 | 7.210 | 5.211 | 5.707 | 5.810 | 3.57% |
| General fisheries | 210 | 381 | 369 | 349 | 398 | 6.18% |

*Source: (BPS, 2022)*

Table 1 shows that from 2018 to 2022, the amount of fishery production by subsector increased every year, both in the aquaculture and capture fisheries sectors. The capture fisheries industry is the most prominent, and although significant, the marine fisheries subsector does not grow significantly every year. The average growth rate of the marine fisheries subsector is 3.57%, lower than the average growth rate of other fisheries subsectors (BPS, 2022).

According to data from the Indonesian Central Statistics Agency, Lampung province has income from fishery products that is included in the high category in Southeast Asia with the data depicted in the following graph:

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Table 2. Data on Capture Fisheries Production in Lampung Province in 2018-2020

| Region | Capture fishery production (Tons) | | |
|---|---|---|---|
| | 2018 | 2019 | 2020 |
| West Lampung | - | - | - |
| Tanggamus | 11495.00 | 26588.00 | 26529.00 |
| South Lampung | 25573.00 | 24203.00 | 13831.00 |
| East Lampung | 31417.00 | 51312.00 | 45658.00 |
| Central Lampung | 2605.00 | 2945.00 | 1583.00 |
| North Lampung | - | - | - |
| Right Way | - | - | - |
| Onion Bone | 19587.00 | 21598.00 | 22336.00 |
| Pesawaran | 14614.00 | 14881.00 | 15636.00 |
| Pringsewu | - | - | - |
| Mesuji | 1655.00 | 2521.00 | 2562.00 |
| Tulang Bawang Barat | - | - | - |
| West Coast | 12786.00 | 4276.00 | 4258.00 |
| Bandar Lampung | 17019.00 | 7229.00 | 5012.00 |
| Metro | - | - | - |
| Lampung Province | 136750.00 | 155552.00 | 137404.00 |

*Source : BPS, 2023*

Data on capture fisheries production (tons) in the Lampung region from 2018 to 2020 shows significant variations. Several regions, such as Tanggamus, South Lampung, East Lampung, Central Lampung, Tulang Bawang, Pesawaran, Mesuji, West Coast, and Bandar Lampung, have different production contributions every year. Some regions experienced an increase in production, such as East Lampung which reached its peak in 2019, while other areas, such as Pesawaran, showed more stable fluctuations in production. However, some regions, such as West Lampung, North Lampung, Way Kanan, Pringsewu, Tulang Bawang Barat, and Metro, did not have production data available during the period. Overall, Lampung province experienced a decrease in capture fisheries production from 136,750 tons in 2018 to 137,404 tons in 2020 (BPS, 2023).

From the above data and questionnaire interviews were conducted on the community and the following analysis was obtained:

**Fishermen's Income with Weather Changes Affecting Fishermen's Activities**

Weather changes affect fishermen's activities with the highest respondent's statement that has an average income of 3-3.9 million, namely 30 people answered YES with the statement that weather changes affect fishermen's activities in going to sea.

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Table 3. Fishermen's income with weather changes that affect fishermen's activities.

**Fisherman's income/month * whether the weather affects the activity of Crosstabulation fishermen**

| Count | | Does the weather affect fishermen's activities | | Total |
|---|---|---|---|---|
| | | YES | NOT | |
| Fisherman's Income/month | 1-1.9 million | 3 | 0 | **3** |
| | 2-2.9 million | 2 | 0 | **2** |
| | 3-3.9 million | 30 | 0 | **30** |
| | >4 million | 3 | 0 | **3** |
| Total | | 38 | 0 | **38** |

*Source : SPSS Output (2024)*

**Fishermen's Income by Time to Go to Sea in the Last 1 Year**

Based on this crosstab data, it can be concluded that most fishermen, especially those with a monthly income between 1 to 3.9 million rupiah (a total of 35 out of 38 respondents), have not gone to sea in one year due to climate change factors. The majority of them mainly came from those with a monthly income of around 3 to 3.9 million rupiah (30 out of 38 respondents). Meanwhile, fishermen with a monthly income of more than 4 million rupiah have mostly never experienced this.

Table 4. Fishermen's Income by Time to Go to Sea in the Last 1 Year

**Crosstab**

| Count | | Have you ever been to sea in 1 year due to climate change factors? | | Total |
|---|---|---|---|---|
| | | NOT | YES | |
| Fisherman's Income/month | 1-1.9 million | 0 | 3 | **3** |
| | 2-2.9 million | 0 | 2 | **2** |
| | 3-3.9 million | 15 | 15 | **30** |
| | >4 million | 3 | 0 | **3** |
| Total | | 18 | 20 | **38** |

*Source : SPSS Output (2024)*

**Fishermen's Income with Changes in Fish Season Patterns Due to Weather**

Based on the analysis, it is known that fishermen with an income of 3-3.9 million answered that there is a change in fish migration due to climate change at sea, causing differences in fishermen's income depending on the season and weather.

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Table 5. Fishermen's Income with Changes in Fish Season Patterns Due to Weather

**Crosstab**

| Count | | Are there any changes in migration patterns or fish seasons that you observe due to this climate change? How is it changing? | | **Total** |
|---|---|---|---|---|
| | | NOT | YES | |
| Fisherman's Income/month | 1-1.9 million | 0 | 3 | **3** |
| | 2-2.9 million | 1 | 1 | **2** |
| | 3-3.9 million | 0 | 30 | **30** |
| | >4 million | 0 | 3 | **3** |
| Total | | 1 | 37 | **38** |

*Source : SPSS Output (2024)*

**Fishermen's income with catches obtained due to weather changes**

Based on this crosstab data, it can be seen that the majority of fishermen, especially those with a monthly income between 2 and 3.9 million rupiah (a total of 33 out of 38 respondents), observe changes in migration patterns or fish seasons due to climate change. Meanwhile, the number of fishermen who do not observe the change is less, especially among those who have a monthly income of less than 2 million or above 4 million rupiah.

Table 6. Nengan Fishermen's Income Obtained Due to Weather Changes

**Crosstab**

| Count | | Whether the weather has a bad impact on your catch in terms of the number and type of fish you catch | | **Total** |
|---|---|---|---|---|
| | | NOT | YES | |
| Fisherman's Income/month | 1-1.9 million | 3 | 0 | **3** |
| | 2-2.9 million | 1 | 1 | **2** |
| | 3-3.9 million | 14 | 16 | **30** |
| | >4 million | 0 | 3 | **3** |
| Total | | 19 | 19 | **38** |

*Source: SPSS Output (2024)*

**Fishermen's Income with Changes in Economic Conditions Due to Climate Change**

Based on the results of the analysis, it can be seen that the majority of fishermen, especially those with a monthly income between 3 and 3.9 million rupiah (a total of 30 out of 38 respondents), feel changes in economic conditions, especially related to income, when there is climate change. Meanwhile, only a small part of fishermen with incomes below 2 million or above 4 million feel the same way.

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Table 7. Farmers' Income with Changes in Economic Conditions Due to Climate Change

**Crosstab**

| **Count** | | **Do you feel changes in economic conditions, especially different incomes when there is climate change?** | | **Total** |
|---|---|---|---|---|
| | | **NOT** | **YES** | |
| Fisherman's Income/month | 1-1.9 million | 1 | 2 | **3** |
| | 2-2.9 million | 0 | 2 | **2** |
| | 3-3.9 million | 8 | 22 | **30** |
| | >4 million | 0 | 3 | **3** |
| Total | | 9 | 29 | **38** |

*Source : SPSS Output (2024)*

This is supported by the results of the explanation submitted by the fishermen with the initials TA which explains as follows: "*yes it's not enough, but when it's the fish season and the weather is good, we try to save".* Based on these results, it is known that fishermen make good use of opportunities when the weather is good, so that in this case it does not make it difficult for them when the weather is bad.

**Adequacy of Income Earned by Fishermen**

Fishermen's perception of the adequacy of income earned by fishermen during bad weather is explained in the following table, from this crosstab data, it can be seen that most fishermen whose income is between 3 to 3.9 million rupiah per month (30 out of a total of 38 respondents) feel that their income is enough. Meanwhile, the number of fishermen with incomes below 2 million or above 4 million who feel quite is much less. There are only 1 in 3 respondents with an income of less than 2 million and none of the 3 respondents with an income of more than 4 million feel that it is enough.

Table 8. Fishermen's Income with Fishermen's Economic Sufficiency

**Crosstab**

| **Count** | | **Do you feel that with this income you feel enough** | | **Total** |
|---|---|---|---|---|
| | | **NOT** | **YES** | |
| Fisherman's Income/month | 1-1.9 million | 1 | 2 | **3** |
| | 2-2.9 million | 1 | 1 | **2** |
| | 3-3.9 million | 23 | 7 | **30** |
| | >4 million | 3 | 0 | **3** |
| Total | | 28 | 10 | **38** |

*Source: SPSS Output (2024)*

Of the total 38 respondents, there were 28 people who answered YES with a percentage of 73.68%, respondents who chose the answer NO as many as 10 people with a percentage of 26.32%, so it can be known that the majority of respondents feel that the income generated from going to sea is sufficient for their families. This is supported by the

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results of the interview submitted by the respondents with the initials GI as follows: *"not enough, the income is the net income we get".* Based on the results of the interview, it is known that fishermen do not feel enough with the total income obtained, which is an average monthly income of 3-4 million rupiah. This is supported by the results of research conducted by (Ulfa, 2018) which found that climate change is the main problem faced by fishing communities. The earth's temperature is rising due to global warming, which also affects the length of the dry season, the melting of polar ice caps, and the rise in sea levels. These factors combine to cause the phenomenon of climate change. The socio-economic problems faced by fishermen are the result of climate change.

**Results of Measurement of Climate Change Respondents' Statements on Fishermen's Income in Tpi Lempasing, Teluk Betung Timur**

Table 9. Temperature changes affect fishermen when going to sea.

| No. | Statement | Information | | Total |
|---|---|---|---|---|
| | | Yes | Not | |
| **4.** | Do temperature changes affect the weather when you go to sea? | 10 | 28 | **38** |
| | **Percentage (%)** | 26,32 | 73,68 | **100,00** |

*Source: SPSS Output (2024)*

Of the total 38 respondents who got the results, there were 10 respondents who answered YES with a percentage of 26.32%, respondents who chose the answer NO as many as 28 people with a percentage of 73.68%, so it can be known that temperature changes do not affect the weather so that it does not have a significant impact on fishermen's fishing activities.

Table 10. Changes in economic conditions, especially different incomes when there is climate change.

| No. | Statement | Information | | Total |
|---|---|---|---|---|
| | | Yes | Not | |
| **5.** | Do you feel changes in economic conditions, especially different incomes when there is climate change? | 29 | 9 | **38** |
| | **Percentage (%)** | 76,32 | 23,68 | **100,00** |

*Source: SPSS Output (2024)*

Of the total 38 respondents, 29 respondents answered YES with a percentage of 76.32%, respondents who chose the answer NO as many as 9 people with a percentage of 23.68%, so it can be known that there is a change in economic conditions, especially income due to climate change.

Table 11. There has been an increase in the number of fish obtained over the last 5 years

| No. | Statement | Information | | Total |
|---|---|---|---|---|
| | | Yes | Not | |
| **6.** | Has there been an increase in fish income over the last 5 years? | 11 | 27 | **38** |
| | **Percentage (%)** | 28,95 | 71,05 | **100,00** |

*Source: SPSS Output (2024)*

Of the total 38 respondents, there were 11 respondents who answered YES with a percentage of 28.95%, respondents who chose the answer NO as many as 37 people with a

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percentage of 71.05%, so it can be known based on the opinion of fishermen stating that there has been no increase in fish income in the last 5 years.

Table 12. Causes of Not Going to Sea Due to Weather Changes

| No. | Statement | Information | | Total |
|---|---|---|---|---|
| | | Yes | Not | |
| **8.** | If the cause is not going to sea due to weather changes. Then. Is there an influence on the fishing patterns that you usually experience as a fisherman? | 20 | 18 | **38** |
| | **Percentage (%)** | 52,63 | 47,37 | **100,00** |

*Source: SPSS Output (2024)*

Of the total 38 respondents, there were 20 respondents who answered YES with a percentage of 52.63%, respondents who chose the answer NO as many as 18 people with a percentage of 47.37%, it can be seen that the majority of fishermen think that weather changes have an impact on the fishermen's fishing patterns.

Table 13. Other Activities Carried Out by Fishermen When Not Going to Sea

| No. | Statement | Information | | Total |
|---|---|---|---|---|
| | | Yes | Not | |
| **11.** | Are there any other activities that you do to be able to still get income when you don't go to sea for a few months? | 37 | 1 | **38** |
| | **Percentage (%)** | 97,37 | 2,63 | **100,00** |

*Source: SPSS Output (2024)*

From a total of 38 respondents, there were 37 respondents who answered YES with a percentage of 97.37%, respondents who chose the answer NO as many as 1 person with a percentage of 2.63%, it can be seen that when fishermen cannot go to sea, other activities that fishermen usually do in order to obtain equipment when they are not at sea are by renting boats for tourists visiting tourist destinations.

## 4. Conclusion

### Conclusion

Weather is the main factor in determining the fishermen's fishing activities, this is supported by the results obtained from 38 respondents where all agree with this. Even in one year, fishermen can not go to sea at all if the weather is not favorable, which 20 out of 38 respondents agreed with answering yes. The change in the direction of fish immigration is a factor that makes fishermen have to increase their reach in catching fish which was confirmed by 20 out of 38 fishermen respondents.

Of the 38 respondents, 29 of them stated that climate change can affect the income received by fishermen. When fishermen do not go to sea, the usual thing for fishermen to do is to rent boats for tourist destinations so that they get income and this was confirmed by 37 out of 38 respondents who answered yes.

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