

# Adaptation and Mitigation of Climate Change on Small islands in the Sitaro Islands Regency of North Sulawesi

1<sup>st</sup> Joyce Christian Kumaat  
Geografi Department  
Social Science Faculty  
Universitas Negeri Manado  
Tondano, Indonesia  
joykekumaat@unima.ac.id

2<sup>nd</sup> Revolson A Mege  
Faculty of Mathematics  
and Science  
Universitas Negeri Manado  
Manado, Indonesia  
ramege@unima.ac.id

3<sup>rd</sup> Grace Suoth  
Geografi Department  
Social Science Faculty Universitas  
Negeri Manado  
Manado, Sulawesi Utara  
gracesuoth@unima.ac.id

4<sup>th</sup> Deny Meliangkay  
Geografi Department  
Social Science Faculty Universitas  
Negeri Manado  
Manado, Sulawesi Utara  
denymaliangkay@unima.ac.id

**Abstract** – The research aims (1) knowing the adaptation ability of coastal peoples in Kalama Island, Tatoareng District Sangihe Island Regency to climate change that occurs; (2) analyze the impact caused by climate change on the fisheries sector in Kalama Island, Tatoareng District Sangihe Island Regency, and (3) adaptation strategies undertaken by coastal peoples, especially for fishermen in Kalama Island in the face of climate change. The research method applied is a qualitative descriptive survey method. This research was conducted in Kalama Island where the population in Tatoareng district that located in Kalama Island was 200 families with reference to the research variables namely: people adaptation and climate change. Furthermore, data collection techniques are carried out by observation, questionnaire and documentation. While the data analysis technique is carried out qualitatively by recapitulating the answers, compiling the respondent's presentation table, the description and interpretation of the data that has been tabulated and then concluding the results of the research data. The results showed that coastal communities in the island of Tatoareng who are generally fishermen felt that climate change was happening lately, indicated by the answer that most of the coastal communities as a whole were still unable to develop strategies to adapt to climate or weather changes such as wind, bulk rain and waves. Information that received by the community is still very lacking with the condition of the remote island, so they have very little information in real time from printed or electronic media. Physically, Kalama Island experienced several problems such as the presence of coastal abrasion due to the coastal conditions that have experienced physical degradation along the coast of Kalama Island.

*Keywords*— *Kalama, Adapation, Mitigation, Climate*

## I. INTRODUCTION

Human needs are increasing with time while limited natural carrying capacity causes greater potential damage to resources in coastal areas and small islands [1,2]. This has a serious impact on the survival of coastal communities on small islands, especially stakeholders, namely traditional fishermen [3]. This event is a logical consequence of fishermen's dependence on coastal and marine resources [4], the problem of environmental degradation in small islands arises due to the effects of climate change, making it difficult for fishermen to determine the fishing season due to erratic weather and this is risky for stability coastal ecosystems and small islands, socio-economic community and damaging the function of the planet earth as life support [4]. Fishermen's preparedness in adapting to extreme weather due to climate change is estimated to be inadequate where climate change is expected to affect current weather conditions. Weather conditions are constantly changing, uncertain, and tend to cause disasters resulting in many sectors of life and livelihoods of fishermen and coastal communities must be prepared to make adaptation efforts [5]. Some facts of climate change cause environmental degradation especially demersal fisheries [6], decrease in pond areas, storm rain and high waves that occur in almost all seas in Indonesia [3]. This fact shows that global climate influences cause fishermen activities to be disrupted, so that Diposaptono reveals from his research that climate change is difficult to avoid because it occurs slowly and takes a long time [7].

Coastal communities are groups of people or a community that lives in coastal areas, and the source of economic life depends directly on the use of marine and coastal resources. The main livelihood in coastal areas is fishermen, although there are livelihoods outside fishermen such as civil servants, stall owners, haircut services and many other businesses in the field of services. Likewise,

coastal communities in Kalama Island, Tatoareng Subdistrict, Sangihe Island District, have a problem in estimating the weather due to lack of information received by the local community, moreover to adapt to climate change, which continues to change every day, which is very concerning the condition of coastal communities in Kalama Island, Tatoareng District, Sangihe Islands Regency. Besides that, climate change can lead to disruption of the activities of coastal communities moreover for traditional fishermen in fishing at sea so that it can affect the economy of traditional fishermen as a result of climate change.

## II. RESEARCH METHOD

### A. Types and Methods of Research

The method used in this study is a descriptive qualitative research method that is surveyed. This type of research aims to collect a large amount of data in the form of variables, units or individuals at the same time [11].

### B. Time and place of research

The study was carried out two months in 2018 according to the time that took place, and the location of this research activity was the location used in the study for the desired data. This research took place in Kalama Island, Tatoareng District, Sangihe Islands Regency, North Sulawesi Province. Determination of the location of the research was carried out purposively, with the consideration that the location of the research was Fishermen's Island which most of the Coastal Community were traditional fishermen, while the challenges faced were quite large considering the condition of the island's ecosystems were very vulnerable to ecological changes, and climate change had an impact on decrease in catches of fishermen.

### C. Population and Sample

#### Population

Population is an area of generalization which consists of objects and subjects that have certain qualities and characteristics set by researchers to be studied and then drawn conclusions [8]. The population in this study were coastal communities in Kalama Island, Tatoareng District, Sangihe Islands Regency, totaling 200 families

#### Sample

The sample is part of the number and characteristics of the population [8]. The population in this study were coastal communities in Kalama Island, Tatoareng Subdistrict, Sangihe Islands Regency, Sampling was taken through random sampling technique so that the sample in this study was 10% of the total population of 200 families. Determination of the size of the sample that is if the subject is less than 100, it is better taken all so that is a population research. Furthermore, if the number of subjects is large, it can be determined between 10-15% or more. So 200 times 10% or  $200 / 100 \times 10 = 20$  KK [10]

#### Research variable

Variables are objects of research or what is the focus of research [10]. The variable that examined is a study of the adaptation of coastal communities in Kalama Island Tatoareng District, Sangihe Islands Regency, with indicators: 1) Community Adaptation, 2) Climate Change.

### D. Data Collection Techniques

Data collection techniques are document analysis by collecting data sourced from archives and documents that are related to the research. The technique used to collect data in this study is as follows:

#### Observation

This technique is used to observe directly the state of the area to be studied in order to obtain data to later be used as data that supports the analysis process.

#### Questionnaire / Questionnaire

Questionnaire in the sense of this research is a list of questions arranged in writing to obtain information or data needed by the author [9]. This technique uses a list of questions that are arranged chronologically and are objective (multiple choice), then given to the respondent to answer them. This is intended to make it easier for respondents to answer the questions that the author asks [11].

#### Documentation

Documentation in this sense is data in the form of images, such as photographs, live images, sketches, etc. [10]. Documentation study for Coastal community adaptation variables on Climate Change with the aim of completing data in the field [11].

### E. Data Analysis Techniques

After the data has been collected in the field of research, then it is outlined in a complete and detailed description or report to find out the picture of coastal community adaptation to climate change in Kalama Island Tatoareng District Sangihe Islands District based on variable indicators. The data is then analyzed qualitatively with the following steps: recapitulating the answers / responses of respondents to the questions given, making a table of the percentage of respondents to each question obtained, description and interpretation of the data that is labeled, concluding the research data [12].

## III. RESULTS AND DISCUSSION

Administratively, Tatoareng Subdistrict is one of the islands in the Sangihe Islands Regency, with the District capital being Kahakitang Village and about 39 nautical miles from the district capital with a time of – 3–4 hours. Tatoareng Subdistrict is located between 3°40 "LU - 3°14 '2" LU and 125°30 '52 "BT. The results of the study are based on informed interviews that the people of Kalama Island are indigenous people and not migrants from other places. The natural and remote natural conditions make this island very exotic in terms of the still clean beaches but the difficult conditions to achieve this make the island's population seen from the level of Education still very low from the data recorded only 5 percent (%) of the population in this island is tasting higher education. The community concentrates more on the patterns that have been passed down through generations, namely as fishermen (80%). This caused damage to the reef which visually from the surface of the water conditions was very good, but several spots of coral reefs that were in the research location, especially in front of the Kahakitang Village suffered severe damage. Some residents or fishermen around respond to the question that this they do not merely damage the reefs in front of this

caused by other activities such as the flow of boats in and out of the village, damage due to large waves when the arrival of the west season and due to theft fish from the community not Kalama Island.

Nature conditions are still natural and having limited access so that the understanding of the people on this island is very minimal, this is indicated by the lack of information on print and electronic media. From the interview results 75 percent (%) of the island's people do not know about information from print and electronic media if linked to climate change. This causes them to be poorly informed about the weather conditions at sea, the impact of some of these communities is only relying on their ancestral habits when they go to sea to catch fish. This condition shows that there is a need for local government involvement in providing intense information to the people in small islands about real time weather conditions, from the results of interviews 65% of the island's coastal communities inform that lately their waters often occur strong winds and high waves that affect their activities in fishing around the island and affect economic activity because the logistical channels of the ships that will bring the island's produce are disturbed.

Mitigation and adaptation towards climate change is a major issue, especially for small island communities, including the people on Kalama Island. The priority and especially in this study are stakeholders on this island to be the main key in sustaining the coastal environment on this island with sustainable.

#### IV CONCLUSION

From the results of this study it can be concluded that in climate change mitigation and adaptation in the small

island strengthening of knowledge that is good education and information media quickly can help people on this island to minimize losses that occur in Kalama Island.

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