International Journal of Marine Engineering Innovation and Research, Vol. 9(4), Dec. 2024. 825-833
(pISSN: 2541-5972, eISSN: 2548-1479)

Coastal Community Perceptions of Waste Management as an Effort to Maintain Marine Sustainability in Tapanuli Tengah Regency, North Sumatera

Husnul Yaqin Harahap[1], Toga Mahaji [2], Juliana Pebrina Siburian[3], Tirta Anugerah[4], Shofian Nanda Adiprayoga [5]

(Received: 12 October 2024 / Revised: 25 October 2024 /Accepted: 24 November 2024 / Available Online: 31 December 2024)

***Abstract*— This study aims to determine the perception of coastal communities in Central Tapanuli towards waste management as an effort to maintain marine sustainability and formulate waste utilization activities as an effort to increase the income of coastal communities in Central Tapanuli. The research method used in this study is a mixed research method. This study was conducted in three locations, namely in Lubuk Tukko Baru Village and Muara Nibung Village, Pandan District and in Jago Jago Village, Badiri District with a total of 100 respondents in the study. Based on the results of the study, the results of the perception of "community understanding of waste management in coastal areas" were obtained with an overall average value of 91.16%, meaning that all respondents strongly agreed or understood very well. Then for the results of the perception of "understanding of coastal environmental cleanliness and waste utilization to increase family income" the overall average result was 53%, with the category sometimes or less understanding. Then the results of several activities were obtained that were appropriate for coastal communities in Central Tapanuli Regency in utilizing waste as an effort to increase income with the management categories divided between organic waste and non-organic waste. Organic waste is very possible to be used for maggot cultivation activities or commonly called Black Soldier Fly (BSF) maggots and making candles and soap for households from used cooking oil. Then for non-organic waste, it is very possible to carry out activities to form a Waste Bank, establish a skills center that provides economic added value, and implement cooperation with private and government companies in managing non-organic waste.**

Keywords— Organic Waste; Non-organic Waste; Perception; Marine Sustainability; Family Income

I. INTRODUCTION

The environment in coastal communities is often contaminated by scattered waste. Potential causes include the habit of people throwing household waste on the beach or waste from other areas carried by sea currents. Another potential cause is that coastal and marine areas are contaminated with waste, including the result of people's habit of throwing household waste on the beach or waste from other areas that is carried by sea currents. However, maintaining environmental cleanliness and health must be a top priority for coastal communities [1].

During the journey, the waste will turn into small particles and will spread throughout the waters and then this will be unknowingly consumed by marine biota. These facts show that plastic waste particles are not only dangerous for marine sustainability, but are also very dangerous for marine biota and it is only a matter of time before the direct effects of these waste particles will also be dangerous for human survival because they have unknowingly consumed marine biota that has been contaminated by micro plastics continuously.

The issue of plastic pollution in the aquatic environment has become a global concern today due to its detrimental impact on marine and coastal ecosystems. Moreover, with the decomposition of plastic waste into micrometer-sized plastic particles (microplastics) and nanometers (nanoplastics), it is possible for fine particles to enter the food chain and end up with humans as the top predator in the food chain [2].

Central Tapanuli Regency is a regency in North Sumatra Province which is located on the west coast of Sumatra Island. The majority of people in Central Tapanuli Regency work as fishermen who depend on the sea for their livelihood. The sea in Central Tapanuli can be categorized as threatened due to the large amount of waste or garbage, especially plastic waste, that enters the sea, so that this can not only threaten the sustainability of the sea, but can also disrupt and even destroy the livelihoods of the fishermen themselves.

[1]Husnul Yaqin, Social Economic Fisheries Study Program, Matauli College for Fishery and Marine Science, Pandan, Tapanuli Tengah, 22538, Indonesia. E-mail: hrphusnulyaqin@gmail.com
[2]Toga Mahaji, Social Economic Fisheries Study Program, Matauli College for Fishery and Marine Science, Pandan, Tapanuli Tengah, 22538 Indonesia. E-mail: togamahaji231@gmail.com
[3]Juliana Pebrina Siburian, Social Economic Fisheries Study Program, Matauli College for Fishery and Marine Science, Pandan, Tapanuli Tengah, 22538 Indonesia. E-mail: juliana.siburian07@gmail.com
[4]Tirta Anugerah, Social Economic Fisheries Study Program, Matauli College for Fishery and Marine Science, Pandan, Tapanuli Tengah, 22538 Indonesia. E-mail: tirta.anugerah1993@gmail.com
[5]Shofian Nanda Adiprayoga, Social Economic Fisheries Study Program, Matauli College for Fishery and Marine Science, Pandan, Tapanuli Tengah, 22538, Indonesia. E-mail: pra_yoga2305@yahoo.com/shofian_prayoga@stpkmatauli.ac.id

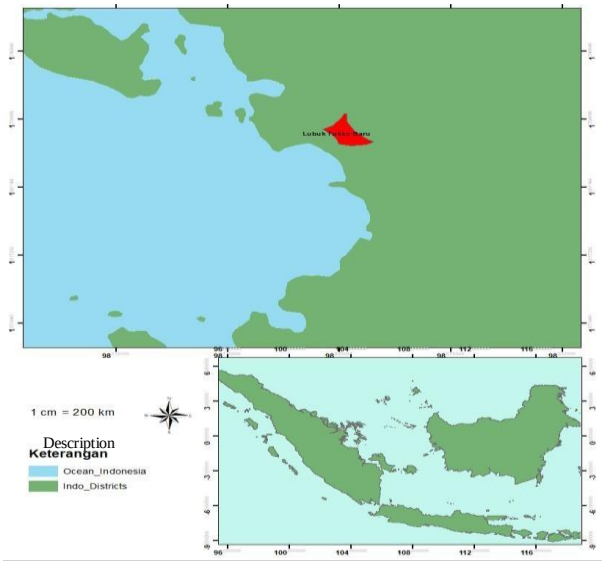

Figure. 1. Map of the Research Location of Lubuk Tukko Baru Village

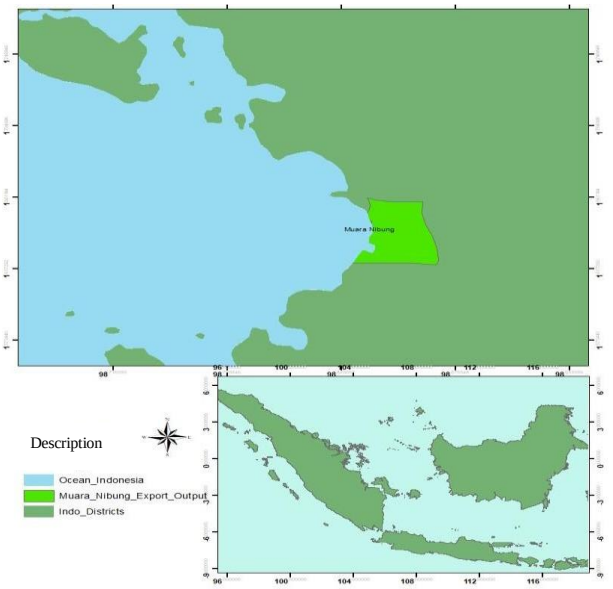

Figure. 2. Map of Research Location of Muara Nibung Village

As a result of the condition of the sea in Central Tapanuli, where waste can be said to be a serious threat to coastal communities, most of whom depend on the sea for their livelihood, this research is deemed necessary to be carried out considering that coastal communities, especially in Central Tapanuli Regency, must be able to manage household-scale waste as an effort to be directly involved in marine conservation. Then in terms of waste management in coastal communities in Central Tapanuli, it is expected that the managed waste can provide added value to family income. This research is also important for the Government, especially in the regions as a reference in making policies on waste management in coastal areas.

The formulation of the problem to be studied is how the coastal community in Central Tapanuli perceives waste management as an effort to maintain marine sustainability and what activities are suitable for the coastal community of Central Tapanuli Regency in utilizing waste as an effort to increase family income.

There are several approaches and problem-solving strategies from the problem formulation that has been created. Specifically, to solve the first problem formulation, a quantitative approach is taken, then to solve the second problem formulation, a qualitative approach is taken, identifying the problem, determining the right method in order to answer the research, collecting information by going into the field, developing possible solutions that are sourced from the research results obtained, choosing the best solution, implementing the solution and evaluating the solution, and conducting further research. The seven things above are approaches and strategies for solving problems from the problem formulation that has been created.

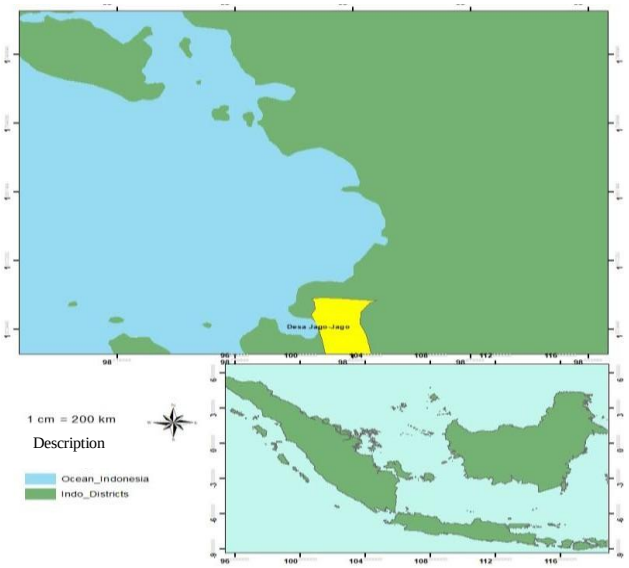

Figure. 3. Map of Research Location of Jago Jago Village

The results of previous research explain that forming a community to participate in waste management is not an easy matter but it is also not as complicated as imagined. Good cooperation is needed between the government and influential parties and hard work is needed in efforts to raise public awareness about the responsibility of managing waste, and also to provide an understanding that the largest amount of waste comes from the community [3].

Based on the context of the existing problem, the advantage of the problem solving offered by the proposing researcher compared to previous research lies in the aspect of the approach used. The approach that will be used in this research will produce a formulation related to strong activities or activities that can be carried out by coastal communities in order to utilize waste to increase family income and as part of efforts towards marine conservation, especially in Central Tapanuli Regency.

II. METHOD

A. Research Methods

The research method used in this study is a mixed research method using a combination of quantitative and qualitative approaches. Quantitative and qualitative data are obtained from the results of interviews with respondents using the questionnaire that has been provided and qualitative data will also be taken from the results of focus group discussions (FGD) with stakeholders.

B. Research Location

The location of this research was carried out in the coastal area of Central Tapanuli Regency, including in Lubuk Tukko Baru Village and Muara Nibung Village, Pandan District and in Jago Jago Village, Badiri District. The research location was determined deliberately with the consideration that the two sub-districts are coastal areas and the lives of the majority of the population in these sub-districts depend on the sea.

C. Research Respondents

Population

Population is a collection of objects regarding a problem as a whole or a collection of individuals or overall characteristics that will be studied. Population is divided into two, namely limited and unlimited population [4]. The population in this study was the entire coastal community at the research location. The population in this study is more specifically fishermen and fishermen's families

Sample

A sample is a part of a population that is used as a study material with the hope that the sample taken from that population can represent the population [5]. In simple terms, a sample is a part of a particular population that is of interest. In drawing a sample, if the population size is not known with certainty (accidental sampling), then the technique or formula from Malhotra's theory can be used [6], that is, it must be at least four or five times the number of question items. The questions in this study were 20 items, so the sample taken in this study was 100 samples (20 question items X 5).

D. Data Collection

The data collected in this study are primary data and secondary data. Primary data was obtained from a survey, namely direct interviews with respondents based on a prepared questionnaire and FGD. Meanwhile, secondary data was obtained from related agencies in Central Tapanuli district, such as the local central statistics agency, which includes geography, longitude and latitude, area, population, education, livelihood and data deemed necessary to complete the research resultsn.

TABLE 1
CHARACTERISTICS OF RESPONDENTS BASED ON AGE

Category (Tahun)	Frequency	Percentage (%)
18-25	10	10
26-35	12	12
36-45	36	36
46-55	22	22
56-65	17	17
66-75	3	3
Total	100	100 %

TABLE 2
CHARACTERISTICS OF RESPONDENTS BASED ON OCCUPATION

Category	Frequency	Percentage (%)
Housewife (Fisherman's Wife)	57	57
Fisherman	29	29
Trader (Fisherman's Wife)	5	5
Nipah Leaf Craftsman (Fisherman's Wife)	5	5
Teacher and Government Employee (Fisherman's Wife)	4	4
Total	100	100 %

TABLE 3
CHARACTERISTICS OF RESPONDENTS BASED ON ORIGIN/PLACE OF RESIDENCE

Origin/ Place of Residence	Frequency	Percentage (%)
Lubuk Tukko Baru Village	35	35
Muara Nibung Village	31	31
Jago Jago Village	34	34
Total	100	100 %

TABLE 4
CHARACTERISTICS OF RESPONDENTS BASED ON GENDER

Gender	Frequency	Percentage (%)
Male	30	30
Female	70	70
Total	100	100 %

E. Data Analysis

Data analysis is the process of refining data into a form that is easier to read and interpret. Primary and secondary data collected are then presented in the form of tables, schemes and analyzed descriptively quantitatively and qualitatively. Next, it is compiled in the form of a report and described.

1. To answer the first research objective regarding the perception of coastal communities in Central Tapanuli towards waste management as an effort to maintain marine sustainability, a Likert scale analysis was used which was sourced from the results of interviews with respondents and then analyzed descriptively quantitatively.
2. Furthermore, to answer the second research objective regarding activities that are suitable for coastal communities in Central Tapanuli Regency in utilizing waste as an effort to increase family income, it was analyzed descriptively qualitatively with data sources coming from FGD, direct identification and identification to the sea at the research locus, and the research questionnaire that had been prepared.

III. RESULTS AND DISCUSSION

A. Overview of Research Location

Lubuk Tukko Baru Village

In general, Lubuk Tukko Baru Village is an area that has great potential for the marine and fisheries sector as well as tourism. So real efforts are needed to preserve the sea free from waste and also several strategies are needed that can be used by the community to be able to utilize waste (mostly waste with low economic value) in order to increase family income.

Muara Nibung Village

TABLE 5
COASTAL COMMUNITY PERCEPTION IN CENTRAL TAPANULI TOWARDS WASTE MANAGEMENT AS AN EFFORT TO MAINTAIN MARINE SUSTAINABILITY

Statement Items	Total value	Category
Garbage in the coastal and marine areas of Central Tapanuli has accumulated and is a serious threat to coastal and marine communities.	96,80%	Very agree
Most of the rubbish that piles up in the sea comes from household waste	92%	Very agree
Garbage or waste that accumulates in coastal and marine areas comes from companies	64,60%	Agree
Non-organic waste is dumped into the sea	66,40%	Agree
Organic waste dumped into the sea	69%	Often
Sorting organic and non-organic waste in the household before throwing it in the trash	50,60%	Sometimes
Collecting non-organic waste from households and then selling it to used goods collectors	57,40%	Sometimes

TABLE 6
SUITABLE ACTIVITIES FOR COASTAL COMMUNITIES OF CENTRAL TAPANULI DISTRICT IN UTILIZING WASTE AS AN EFFORT TO INCREASE INCOME

Types of waste	Activity
Organic waste	1. Maggot cultivation or commonly called Black Soldier Fly (BSF) maggot flies 2. Making candles and soap for household use from used cooking oil
Non-organic waste	1. Establishment of a Waste Bank that focuses on managing non-organic waste 2. Establishment of a handicraft or skills center that adds economic value to non-organic waste 3. Implementation of cooperation with private and government companies in an effort to encourage the enthusiasm of coastal communities to utilize non-organic waste specifically

In general, Muara Nibung Village is an area that has great potential for the marine and fisheries sector, especially the processing of salted and dried fish. This village can also be called a densely populated area (observations show that many houses in this sub-district are located above the sea), so real efforts are needed to preserve the sea free from waste and several strategies are also needed that can be used by local communities specifically to be able to utilize waste (mostly waste with low economic value) in order to increase family income.

Jago Jago Village

In general, Jago Jago Village is an area where the majority of the people depend on their livelihood or fulfill their families' daily needs by utilizing marine products and the potential of the fairly extensive nipah trees, as well as utilizing the potential of mangrove shells and bamboo shells in the village. So real efforts are needed to preserve the sea free from waste and also several strategies are needed that can be used by local communities specifically to be able to utilize waste (mostly waste with low economic value) in order to increase family income.

B. Respondent Characteristics

Respondent Based on Ages

Age is a limitation or level of life size that affects a person's physical condition [7]. It is also mentioned that a person's age influences how he learns, understands, accepts or responds to change [8].

The principle is that the age level will actually greatly influence a person's social life. Respondents in this case, namely coastal communities who are younger in their lives, are very vulnerable to changes in behavior from existing norms or customs. Meanwhile, coastal communities with older ages will always feel that they are in a position to be respected and appreciated.

The characteristics of respondents taken based on age at the three research locations have different ages. Furthermore, it was explained that based on data collection in the field, there were 10 respondents aged 18 - 25, 12 respondents aged 26 - 35, 36 respondents aged 36 - 45 years, 22 people aged 46 - 55 years, then there were 17 respondents aged 56-65 years, and only 3 respondents were the oldest, namely 66-75 years old.

Respondent's Occupation

Job characteristics are the basis for a person's productivity and self-satisfaction. Work is one of the indicators that is directly involved in playing an important role in the success and survival of a person's household.

A person has a variety and level of education which then gives them the opportunity to have a prosperous life and what they do is useful for themselves, their family and their environment. Respondent characteristics based on work obtained from the results of data collection in the field, there are respondents with the job of Housewife who are all fishermen's wives as many as 57 respondents, then respondents who work as fishermen as many as 29 people, there are 5 respondents who work as traders, respondents with jobs as craftsmen of nipah leaves as many as 5 people, and then there are respondents who work as teachers and government employees as many as 4 people.

Respondent's place of residence

The area of origin or place of residence will basically influence a person's knowledge of something that is asked or requested for a response related to problems or issues that exist in their place of residence.

Based on the results of the research and data collection conducted, it was found that all respondents came from three different areas of origin, namely from Lubuk Tukko Baru Village, Pandan Distr ict, and Muara Nibung Village, Pandan District, and Jago Jago Village, Badiri District. Respondents in this study were all local people at the research location, this will relate to the ease of answering questions on the questionnaire and also the validity of the data on the answers to the responses given by the respondents. A total of 35 respondents came from Lubuk Tukko Baru Village, 31 respondents came from Muara Nibung Village, and 34 respondents from Jago Jago Village.

Respondent Gender

Gender is a grammatical classification of words and other words related to them which is broadly related to the existence of two genders or neutrality [9]. Gender is often referred to as gender, that gender is also related to the differentiation of roles, functions and responsibilities of men and women as a result of agreement or the result of the formation of society. Gender is also a cultural construct that is open to all changes [10].

Gender is used to differentiate between women and men biologically since a person is born. The biological differences and biological functions of men and women are not interchangeable between the two, neither are their functions and purposes. The gender of respondents in this study was predominantly female, 70 people, and the gender of respondents was male, 30 people.

C. Coastal Community Perception in Central Tapanuli Regarding Waste Management as an Effort to Maintain Marine Sustainability

The perception needed in the results of this study is basically an understanding related to waste management in coastal areas and the understanding of coastal communities related to the cleanliness of the coastal environment, coupled with their understanding related to the use of waste to be used as a way to increase family income. Specifically, this perception was obtained from coastal communities in three research locations, namely coastal communities in Lubuk Tukko Baru Village and Muara Nibung Village, Pandan District, and coastal communities in Jago Jago Village, Badiri District.

The research results obtained from the questionnaire responded to or answered by respondents were then analyzed using a Likert scale with statements answered by respondents consisting of two aspects or categories of questions. The statement aspects in the 2 questionnaires consist of respondents' understanding related to understanding waste management in coastal areas and understanding related to coastal environmental cleanliness and the use of waste to increase family income.

Based on the research results and data analysis that has been carried out, it was found that from a total of 100 respondents who responded regarding aspects of statements related to understanding waste management in coastal areas at the research location, an overall average value or score of 91.16% was obtained, consisting of 10 statements, meaning that the value is in the category of strongly agreeing or strongly understanding regarding waste management in coastal areas, especially at the research location, namely Lubuk Tukko Baru Village, Muara Nibung, Pandan District and Jago Jago Village, Badiri District, Central Tapanuli Regency.

Then for the aspect of statements related to the understanding of coastal environmental cleanliness and the use of waste to increase family income at the research location from a total of 100 respondents consisting of 10 statements, the overall average value or score was 53.44%, meaning that the value is in the category of less understanding related to the understanding of coastal environmental cleanliness and the use of waste to increase family income, especially at the research location, namely Lubuk Tukko Baru Village, Muara Nibung, Pandan District and Jago Jago Village, Badiri District, Central Tapanuli Regency.

Important notes from the results of the research conducted related to the Perception of Coastal Communities Regarding Waste Management as an Effort to Maintain Marine Sustainability in Central Tapanuli Regency, North Sumatra at three research locations (Lubuk Tukko Baru Village and Muara Nibung Village, Pandan District and Jago-Jago Village, Badiri District), include the following :

1. The results of the study showed that for questions on the aspect of understanding waste management in coastal areas at the research location with the question item "Waste in the coastal and marine areas of Central Tapanuli has been abundant and piled up and is a serious threat to coastal and marine communities", the answers given by respondents were mostly "Strongly Agree or a score of 5" with an average answer value for this question of 96.8%. This shows that coastal communities in the three research locations actually understand the condition of waste that has actually piled up in their residential areas and the sea can be a serious threat to the lives of coastal communities themselves. so that as a result of this, sustainable waste management is needed in order to maintain marine sustainability.
2. The second note related to the research results shows that for questions on the aspect of understanding waste management in coastal areas at the research location with the question item "most of the waste that accumulates in the sea comes from household waste", the answers given by respondents were mostly "Strongly Agree or a score of 5" with an average answer value for this question of 92%. This shows that coastal communities in the three research locations strongly agree that the garbage piled up in the sea mostly comes from their household waste. So as a result, wise and good waste management is needed from households, such as not throwing household waste directly into the sea in order to maintain marine sustainability.
3. Furthermore, the answer or result of the smallest value in the aspect of understanding waste management in coastal areas at the research location with the question item "waste or waste that accumulates in coastal and marine areas comes from companies". The average value of the answer to this question is 64.6% or an answer in the agree category with a score of 4. This explains that coastal communities in the three research locations can be said to agree that the rubbish or waste that accumulates in coastal and marine areas comes from companies. These results show that companies are also involved as parties that contribute to producing waste in coastal and marine areas.
4. Based on the research results obtained for questions on the aspect of understanding related to the cleanliness of the coastal environment and the use of waste to increase family income at the research location with the question item "Non-organic waste is dumped into the sea", the answers given by respondents were mostly "often or answer score 4" with an average answer value for this question of 66.4%. This shows that coastal communities in the three research locations often throw non-organic waste directly into the sea. As a result of this, hard work is needed to provide an understanding that coastal communities are prohibited from throwing non-organic waste into the sea, which is a bad habit that can threaten marine sustainability.
5. The results of the study showed that for questions on the aspect of understanding related to the cleanliness of the coastal environment and the use of waste to increase family income at the research location with the question item "organic waste is dumped into the sea" more people answered "often or an answer score of 4" with an average answer value for this question

of 69%. This shows that coastal communities in the three research locations often throw organic waste into the sea. The bad habit of throwing organic waste into the sea is a bad habit that must be immediately changed and abandoned for the sake of preserving the sea in the futureOne of the consequences of organic waste being continuously dumped into the sea is that it will cause the organic waste to rot, which can be dangerous and cause death to marine biota. Garbage in coastal areas is one of the complex problems faced by areas near the coast or coastline that have several rivers that flow into the sea [11]. Then marine debris can also have a dangerous impact on the survival of organisms in the sea. Apart from that, marine debris can spread disease to humans [12].

6. Furthermore, an important note related to the question item "sorting organic and non-organic waste in the household before throwing it in the trash" in the aspect of questions related to the cleanliness of the coastal environment and the use of waste to increase family income, the average answer value from respondents was 50.6% with the category sometimes or a score of 3. These results, if narrated, will be in line with the answers of respondents in the three research locations who answered frequently to the question item about organic waste being dumped into the sea and the question item about non-organic waste being dumped into the sea. On average, out of 100 respondents, they only occasionally sort household waste and throw it into landfills because most respondents throw organic and non-organic waste directly into the sea.
7. Based on the results of the research that has been conducted, it is time for coastal communities in the three research locations to change their bad habits of often throwing organic and non-organic waste into the sea into something more positive in order to be directly involved in efforts to maintain marine sustainability and start to change their mindset that waste (both organic and non-organic) if managed properly can provide additional economic income for families. For example, the question item "collecting non-organic waste from households and then selling it to used goods collectors" in the aspect of questions related to understanding the cleanliness of the coastal environment and the use of waste to increase family income, the average answer was 57.4% with the category sometimes with a score of 3. This shows that there is still a lack of understanding among coastal communities in the three research locations that waste (in this case non-organic waste) if managed properly and sustainably can be a source of income that is quite profitable for their families.

D. Suitable Activities for Coastal Communities in Central Tapanuli Regency in Utilizing Waste as an Effort to Increase Income

Marine waste can also come from fishermen because fishermen's activities are one of the factors that increase waste in marine waters. This is because many fishermen deliberately throw away unused fishing gear in the sea [13].

Coastal community activities in this research concept are activities that can provide added value to their households. This is done by coastal communities as an effort to provide prosperity and happiness for families because in terms of utilizing the sea, will not always provide economic benefits for them. If we observe the condition of the sea today, it is increasingly providing uncertainty or an uncertain livelihood for their income, can be caused by climate change, the use of prohibited fishing gear and the continued exploitation of the sea, to the problem of waste that pollutes the sea and garbage that also has a negative impact on the marine ecosystem itself.

We can see the lives of coastal communities whose livelihoods depend on the sea as a life that is full of uncertainty and difficult and even impossible to predict. Utilization activities other than fishing can be used as a new way to participate in providing added economic value for coastal communities by continuing to utilize marine and coastal ecosystems, for example fish farming activities, tourism, processing of fishery products, and utilization of waste.

One of the objectives of this research is to formulate activities that are suitable for coastal communities in Central Tapanuli Regency in utilizing waste as an effort to increase income. The research objective was deliberately raised as a form of the birth of research results that would directly have a positive impact on the lives of coastal communities in Central Tapanuli Regency, in this case increasing family income by utilizing waste. The waste that is utilized includes organic and non-organic waste found in households, coastal communities' residential environments, and the sea.

Based on the results of research conducted using a qualitative approach, namely Focus Group Discussion (FGD) involving environmental activists in Central Tapanuli Regency as resource persons, in this case is the Yamantab Central Tapanuli Waste Bank. The Yamantab Waste Bank is the first and only Waste Bank to date in Central Tapanuli Regency which was established and started operating in November 2022. Then, in the implementation of the FGD, it was concluded that there were several activities that were suitable for the coastal communities of Central Tapanuli Regency in utilizing waste as an effort to increase income, specifically in the three research locations. The fact is that if we look at the results of observations in the field, the type of waste that is mostly buried in coastal and marine areas in the three research locations is mostly non-organic waste which has low economic value, so that in terms of managing non-organic waste, efforts are needed to change or modify it in order to increase its economic value. Several activities that are suitable for the coastal communities of Central Tapanuli Regency in utilizing waste as an effort to increase income, the management categories are divided between organic waste and non-organic waste, namely as follows:

The type of organic waste that is mostly dumped into the sea at 3 research locations based on the results of direct observations and identification in the field is the type of household waste from coastal communities

consisting of food waste, plant waste, waste and agricultural waste. There are several activities that are appropriate or considered possible for the community to carry out at the three research locations to utilize organic waste as an effort to increase family income, including:

1. Organic Waste

a. Maggot cultivation or commonly called Black Soldier Fly (BSF) maggots.

Maggot fly cultivation is very appropriate for coastal communities in three research locations because this activity does not require large costs, maggots can be used as feed for fisheries and livestock (chicken) cultivation activities, and maggot cultivation does not require a large area of land, and the price of dry maggots if sold on the market can reach Rp. 100,000-130,000 per kg.

b. Making candles and soap for household use from used cooking oil.

The activity of converting used cooking oil into wax or soap is an activity that is relatively easy to do because it does not require a large management space. Candles and dishwashing soap are very much needed in households for all purposes, then candles and soap have a fairly good economic value (candles can be sold from Rp. 2,000 to Rp. 6,000 and depending on the size and dishwashing soap can be sold on the market for up to Rp. 3,000 per piece), This can increase the income of coastal community families. In fact, in terms of waste cooking oil, it can also be sold in liters to special used cooking oil collectors, but if it is processed into candles or dishwashing soap, it will automatically add value to the sales results.

2. Non-Organic Waste

There are several appropriate activities for the community at the three research locations to utilize non-organic waste as an effort to increase family income, including:

a. Establishment of a Waste Bank that focuses on managing non-organic waste.

Waste Banks can be formed or established and managed directly by the Government in three research locations. Establishing a Waste Bank does not cost much, it only requires space for storing goods. The budget or costs for establishing this Waste Bank can also come from village funds or sub-district funds so that no initial donors are needed for the establishment. Then, in terms of managing the Waste Bank in the Village or Sub-district, there is no need to work hard to find customers because the main target customers of the initiated Waste Bank are the people in the administrative area of the village or sub-district where the Waste Bank was established.

b. Establishment of a handicraft or skills center that adds economic value to non-organic waste.

Based on the FGD conducted and direct observations in the field, the type of non-organic waste that accumulates in coastal areas and is dumped into the sea is a type of non-organic waste that is easy to change into something with added economic value. The formation of handicrafts or skills sourced from non-organic waste can be realized in coastal areas at three research locations because the formation of this institution or group is claimed to be able to participate in changing the environmental conditions of coastal areas which appear dirty due to piles of waste. Non-organic waste can be made into ecobricks which can be used for seats, tables, and even as a substitute for bricks. Making ecobricks is relatively easy and can be done by all age groups and the types of waste that can be made into ecobricks include all types of non-organic waste such as plastic bags, plastic sachets, leftover cloth, rubber, and even discarded cigarette filters. Furthermore, in relation to the type of non-organic waste that has low economic value, it can be made into table mats, clothing bags, flowers, and even paving blocks by melting it using a non-organic waste melting machine.

c. Implementation of cooperation with private and government companies in an effort to encourage the enthusiasm of coastal communities to utilize non-organic waste specifically.

Waste management cannot emerge and be expected only from coastal communities without any assistance or intervention from outside parties. Waste management is the responsibility of all levels of society if we want to achieve sustainable marine conservation in the future. The realization of cooperation from all stakeholders is needed for the management of non-organic waste in coastal areas at three research locations because if it is associated with waste management or changing the form of non-organic waste into something of value, it also requires quite high costs so that these costs cannot be entirely sourced from village and sub-district funds or only from coastal community groups.

The management of non-organic waste is actually not difficult because it can be processed using machines, such as in Central Tapanuli Regency where there is a Steam Power Plant (PLTU). PLTU can accommodate non-organic waste to be used as a substitute fuel for coal. Then, because non-organic waste can be made into crafts or something that has utility, if non-organic waste from households can be managed well and collaboration with private and government companies can be carried out, it will have an increasingly positive impact on the lives of coastal communities in the three research locations.

Based on the results of the FGD conducted with the Yamantab Waste Bank, Central Tapanuli Regency, the results or experience obtained were that waste management if carried out through the implementation of cooperation with corporations will provide enthusiasm to continue to protect the environment and provide added economic value for coastal community families themselves. One example of the implementation of cooperation that has been carried out by the Yamantab Waste Bank with the PLN company in Central Tapanuli is the collection of 3,000 ecobricks within a period of three months, namely August-October 2024. The ecobricks collected by the Yamantab Waste Bank come from coastal communities in Central Tapanuli Regency, with each ecobrick made being purchased for Rp. 5,500. This activity then really helps to change the mindset of the community from the bad behavior of throwing garbage carelessly into the sea to being more concerned about the cleanliness of the environment in which they live and also getting income benefits from the ecobricks made by the coastal community.

IV. CONCLUSION

Based on the research that has been carried out, the following conclusions were obtained:

The perception of coastal communities regarding waste management as an effort to maintain marine sustainability is divided into two aspects or understandings. The understanding of coastal communities regarding waste management in coastal areas at the research location obtained an overall average value or score of 91.16%, meaning that this value is in the category of strongly agreeing or very understanding regarding waste management in coastal areas, especially at the research location. Then, related to the understanding of coastal environmental cleanliness and the use of waste to increase family income at the research location, the overall average value or score was 53.44%, meaning that the value is in the category of less understanding related to the understanding of coastal environmental cleanliness and the use of waste to increase family income, especially at the research location.

There are several activities that are appropriate or considered possible for the community to carry out at the three research locations to utilize organic waste as an effort to increase family income. These utilization activities are divided into two types of waste utilization, namely organic waste and non-organic waste. Maggot cultivation or commonly known as Black Soldier Fly (BSF) maggots and making candles and soap for households from used cooking oil are suitable activities for coastal communities in three research locations in order to utilize organic waste to increase family income. Furthermore, related to activities that are suitable for coastal communities related to the use of non-organic waste to increase family income, namely the establishment of a Waste Bank that focuses on the management of non-organic waste, the establishment of a handicraft or skills center that adds economic value to non-organic waste, and the implementation of cooperation with private and government-owned companies in an effort to encourage the enthusiasm of coastal communities to utilize non-organic waste.

ACKNOWLEDGEMENTS

The author would like to express his gratitude to the Ministry of Education and Culture of the Republic of Indonesia for the support and funding assistance for the 2024 novice lecturer research program. Furthermore, the author would also like to thank the Matauli Fisheries and Marine College campus, Central Tapanuli, North Sumatra and the research team involved in this research for their support, enthusiasm and motivation as well as direct assistance during the implementation of the research, data processing, and journal publication.

REFERENCES

[1] Titaley, E., Lalihun, I., Saija, D. E., Alfons, C. R., & Manuputty, P. H. (2024). Strengthening Coastal Communities in Seith Country in Maintaining Cleanliness of the Coastal Environment. Mandira Cendikia Community Service Journal, 3(2), 60-69.

[2] Widianarko, Y. B., & Hantoro, I. (2018). Microplastics in Seafood from the North Coast of Java.

[3] Lamane, S. A., Sarmedi, S., & Suprayitno, A. R. (2023). Family Participation in Coastal Waste Management in North Belopa District, Luwu Regency. Scientific Journal Building Villages and Agriculture, 8(5), 203-213.

[4] Zakariah, M. A., & Afriani, V. (2021). Statistical analysis with SPSS for quantitative research. Al Mawaddah Islamic Boarding School Foundation Warrahmah Kolaka.

[5] Zakariah, M. A., & Afriani, V. (2021 Statistical analysis with SPSS for quantitative research. Al Mawaddah Islamic Boarding School Foundation Warrahmah Kolaka.

[6] Malhotra, N.K. 2006. Marketing Research: Applied Approach. Jilid II. Edition 4. Jakarta: PT. Indeks Kelompok Gramedia

[7] Iswantoro, C., & Anastasia, N. (2013). Demographic relationships, family members and situations in making home purchase funding decisions Live in Surabaya. Finesta Vol. 1 No.2, 125-129.

[8] Anugerah, T. Vulnerability of the livelihood of Fishermen's Houses (Case Study of Tanjung Medang Village, Meranti Islands Regency, Riau) [Thesis]. Bogor: Bogor Agricultural Institute Postgraduate School

[9] Fakih, Mansour. 2016. Gender analysis and social transformation. Yogyakarta: Insist Press

[10] Juditha, Christiany. 2015. Gender and sexuality in mass media construction. Journal of the Ministry of Communication and Information RI. Vol. 1:1

[11] Dewi, I. S. et al. 2015. Distribution of Microplastic at Sediment in the Muara Badak Subdistrict , Kutai Kartanegara Regency, vol. 4 no.3, hal: 121–131.

[12] Bangun, S. A. Sangari, J. R. R. Tilaar, F. F. Pratasik, S. B. Salaki, M. Pelle, W. 2019. The composition of sea waste on Tasik Ria Beach. Tombariri District. Minahasa Regency. Platax scientific journal. 7(1) : 322-328.

[13] NOAA. (2015). Turning The On Trash A Learning Guide On Marine Debris. NOAA PIFSC CRED.