



# Supporting the capacity of coastal areas in North Gorontalo District

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## Abstract

The research objective is to determine the coastal area's carrying capacity, which is the main focus of research. The research has been conducted for three months, starting from June 2020 to August 2020. The data needed in this study consists of primary data and secondary data. Primary data comes from information that supports the achievement of research objectives. Primary data can come from field information, community information, and documents relevant to the achievement of research objectives. Secondary data consists of data related to the management and utilization of coastal areas, traditional and modern, and various other relevant documents. Primary collected data by observations and field surveys, interviews with key informants, namely people recorded as having lived in coastal areas for a long time. The in-depth interview process carried out using an interview guide, which contains the informant's main things. Technical Sampling by Purposive Sampling, namely the area selected based on its ability to answer and provide information about the problem and research objectives. The area taken as the sample is because the researcher thinks that the coastal area has the information needed for his research. The number of samples taken was three districts from a homogeneous sub-district population. Analysis of the priority of coastal area development using an integrated approach This analysis will be carried out using the process hierarchy analysis (AHP). The conclusion that fishing technology has not been able to maximize fisheries' full potential in marine areas. The government must immediately building infrastructure that supports downstreaming in coastal areas, encouraging increased capacity or volume of capture fisheries using fishermen's technology.

*Keywords: carrying capacity, coastal areas, fishery resources, social, economic*

## Introduction

### 1.1. The problem of coastal areas in Gorontalo District

#### 1) Mangrove Forest Damage

ForestMangroves are tropical and subtropical coastal vegetation communities dominated by several types of mangrove trees that can grow and develop in muddy coastal tidal areas (Nontji, 1993). Mangroves grow on sheltered beaches or flat beaches, usually where there are no river estuaries, usually growing widely. Mangroves do not grow on steep, wavy beaches with strong tidal currents, because this does not allow the deposition of silt from the sand, as the substrate needed for their growth (Nontji, 1993).

Mangroves are tree plants or plant communities that live between the sea and land affected by tides. Mangrove habitats are often found at the meeting place between river estuaries and seawater, becoming a protector of the land and gigantic sea waves. The river flows freshwater for mangroves, and at high tide, the mangrove trees are surrounded by salt or brackish water (Murdiyanto, 2003)

According to Saparinto (2007), mangrove forests can physically function to keep the coastline stable, protect beaches and river cliffs from abrasion, reduce and resist tsunami storms, as a buffer area for intrusion or seepage of seawater into the land. Chemical functions as a cycle process that produces oxygen and absorbs carbon dioxide, processing waste materials from industrial pollution and ships in the oceans. Biology function is a producer of decomposers, spawning ground or nursery ground for shrimp, crab, shellfish, as an area, nesting and breeding for birds and other animals, as a source of germplasm, as a natural habitat for various types of terrestrial and marine biota. Socio-economic functions, producing fuel, industrial raw materials, medicines, household furniture,

According to Baderan (2017), Mangrove damage 2010 reached an increase of 41% from 21% in 2000, total damage mangroves in 2010 have reached 62%, where the mangrove area has been damaged has reached 687.3 hectares, with damaged conditions. What happened was that it was completely damaged without any mangrove vegetation, which was 551.5 hectares or 51% of the total mangrove forest area. Simultaneously, for those rare-damaged conditions, it was 135.8 hectares or 12% of the total mangrove forest area. Meanwhile, mangrove areas with good-very dense criteria were 341.8 hectares or 31% of mangrove forests' total area in 2010, and mangrove conditions with good-moderate criteria were 64.6 hectares or 6% of the total mangrove area.

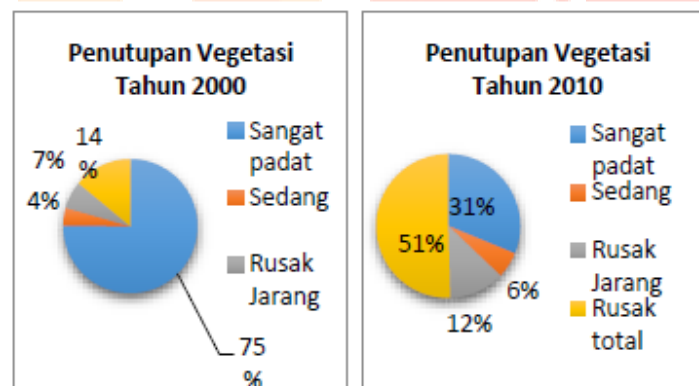


Figure 1. Changes in Mangrove Forest Cover in Kwandang Bay (Baderan, 2017)

In line with the findings above, the results of image analysis between 1996-2018 decreased mangrove forests by 30.65% in all areas of North Gorontalo Regency. Primary mangrove forest cover is the forest area with the most extensive conversion of function, namely an area of 1275 ha or a decrease of 46.06%. The largest decrease in mangrove forest cover occurred in the period 1996-2000.

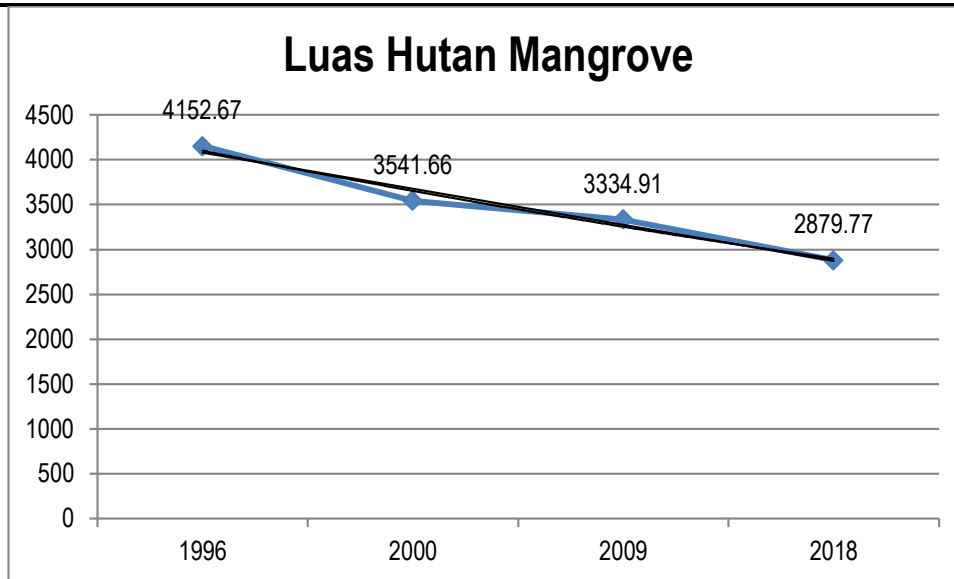


Figure 2. Changes in Mangrove Forest Cover in Kab. North Gorontalo

According to Triyanti *et al* (2017), damage to mangrove forests in North Gorontalo has an impact on the loss of mangrove ecological value of IDR 18,205,000,890 / ha/year, the economic value of mangroves worth IDR 40,716,063 / ha/year and socio-cultural value of IDR 20,341,259 / ha/year. North Gorontalo is damaged, so the total loss that must be borne is Rp. 18,266,058,212 / ha/year

## 2) Community Capacity in Coastal Areas

North Gorontalo District has the potential for enormous marine natural resources, this is evident from the long coastline of the North Gorontalo Regency which reaches 198 km and is the longest coastline in Gorontalo Province. Another exciting potential to be analyzed is that the coast of Gorontalo Utara Regency is directly facing the Pacific Ocean, where there are East Asian countries, such as Japan, South Korea, and China, which master advanced technology as well as enormous market potentials. Based on data from the North Gorontalo Fisheries and Marine Agency, the coastal area of North Gorontalo reaches 75% of the total area of North Gorontalo.

### Research purposes

Determine the carrying capacity of coastal areas, which are the primary focus of research

Table 1. Research Variables

Determine the carrying capacity of coastal areas which are the primary focus of research	1. Food carrying capacity 2. Water carrying capacity	1. Land use 2. Rainfall data 3. Watershed area 4. Demographic data
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## 3.1. Data analysis

### 1. Mapping the problems of planning and developing coastal areas.

Analysis of problems or problems in the development of coastal areas is an analysis of the mapping of biophysical and socio-economic problems that can potentially hinder the planning and development of coastal areas in the North Gorontalo District. This analysis will be carried out descriptively. Analysis of the biophysical and socio-economic characteristics will be critical to determine the intervention for coastal area development and, at the same time, evaluate the coastal area development policies that have been carried out by local governments.

## 2. Coastal Area Supporting Capacity Analysis

For this research, the carrying capacity measures that play a role in developing coastal areas are water carrying capacity and food carrying capacity. The calculation between the availability and demand for water is carried out by referring to the Permen LH No. 17 of 2009 concerning guidelines for Determining Environmental Supporting Capacity in Regional Spatial Planning, as follows:

Analysis of determining the priority of coastal area development using an integrated approach

This analysis will be carried out using the process hierarchy analysis (AHP). This analysis is still directly related to the analysis of the factors that influence coastal areas' planning and development. The results of the analysis of the influencing factors will be used by experts who will be interviewed to determine the right strategy in developing coastal areas

The following shows the steps for using AHP tools in developing a coastal area development model

### 1. Defines the problem and determines the desired solution.

In this stage, we try to determine the problem we will solve in a clear, detailed, and easy to understand manner. From the existing problem, we try to determine a possible solution to the problem. The solution to the problem may be more than one. We will develop this solution further in the next stage.

### 2. Create a hierarchical structure that begins with the primary objective

After compiling the main objectives as the top level, a hierarchical level will be arranged under it, namely the suitable criteria for considering or assessing the alternatives we provide and determining these alternatives. Each criterion has a different intensity.

### 3. Combining opinions from multiple questionnaires with Geomean.

If experts fill in the questionnaire, we will unify the experts' opinions by using the geometric or geomantic mean equation where this calculation is to provide a better average approach to the data obtained from the respondents' assessments in the questionnaire. The geometric mean is the average obtained by multiplying all the data in a sample group, then increasing the number of data samples. The geometric mean can be formulated as follows.

$$GM = \sqrt[n]{(X1)(X2) \dots (Xn)}$$

Where

GM = Geometric Mean

X1 = 1st expert

X2 = 2nd expert

Xn = nth expert

### 4. Hierarchical structuring

The arrangement of the hierarchical structure was carried out by starting the research objective, namely developing a coastal area development strategy consisting of

### 5. Create a matrix

Creating a matrix for each aspect of the coastal area development model creates a combined opinion matrix, which is a new matrix whose elements are derived from the geometric mean of the elements of the coastal area development aspect matrix whose consistency ratio meets the requirements. The compilation of this combined matrix is to form a matrix representing the matrix aspects of the strategy for implementing the coastal area development model.

## Results and Discussion

According to Dahuri (2001), the management of coastal areas is essential because of 2 things, namely:

### 1) Minimizing spatial use conflicts:

The non-integration of various spatial use activities in coastal areas utilizing coastal area resources has triggered conflicts of interest from the sector, private sector, and community. The main reason is that so far, there have been no clear rules, either in terms of law or substance, regarding spatial planning for coastal and oceanic areas. In addition to lacking synergy, activities that are not integrated are often disruptive and detrimental to interests, such as polluting industrial activities and adjacent fisheries. Spatial use conflicts can also cause an increase in the potential for damage to coastal resources

### 2) Overcoming classic problems

Other classic problems include limited sources of development funds, low quality of human resources, poverty of coastal communities, lack of coordination among development actors, and weak law enforcement.

The third priority that has received attention is increasing the capacity of the community. From the perspective of community empowerment, such as assistance and access to capital, it is necessary to create access for the poor to these resources.

Furthermore, to see the combined opinion on each alternative, it can be seen in several tables:

Table 2. Matrix of Combined Opinions at the Level of Economic Improvement in Coastal Areas

Alternative coastal economy improvement	Weight	Priority
Strengthening local businesses	0.639	1
Increased investment	0.361	2

Primary Data, 2020

The data processing results above show that all parties believe the criteria for strengthening local businesses affect coastal communities' development with a weight of 0.639. At the same time, the next priority to increased investment with a weight of 0.086.

The pattern of empowering local businesses is significant if we reflect on Indonesia's 1997 economic crisis. The Indonesian economy, which is always oriented towards big business, turned out to be very fragile. The results of a survey conducted by the World Bank in collaboration with the Ford Foundation and the Central Bureau of Statistics (September-October 1998) confirmed that the economic foundations based on large-scale enterprises were very fragile when hit by the crisis. The economic structure, which is dominated by large-scale enterprises with very fragile performance, has taught the economic crisis that Indonesia had to pay dearly in 1997 (Watterberg et al., 1999).

The failure of the economic development pattern based on large business conglomerates has prompted economic planners to divert development efforts based on strengthening local businesses by empowering small and medium enterprises (MSMEs). Micro, Small, and Medium Enterprises (MSMEs) are the largest economic actors in the Indonesian economy. They have proven to be a safety valve for the national economy during times of crisis and a dynamist for economic growth after the economic crisis.

Large businesses to support increased investment in the coastal area of the North Gorontalo Regency. Furthermore, the pattern of strengthening local businesses expected to create a partnership pattern with The increased investment to create jobs to raise income levels. If income increases, the poverty rate can be reduced. Increased investment can also attract carriages of SMEs or local businesses through a partnership program. Strengthening SMEs can also improve the economy. An economy that continues to grow can be used as one of the benchmarks for economic development, where one of the indicators is a reduction in the level of poverty. For 12 years and three months from 2007 to March 2019, BPS noted that Indonesia's poverty had decreased by 3.11%. When compared with several neighboring countries, the World Bank noted that the amount of decline in Malaysia was 4.7% (2002 to 2015), Thailand 13.3% (2006 to 2016), while Myanmar fell to 16.1% (2005 to 2016).

The matrix of combined opinions on the criteria for coastal area governance shows that the criteria for policy support for coastal community development have the highest priority with a weight of 0.512 while the lowest is in the area management aspect with a weight of 0.488. An overview of the combined opinion can be seen in table 3:

Table 3. Matrix of Combined Opinions at Alternative Levels of Coastal Zone Management

Alternative Coastal Zone Management	Weight	Priority
Policy Support	0.512	1
Area Management	0.488	2

Primary Data, 2020

Research conducted by Belau (2015) in Intan Jaya Regency shows that government policies on community development have directed all DPOs to concentrate on solving various problems, including the problem of poverty. The government's policies are the basis for allocating budget, technology, and human resources to help communities, including coastal communities, who have problems with poverty. The BPS report shows that Indonesia's GNP coefficient is at the level of 0.382 as of March 2019, which means that 1% of the population controls 38.2% of Indonesia's total national income. Based on the criteria given by Todaro and Smith (2011), these levels into relatively unequal distribution be classified. Inequality of income, of course, poverty will continue. The decrease in the Gini coefficient in this one year was also minimal (0.7%). Strong policy support will also facilitate the management or management of coastal areas

Furthermore, the combined opinion matrix on the alternative criteria for community empowerment shows that economic programs get the highest priority with a weight of 0.826. At the same time, the lowest is social programs with a weight of 0.174, as seen in table 4:

Table 4. Matrix of Joint Opinions at Alternative Levels for Community Capacity Building Programs

Alternative Empowerment Program Criteria	Weight	Priority
Economic program	0826	1
Social program	0.174	2

Primary Data, 2020

According to the Ministry of National Development Planning (PPN) / National Development Planning Agency (Bappenas), they have prepared five strategies for community capacity building programs. According to the 2019 Government Work Plan (RKP) target of 8.5% -9.5%, this strategy is expected to accelerate the reduction of the poverty rate. The first strategy is to encourage inclusive economic growth. At the macro level, the government encourages inclusive economic growth, maintains macroeconomic stability, stabilizes prices, creates productive employment, maintains the investment climate, maintains trade regulations, increases productivity in the agricultural sector, and develops infrastructure for disadvantaged areas. Second, the development of economic growth centers outside Java to strengthen infrastructure, connectivity that connects the economic center and supporting areas, and strengthen the development of local products. Our local products are still inferior when compared to imports, especially those that enter e-commerce. Third, reform of the subsidy budget. The allocation for fuel subsidies has been diverted into transfers to regions and village funds (TKDD) to reduce inequality. The increase in inequality villages to 0.324 in March 2018 from the position in September 2017 of 0.32 is part of the adjustment. Because if look at the increase in income, the middle to lower class in the village has experienced a significant increase. Fourth, increasing the social protection budget. A significant reduction in subsidies, from 3.4% to 0, 8% of GDP in 2015 and 2018 allocated for social protection through health insurance premiums for the poor and expansion of social assistance programs. Fifth, strengthening the domestic economy and import governance. Strengthening the domestic economy is realized by increasing ease of doing business is closely monitored areas and ease of business permits through Online Single Submission (OSS).

The combined opinion matrix for alternatives to increase investment shows that infrastructure development is given priority in the North Gorontalo District's coastal community development process with a weight of 0.524. At the same time, the lowest is the incentive system with a weight of 0.124. The description of the combined opinions of the actors for the criteria for soil types can be seen in table 5:

Table 7. Matrix of Combined Opinions at the Level of Increasing Investment

Alternative Investment Increase Criteria	Weight	Priority
Infrastructure development	0.524	1
Legal certainty	0.352	2
Incentive system	0.124	3

Primary Data, 2020

In several coastal areas in North Gorontalo District, pockets of the poor are still found. One of the things done by the government in developing coastal communities to reduce poverty in this region is by building infrastructure. The reduction in the number of poverty in Indonesia cannot be separated from the ongoing infrastructure development carried out by the government, be it infrastructure that is small in scale or large in scale. The government has provided access to many people, from roads, health, water storage for drinking to street lighting. These various facilities give people the opportunity to work longer hours and some even open new businesses. Infrastructure development is not only about infrastructure but, Infrastructure development to provide new jobs for underprivileged people in cities can be done by opening places to sell and providing business loans. This infrastructure development will grow the people's economy and the poverty problem will be resolved. How important the infrastructure development is to solve poverty.

The combined opinion matrix for alternative criteria for strengthening local businesses shows The increase in the volume of fishing capacity of experts who are influential in community development with a weight of 0.559, while the lowest weight is given to the downstream / industrialization of products and services in coastal areas with a weight of 0.141. An overview of the combined opinion of the actors can be seen in table 8:

Table 8. Matrix of Joint Opinions at Alternative Levels for Strengthening Local Businesses

Alternative Strengthening local businesses	Weight	Priority
Increase the volume of fishing capacity	0.559	1
Access to markets and increased distribution of products and services in coastal areas	0.300	2
Downstream / industrialization of products and services in coastal areas	0.141	3

Primary Data, 2020

According to Sefitri et al (2010) Capture fisheries business development in general can be done by increasing the production and productivity of fishery businesses, which are aimed at increasing fishermen's income, gross domestic product, foreign exchange, local income, fulfilling community nutrition and absorbing labor, without disturbing and destroying the sustainability of fishery resources.

There are several problems that must be considered at this time in the coastal area of North Gorontalo, where the condition of the area has a large enough fishery potential, but the utilization of this potential is not optimal. namely information on resources around the management area of North Gorontalo Regency that is not yet optimal, information on effective and efficient technology, competition in fishing areas between active and passive fishing gears, supervision and law enforcement has not been implemented effectively, port infrastructure is inadequate, capability fishermen for their own investment are still weak and the bargaining position of fishermen is weak in carrying out marketing. Increasing the capacity of fisheries volume, opening up market access and smooth distribution of coastal natural resources products and services are expected to accelerate the downstreaming or industrialization of products and services in coastal areas

Furthermore, for the combined opinion matrix on the policy support criteria, expert respondents gave the highest priority to the strong funding criteria with a weight of 0.603 while the lowest weight was given to the making of location-specific guidelines for North Gorontalo District with a weight of 0.108. An overview of the combined opinions of the actors can be presented in table 9:

Table 9. Combined Opinion Matrix at Policy Support Criteria Level

Policy Support Criteria	Weight	Priority
Strong funding	0.603	1
Program Synchronization	0.296	2
Making guidelines for coastal management and utilization	0.101	3

Primary Data, 2020

Based on data from the Ministry of Finance of the Republic of Indonesia since 2018, the budget for community development as a whole including the development of coastal communities has always increased as shown by the 2018 State Budget, where the 2018 State Budget which focuses on community development to alleviate poverty and inequality is allocated Rp. 2,204, 4 trillion including central government expenditure of IDR 1,443.3 trillion and K/L expenditure of IDR 814.1 trillion. Social protection programs such as the 2018 Family of Hope Program (PKH) will increase from 6 million to 10 million recipients. Expansion of non-cash assistance, prosperous rice (Rastra). Besides that, what is no less important is health and education. In addition to the APBN and APBD budgets, the government continues to encourage awareness of the business world to carry out Corporate Social Responsibility (CSR) programs. CSR optimization is believed to reduce poverty. The CSR program is a synergy between the government, entrepreneurs, and the community that has a more positive impact on society, so that matters related to poverty reduction can be even better. The implementation of CSR by companies is not only due to statutory orders, but also because CSR is a long-term investment for the sustainability of the company and society which has a more positive impact on society, so that matters related to poverty reduction can be even better. The implementation of CSR by companies is not only due to statutory orders, but also because CSR is a long-term investment for the sustainability of the company and society which has a more positive impact on society, so that matters related to poverty reduction can be even better. The implementation of CSR by companies is not only due to statutory orders, but also because CSR is a long-term investment for the sustainability of the company

Many empirical studies show a significant relationship between strengthening the financial sector, especially formal finance, with high economic growth and increased welfare. In addition, an inclusive financial system plays an important role in reducing poverty and reducing income disparities. Khasnabis and Mavrotas (2008) suggest that effective mobilization of domestic savings for private investment plays a key role in achieving economic growth and poverty reduction. Therefore an efficient and inclusive financial system will empower individuals, facilitate the exchange of goods and services, integrate society with the economy and provide protection against economic shocks. Several other studies also emphasize the importance of the link between financial sector strengthening and poverty reduction, for example studies by Beck et al (2004), Green et al (2006), Honohan (2004), and Claessen and Feijen (2006). Ahmad and Malik (2009) state that the development of the financial sector has a positive effect on GDP per capita through efficient allocation of funds and increases output per worker and can invite the inflow of foreign capital. This is because the financial system can reduce information costs and transaction costs, increase capital allocation and asset liquidity, and can encourage investment in activities that have high added value (Levina, 1997). Therefore, financial inclusion - through access to financial services such as savings, credit, insurance, pension funds and payment facilities - will greatly help marginalized and low-income groups to increase their income, accumulate wealth, manage risks, and make efforts to get out of poverty. Thus, financial markets will become the heart of an economy that can contribute to economic prosperity by mobilizing savings, providing credit for businesses, risk management, and accelerating the business world by providing transfer and payment facilities.

Furthermore, for the joint opinion matrix on the alternative criteria for coastal area management, expert respondents gave the highest priority for the criteria for the determination of conservation areas and sustainable natural resource use with a weight of 0.587 while the lowest weight was given the Implementation of Disaster Mitigation with a weight of 0.111. An overview of the combined opinions of the actors can be presented in table 10:

Table 10. Matrix of Combined Opinion at Coastal Zone Management Criteria Level

Management Criteria	Weight	Priority
Designation of conservation areas and sustainable use of natural resources	0.587	1
Revitalization of coastal protected areas	0.202	2
Implementation of Disaster Mitigation	0.111	3

Establishment of conservation areas in coastal areas is very important to protect communities from threats and damage due to uncontrolled development. The establishment of a conservation area is one of the breakthroughs in realizing a sustainable development model in coastal areas. In order to achieve success in achieving the goal of establishing conservation, it is necessary to adopt a paradigm shift in conservation areas and to make breakthroughs and new conservation innovations. It is hoped that the development of communication systems and networks will have a kind of snowball effect. Establishment of conservation areas in coastal areas will not reduce people's access to utilize natural resources in coastal areas. In an effort to provide direct benefits, it is imperative to develop alternative economies for people who depend directly on coastal natural resources

Furthermore, for the joint opinion matrix on the alternative criteria for social empowerment, expert respondents gave the highest priority to the criteria for improving skills through the training and mentoring system with a weight of 0.427 while the lowest weight was given a scholarship with a weight of 0.211. An overview of the combined opinions of the actors can be presented in table 11:

Table 11. Matrix of Joint Opinions at the Social Program Criteria Level

Social Program Criteria	Weight	Priority
Skills improvement through a training and mentoring system	0.427	1
Providing access to basic needs	0.362	2
Providing Scholarships for Students and Students from Coastal Areas	0.211	3

Primary Data, 2020

Humune et al (2010) said that improving community skills to be able to increase human resources from environmental management must involve government intervention to encourage active participation of the whole community. Skills are very important for every community to have because skill development can help people improve the quality of work that is more skilled and dexterous in doing their jobs. These skills are mainly related to ways of utilizing fishery resources in coastal communities, how people utilize potential fishery resources with the skills possessed by the community.

Based on the results of interviews with community respondents who live in the coastal areas of North Gorontalo Regency, the knowledge and skills possessed by coastal communities are still low because of the knowledge and understanding of coastal communities. This is evident from the use of fisheries technology which is still not low. The skills possessed by coastal communities, especially fishermen, are acquired from generation to generation. Coastal communities tend to be apathetic and do not have strong motivation to be able to improve their skills. This has resulted in no improvement in managing the fisheries potential of the community. If the community has the skills, it is hoped that the coastal community will have the opportunity to be able to meet their basic needs.

Furthermore, for the combined opinion matrix on the criteria for economic empowerment programs in coastal community development, expert respondents gave the highest priority to providing capital for businesses with a weight of 0.702 and the criteria with the lowest weight was the development of cooperation and business partners which was equivalent to the lowest weight of 0.131. An overview of the combined opinions of the actors can be presented in table 12:

Table 12. Matrix of Combined Opinions at the Economic Program Criteria Level

Economic Program Criteria	Weight	Priority
Providing capital for businesses	0.702	1
Business Assistance and technical assistance	0.167	2
Development of cooperation and equal business partners	0.131	3



One of the biggest obstacles in increasing the production of coastal resources such as capture fisheries is the absence of a special financing scheme for coastal communities, especially fishing communities. According to Masyuri (2014), Banking institutions are generally not interested or less interested in extending credit to fishermen in the capture fisheries sub-sector. In this case, fishermen are deemed unable to repay the loans they receive regularly, while banks need certainty about the regularity of the installments of the funds lent. Therefore, the pattern of financing for capture fisheries business in Indonesia generally comes from non-bank financial institutions such as loan sharks. The only fisheries sector that has received support from banks is the ponds operated by Bank BRI

The government has actually provided a solution by providing assistance, one of which is through the aid program of 1000 30 GT vessels throughout Indonesia. The final objective of this program is to modernize the capture fisheries facilities and infrastructure. However, based on information, generally the aid from these ships is not utilized

Important factors for the non-operation of the aid vessels include the shape, size, and nets used that are not supportive or not in accordance with fishermen's habits, and the amount of operational capital they need. This reality is the reason for conducting an evaluation of the 1000 ship assistance program. The program in question was finally terminated halfway through. It seems that the diversity of businesses and traditions of the local fishing community needs great attention in the implementation of the financing program. If not, this could be an important factor in the failure of the financing programs carried out

### Conclusion

1. Fishing technology has not been able to maximize all fisheries potential in marine areas
2. The government must immediately build infrastructure that supports downstreaming in coastal areas
3. Encouraging increased capacity or volume of capture fisheries using technology that can be adapted by fishermen

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