

Resilience Community Livelihood: Case Study on Tunda's Island Community

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Abstract

Studies on community household livelihood have been carried out mainly to explain the level of vulnerability to community livelihoods. The livelihoods of the island community are greatly influenced by natural factors and surrounding environment. The livelihoods of the island community are mostly small scale fishermen who are vulnerable to climate and non climate factors. This research study explain how island communities survive with the risk of the vulnerability of their livelihood due climate change. This case study analysis was used to find out a spesific picture of community household in Tunda Island in responding to pressure and taking various adaptation measure to survive. This study has several finding to explain how community households survive, among others by diversifying additional source of income within the household due to the main source of income that no longer produces income due to various environmental problems, one of which is climate change. The resilience of the island community is built through a community system that is built base on mutual awarness by using the various resources available on Tunda Island. Community resilience does not only household adaptation pattern infacing various ecological problems but also includes community adaptation patterns in maintaining the sustainability of community food system, environmental balace and household livelihood system

Keywords: Livelihood; vulnerability; resilience; climate change; island's community

Abstrak

Studi tentang mata pencaharian rumahtangga masyarakat telah banyak dilakukan terutama untuk menjelaskan tingkat kerentanan mata pencaharian masyarakat. Masyarakat pulau tunda memiliki sumber nafkah utama yang dipengaruhi oleh faktor alam dan lingkungan. Sumber nafkah utama rumahtangga adalah nelayan dalam skala kecil yang rentan terhadap faktor iklim dan non iklim. Penelitian ini menjelaskan bagaimana masyarakat pulau bertahan hidup dengan resiko peningkatan kerentanan sumber mata pencaharian masyarakat akibat perubahan iklim. Analisis studi kasus digunakan untuk mengetahui gambaran secara spesifik tentang rumahtangga masyarakat di Pulau Tunda dalam menyikapi perubahan dan melakukan berbagai tindakan adaptasi untuk bertahan hidup. Hasil penelitian menemukan bahwa terdapat beberapa alternatif cara masyarakat untuk dapat bertahan hidup antara lain diversifikasi sumber nafkah tambahan untuk menopang sumber nafkah utama yang menurun akibat dampak perubahan iklim. Peningkatan ketahanan masyarakat melalui peningkatan kesadaran komunitas dalam mengolah sumberdaya alam di Pulau Tunda. Adaptasi rumahtangga juga dilakukan dengan menjaga keberlanjutan sistem pangan komuitas, keseimbangan lingkungan dan sistem nafkah rumahtangga.

Kata Kunci: Sumber Nafkah; kerentanan; ketahana;, perubahan iklim; masyarakat pulau

1. Introduction

Tunda Island is located in Serang Regency and part of 17 island in the north of Jaca island, Banten Province (Mujiyanto, Garcia, Haryadi, Rahayu & Budikusuma, 2020). Serang Regency is one of the Regencies in Banten Province

which have potential non-biological resources (island) that can be serve as a marine tourism destination in to support regional developement and community in the area. Tunda island has potential resouces and ecosystem. According to Darus et al (2014), Tunda island is a small

island that has three an important ecosystem such as mangroves, seagrass and coral reef.

Geologically, it is located at coordinates 5°48'18'' to 5°49'20'' South Latitude and 106°15'14'' to 106°17'27''E. The tunda Island region is a volcanic island that was formed from frozen lava deposits. Land topography 0-4 meter above sea level with areas in the east that area more 1-2 meter high from the west. The land on Tunda Island is dominated by shrubs, only about 10 hectares of land used for housing and facilities public (DKP, 2017). Tunda island is and island with a very low population density where the need for land for housing is currently only 2,1 hectar or 5,4% of the island's area (Kuswara, 2012).

Community in Tunda Island only have one kelurahan or village namely Wargasara Village which consists of two villages, namely West Village (*Kampung Barat*) and East Village (*Kampung Timur*) (Ulumi and Syafar, 2021). Total area in Tunda island is ±260 hectar which occupied by 450 families with a population of 1502 people whose work on marine product such as fisherman (80%), farm laborers (10%) and other workers (10%) (Suhasfan and Setiawan, 2022).

Small islands have identical characteristics, namely susceptibility to hazards and limited capacity to be able to buffer potential environmental hazards that arise (Myers et al., 2000), limited natural resources (Velde et al., 2007), traditional farming / fishing models and unsustainable (Bertram, 1986) and limited fulfillment of food security such as clean water, staple food and additional food (Hehanussa & Bakti, 2004). The characteristics of the ecosystem found on Tunda Island are a mixture of terrestrial and marine ecosystems and coastal ecosystems. The main natural resources on Tunda Island include mangroves, coral reefs and fish resources, while on land the natural resources that are owned are

coconut trees, papaya trees and vegetable plants.

Fishermen who are the main source of livelihood for the people on Tunda Island have a dependency on the marine ecosystem. This is because the people who work as fishermen are small-scale fishermen and fishermen's laborers (Cavendish, 2000). The characteristics of these fishermen include using a fishing hook to catch fish, a motor boat not too far from the island, a fishing system with a daily or weekly pattern. The charactrictic of economic welfare by community in Tunda island can not be said to be good (Kehlbacher, Bennett & Balcombe, 2012). This condition shows that the dependence of the islanders on natural conditions and natural resources to meet their daily needs is very high.

Fishermen have a high potential for vulnerability to environmental change, including the impacts of climate change. Environmental changes in general can be caused by various factors caused by humans and non-human factors. Climate change has a significant impact on ecosystems, community structures and populations and organisms on Earth (Putuhena, 2011). One of the causes of vulnerability to the livelihoods of the coastal communities of Tunda Island is climate change.

Climate change is one of the consequences of global warming which causes sea level rise. The increase in sea level according to the IPCC (Intergovernmental Panel On Climate Change) occurred as much as 10-25 cim in the last 100 years, and will increase to 95cm in 2100 in the future (Meiviana et al., 2004). In general, the impacts of rising sea level that will affect the life of people living on small islands include (Soegiarto, 1991).

Ecosystem changes on Tunda Island has increased caused by flood and sea level intrusion, coastal erosion, sedimentation, change of water rive flow

and also subsidence. Impact of that in Tunda island such as :

1. Ecological changes: reduced inundation areas (wetland) in coastal areas, intrusion of sea water, evaporation, loss of plants and habitats on the coast, and reduced land;
2. Socio-economic changes; loss of settlement, infrastructure, increased damage in the village, and loss of village tourism sites;
3. Institutional changes: clear boundaries, adjustments to laws, and changes in regional management.

Climate change has a significant impact, especially on coastal ecosystems due to rising sea levels, changes in sea surface temperature, changes in sea acid levels as well as increasing the frequency and intensity of various extreme events in the form of storms and high waves (Nurlaili, 2012). Climate change poses a threat to fishermen's livelihoods, especially the cessation of fishermen from fishing in the sea due to weather factors.

This condition has a systemic impact, especially on the ability of fishermen's families to be able to meet their daily needs. Climate change has made the adaptation patterns of fishermen in the past no longer able to be applied to current fishermen problems. The pattern of utilization and management of natural resources that has been entrenched for years is no longer a model of adaptation for fishermen today due to environmental and climate change (Winarto, 2010). The lack of fishermen's knowledge about marine resource management is exacerbated by the traditional fishing gear infrastructure forcing small fishermen to retreat and stop their livelihoods due to environmental change and climate change.

Climate change has a significant impact on the socio-economic activities of people in various areas, one of which is

coastal areas and small islands. Various problems that arise, one of which is the economic loss to fishermen due to farther fishing locations and longer fishing times due to changes in fishing areas. The reduced productivity of fisheries due to the destruction of coral reef ecosystems and mangrove forests is not only due to human activities but also due to rising sea surface temperatures. The rise in sea level has an impact on flooding inundating rural areas, a decrease in environmental quality, and the potential for death due to extreme climate (KLH, 2017).

This study departs from the background that small fishermen living on the island have problems related to dependence on natural resources and the effects of climate change on the sustainability of their livelihoods as fishermen. However, as humans, island communities have the ability to survive and face the conditions of vulnerability of their livelihoods through diversification of livelihood sources.

Diversification of livelihood sources is described as a process carried out by families to carry out various activities with the aim of survival (Ellis, 1998). Island communities with their characteristics have the problem of the vulnerability of their livelihoods due to the impact of climate change, but also have the potential to survive by using the various resources that exist in their surroundings. In general, this paper discusses two questions. Firstly, the extent to livelihood pattern's vulnerability as an impact of climate change in Tunda Island. Secondly, the measures taken by people in Tunda Island in order to survive under these conditions.

2. Method

This research used a qualitative approach with a case study method. The qualitative approach aims to dig deeper into the social context experienced by the informants in this study. This research was conducted for three months starting from

July to October 2019. There are three key informant in this study who work as fishermen, such as Mr. Na (50) who has lived for generation on Tunda Island, Mr. As (45) who is a fisherman and work for the local government and Mr.Sn (35) who is fisherman who lives because he is married local people of Tunda Island. The selection of three key informan baes on the period of time become a fisherman and life in Tunda Island.

Triangulation of research data was carried out by interviewing the head of local government on Tunda Island. Data collection techniques in this study used some methods such as in-depth interviews with key informant and additional informant (local people), discussions with local communities and through literature study and secondary data collection obtained from various sources. Data analysis used narrative data analysis based on the findings of the research.

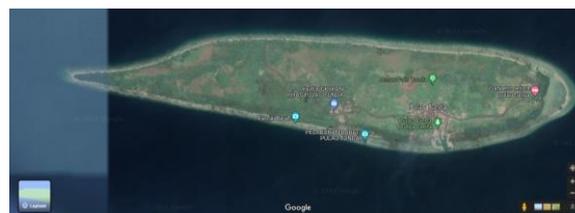
3. Results and Discussion

3.1 Characteristic Social Economic Tunda Island

Tunda Island is one of the island which located in Serang Regency, Banten Province. Tunda Island only has one village, namely Wargasara Village. Wargasara Village consists of two kampong such as Kampong Barat and Kampong Timur. In Tunda Island, there is 2 RW and 6 RT. In Kampong Timur, there are 1 RW and 4 RT and Kampong Barat, there are 1 RW and 2 RT.

Tunda island has an area of 289,79 ha but only half of the island that inhabited by the community (Picture 1). Tunda's island community only life from the east to the center of the island. Total of Tunda's island community are 1,115 people with 365 families. The leader of Tunda's island community are head of RT or RW. Location of local government is on the seafront near the port. There are some social infrastucure in Tunda Island such as elementary schools, mosque, and local health centre. But the problem in there is

availability of energy still limited especially electrical energy. Electricity only available from 18.00 to 21.00 WIB for Diesel Power Plants (PLTD) and 21.00 to 02.00 for Solar Power Plants (PLTS). Internet network access on Tunda Island is still difficult to obtain, the signal can be reached only at certain places.



Picture 1

Tunda Island (Source :

<https://www.google.com/maps/@-5.8129539,106.2735119,2268m/data=!3m1!1e3>)

Tunda Island residents have a livelihood as fishermen, farm laborers, traders, entrepreneurs, craftsmen, and civil servant (PNS) with percentage of fishermen (80%), farm laborers (10%), and others (10%). Based on research results, it is known that many young peole on Tunda Island are unemployed. The majority of the work of the people on Tunda Islan are fisherman and farmers. However, not a few have switched professions to the tourism sectors and trying to increase their family income. Data Tirtayasa Subdistrict (2016) about the economic welfare, there are 200 household that classified as underprivileged and properous at level 1. So linked between livelihoods and economic welfare condition can be found that the livelihoods of the population as fisherman in the area have not provide welfare enough for family.

3.2 The Extent to Livelihood Patterns' Vulnerability as an Impact of Climate Change in Tunda Island

Tunda Island fishermen are small fishermen with a traditional fishing system, that is, they still use hooks and fishing rods when catching fish. As many

as 70-80% of the people living on Tunda Island work as fishermen while the other 20% have other livelihoods such as trading, being laborers outside the island or not working. The fishing community of Tunda Island has two fishing patterns, namely daily fishermen and weekly fishermen. Daily fishermen are fishermen who catch fish every day who start working from 07.00 am to 17.00 and return home in the afternoon. Meanwhile, weekly fishermen are fishermen who catch fish for one week at sea and return home after one week (*babang*).

Changes in fishing patterns of Tunda Island fishermen are caused by several factors, one of which is climate change. One of the impacts of climate change is the increase in sea surface temperature which causes fish to move to areas at temperatures that allow them to live. This condition becomes a problem because fishermen no longer have the ability to predict and determine the location where to fish is different from before. The luck factor is the main factor that determines the number of fishermen's catch at one time.

"...in the past there was a certain place for fishing so that you got lots of fish, but now, if you are lucky, you get a lot of it, if you don't get anything....(Mr NA)"

In general, Tunda Island fishermen are small fishermen and traditional fishermen who have experienced changes both in the way they do fishing and in the

use of fuel for fishing. In addition to fishing gear, fishermen did not need fuel (diesel) to go to sea, because previously the fishing location was not too far away so that the rowing process could be carried out by fishermen. In contrast to the current situation, where fishing locations are increasingly distant and require more fuel to be able to reach fishing locations that can produce fish.

The fish catch generally reaches 3-5 kg per day when the season is good. With this condition, it shows that the fishermen of Tunda Island do fishing only to fulfill their daily needs but not for sale. Apart from dependence on the weather where the fishing process is only done when the weather is good. However, currently some of the catch is sold at the fish auction market and fishermen generally carry money of Rp. 100,000 to Rp. 150,000 per day which is used, among other things, for family needs and sailing capital the following day.

The dependence of Tunda Island fishermen on climate and weather factors affects their income to be able to meet their daily needs. This causes some people who have the ability to be able to find other alternative income, carry out various activities to make ends meet. Alternative livelihoods for the people of the island of tunda are divided into non-farm (related to fishing and fishing) and off-farm (non-fishery business). The following are alternative livelihoods for the people of Tunda Island, including:

Table 1
Alternative Livelihood Of The Tunda Island Communities

On Farm	a. Labor at big fisherman b. Coconut farmers c. Fisherman guide on tv channels
Non Farm	a. Small Store b. House Rent c. Ship Rent d. Tour Guide

Source : primary data (2020)

3.2.1 Traditional of Fishing Strategy

Fishermen on the island of tunda are small fishermen who use tools in the form of fishing rods. Tunda Island fishermen use ships measuring 5 meters which have a capacity of one to two people. The difference between fishermen in Tunda Island and fishermen in other regions is the fishing gear used. The tools used for fishermen on Tunda Island are in the form of ordinary fishing rods, while fishermen in other areas use nets and other more modern tools. The impact is a small catch so that the income per day is only able to leave for sailing the next day. The pattern of selling fishermen's catch on the island of Tunda is collected at the nearest stalls and then purchased by the local community or if occasionally goes to the fish auction, it will be sold at TPI which is in Karang Antu Harbor, Serang Banten.

"...the catch is now a little bit not like before, if now it's enough for food, thank goodness, because it will be used again the next day... (Mr AS)"

3.2.2 Fishing Competition

More modern fishing patterns are carried out by fishermen from outside of Tunda Island, especially by large vessels using a response pattern that is not environmentally friendly. This catching pattern includes using shooting tools, bombs, or other fishing gear which causes damage to the underwater ecosystem around Tunda Island. This condition has a significant impact on small fishermen who are very dependent on natural and weather conditions. In addition, the existence of large fishermen also has an impact on the dependence of small fishermen in the form of patron clients as fishermen laborers who work on large ships. This causes the potential vulnerability of fishermen as a source of livelihood for the community and indirectly causes structural poverty due to dependence on the existence of large vessels.

"...now being a fisherman is a bit difficult to remember because there are also many rivals, we have to look for fish that are really far away, sometimes it reaches Lampung but not how much the problem is that the ship's capital is not strong too small..Mr.AS)"

3.2.3 Marine Resources Damage

The potential of natural resources on the island of tunda that is felt by various communities is sufficient to meet the needs of the local community. However, their income from their livelihoods has recently decreased due to the various constraints previously described. The existence of ships with bright lights and then taking fish by shooting is a problem for fishermen in competing for produce from the sea in their own territory. The results showed that the decrease in fishermen's catch reached 90%. From the beginning, they could get 50 kg of fish from fishing, currently the catch is only 5 kg. The decline in catch has occurred since 2010 due to various factors, including natural factors and factors of competition with large fishermen.

"...if here the fishermen usually use fishing rods, it's still traditional but so the sea doesn't damage, so you can still fish near the house, but what else, many fish using bombs, nets, and other tools so the sea is still damaged, the corals are damaged, the fish on the go... (Mr. SN)"

3.2.4 Climate Change and Vulnerability of Coastal Community

The rise in sea surface temperature causes various problems for the environment. On the coast and islands, rising temperatures cause sea levels to rise, which results in the loss of coastal ecosystems. In marine ecosystems, climate change causes the ecosystem to change so that the location of fish gathering also changes. Increasing ocean

temperatures often cause ocean ecosystems to change. In addition, climate change causes the potential for frequent weather changes and climate disasters. These conditions have an impact on changes in fishing patterns carried out by island fishermen and also on the number of fish catches they produce.

"...In the past, there was still sea here, in fact, there was a buildup of sand so the land was here too, but there was mangroves, the sea boundary used to be there, sometimes sometimes when you get there, the water just hasn't reached the village. As for fish, now no one is near, if you want to fish, you have to go far so you get a lot...(Mr. AS)"

3.2.5. Lack of Regeneration in Fisherman Family

Natural resources from the sea on the island of Tunda are the main source of livelihood for the local community, however, from the information we got, the profession as a fisherman is not passed down from generation to generation to their children. Adult fishermen give freedom to their children to make their choice of work. This is because the profession as a fisherman does not have a significant impact on the economy for families, especially with the various challenges they have faced in recent years.

"...now not often want to be fishermen, most of the young people go to school on land, if someone comes home, the most successful has been and continues to bring many tourists here...(Mr. SN)"

The livelihood vulnerability that occurs in the community on Tunda Island can be caused by two factors, namely internal factors and external factors. Internal factors are mostly caused by the absence of regeneration and improvement of fishing systems and patterns. Meanwhile, external factors are caused by factors of climate change which have an impact on changing environmental

conditions and the factor of big fishermen who monopolize the fishing system in the ocean.

3.3 The Measure Taken By People In Tunda Island In Order To Survive Under These Conditions

Climate Change has a significant impact to community who lived at Tunda Island especially as a fishermen. Local fisherman in Tunda Island is a traditional fisherman. The specific characteristic of fisherman have a significant impact when there is a change caused by factors or the impact of environmental damage in general. This is caused the people of Pulau Tunda have to to some action to survive in the midst of these condition. There are some action that local community have been done to increase the community resilience in Tunda Island.

3.4 Community Resilience

The issue of livelihood vulnerability is a major problem faced by fishermen not only due to internal factors but also external factors, one of which is climate change. Climate change is one of the factors causing the vulnerability of the livelihoods of Tunda Island fishermen because of the traditional fishing methods and processes carried out by Tunda Island fishermen. This problem can be overcome by means of survival carried out by the community through increasing community resilience with several alternative activities, including:

3.5 Income Diversification

Marine tourism or marine tourism is one of the tourism potentials that can increase income for people on Tunda Island. Community-based tourism management by involving the community and stakeholders is able to make Tunda Island tourism better known by the community. The main impact of increasing tourism potential is the potential for a new source of income for

the community such as trading, selling souvenirs, becoming a tour guide, renting out a place to live and many other potentials. Currently, the diversification of their livelihoods is carried out by the people of Tunda Island by becoming traders and fishermen laborers and some others working outside the island. Diversification of household livelihoods is a form of community resilience to overcome the problem of climate change impacts on the livelihoods of residents on Tunda Island. Through the diversification of livelihoods, the population can survive without leaving the island. Increasing tourism to Tunda Island is an important thing because it can be an alternative solution to the problem of the vulnerability of the livelihoods of the island community.

3.6 Environmental Awareness Built By Community

Community awareness of environmental management needs to be increased as an effort to increase community resilience in facing the problem of livelihood vulnerability. Some of the efforts that can be made include: 1) Returning to local wisdom to manage natural resources and regulate fishing patterns. The management of natural resources around the island is an alternative to restore the "home" of fish that have been lost due to various environmental damage caused by human and non-human factors. Returning to local wisdom is an effort to restore community relations with nature. 2) Improving the fishing system, traditional patterns that are still used by fishermen are important to be maintained but must also be supported by improvements and regulation of the fishing system either based on certain patterns or improving capital infrastructure in fishing such as ships and larger but environmentally friendly fishing gear. 3) Waste management, waste becomes a problem in island communities. Innovation towards the potential for

diversification of livelihoods through tourism is inseparable from the condition of the island which is free of waste. Good waste management will increase the potential for tourism to enter Tunda Island. 4) Improvement of the mangrove ecosystem as a barrier to seawater intrusion. 5) Community empowerment to be able to produce products and souvenirs from Tunda Island.

3.7 Household Ecological Adaptation

The vulnerability of livelihoods due to climate change can be overcome by adapting the household ecology. Household ecological adaptation can be carried out by taking measures, including: a) The system for managing food sources, namely by making a supply of certain foodstuffs or adapting by planting food sources that can be consumed by the people on the island of tunda; b) Environmental balance, namely the need to balance the environment by not overexploiting marine resources, preserving mangroves as protection from abrasion and sea water intrusion and managing waste from both island communities and marine waste; c) A livelihood management system, namely regulating island tourism management to be able to generate new sources of income for community households living on Tunda Island.

4. Conclusion

The vulnerability of livelihood people on Tunda Island can be seen from the decline in catches, which is exacerbated by climate change. Wind intensity and season that tend to change rapidly. That's problem is exacerbated by internal problems such traditional fishing equipment and problem of family regeneration. This condition forces the community to make various efforts to increase community resilience. One of them is through improving the community in building the sustainability of household sources of livelihoods as well as the sustainability of marine and coastal

island ecosystem. Community resilience is a solution to overcome the problem of vulnerability to household livelihoods for island communities. Community resilience is built through diversification of household income sources, increasing community awareness to build a good and sustainable environmental ecosystem and household adaptation to changes in income sources, namely by making alternative sources of livelihood, planting around house, mangrove conservation to reduce sea water abrasion and community based tourism to increase local income.

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