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## Adaptation of the Fisherman Community Environment to Changes in the Coastal Region Ecosystem of Padang City

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**Abstract:** The main purpose of writing this research is to analyze the pattern of adaptation of fisherman communities to the impact of changes in the ecosystem in the coastal region of Padang City. To understand the adaptation patterns of fishermen to the impact of ecosystem changes, literature reviews, in-depth interviews, observations, and focus group discussions were conducted with local fisherman communities in the coastal region of Padang City. The results show that the fisherman community of Padang City has felt the impact of ecosystem changes such as damage to mangroves and coral reefs due to exploitation of coastal resources and natural disasters. Therefore, the adaptation of fisherman communities to cope with the impacts of changing ecosystems follows a reactive adaptation

pattern. They tend to use abilities from within the community. The adaptation pattern is carried out by developing job diversification, modifying the boat fleet, adjusting fisherman times with natural signs, and taking joint actions to rehabilitate damaged ecosystems.

**Keywords:** adaptation, fisherman community, ecosystem, coastal region, padang.

### Introduction

Padang City is one of the big cities in coastal regions in Indonesia that is experiencing changes in the ecosystem [1-3]. [4] stated that changes in the ecosystem can be caused by community activities or natural disasters. Coastal abrasion, tidal flooding, and sedimentation have resulted in most of the coastal regions and they're in damage to ecosystems,

according to the Wetlands International Indonesia Program (WIP) report, as result of these marine disasters, wetlands in Padang City (especially those located on the coast of north and south) are thought to have undergone many changes in the shape, area, and quality of water and its basic substrate [5].

The existence of coastal ecosystems has an important function and role on small islands [6]. According to [7] function and the role of small island ecosystems as regulators of global climate, hydrological and biogeochemical cycles, absorbers of waste, sources of germplasm, and other life support systems. [8-11] mentioned a number of economically valuable organisms whose lives depend on coral ecosystems, namely turtles, barong shrimp, octopus, conches, clams, oysters, seaweed, clams, and sea cucumbers. When one ecosystem changes, it will affect other ecosystems around it, including humans who depend on coastal ecosystems.

Ecosystem changes in the coastal region of Padang City are marked by damage to mangrove and coral reef ecosystems. The damage that occurs to the coral reef ecosystem ultimately affects fish populations and can have implications for fisherman activities and the economy of fishermen [12]. According to [13] that fish migration patterns occur due to damage to coral reefs due to the process of upwelling, so this triggers fish to migrate looking for places that have better coral reefs. In addition, changes in the ecosystem have an impact on the socio-economic activities of the community which include changes in fisherman time, fish catchment areas, and fish catches [14]. Changes in the ecosystem in the coastal region of Padang City have caused fisherman communities to live in an uncertain environment. According to [15] stated that the condition of fisherman communities or coastal communities in various areas is generally characterized by poverty, socio-cultural backwardness, low quality of human resources (HR), and the capacity to organize communities.

The impact of these changes has added to the vulnerability of the area, with panic among fishermen regarding their catch, and a decline in fish populations which has an impact on fishermen's

income. Not only in the coastal region of Padang City, currently the problem of vulnerability of coastal communities due to changes in ecosystems is not a new thing faced by the community. To reduce bad impacts, various efforts have been made, it is necessary from an early age for the fisherman community. One of the efforts is by adapting to changes in the physical and social environment that occur temporally. Until now, the government is concerned with conducting counseling efforts related to adaptation measures that should be taken by fishermen. Adaptation is a system of interaction that continues between humans and humans, and between humans and their ecosystem [16, 17].

The higher the level of adaptation, the greater the ability to sustain life and affect the survival of other creatures [18]. However, the existence of differences in the morphology of an area affects differences in human responses [19, 20]. Based on the results of the description of the conditions of changes in the ecosystem in the coastal region of Padang City. This research is intended to see the adaptation patterns carried out by the community in the coastal region of Padang City that is facing the impacts of changes in the ecosystem.

## METHODS

This research uses qualitative methods. This qualitative method is used to determine the adaptations made by fishermen in dealing with changes in the ecosystem. The approach used in this research is descriptive. Descriptive research is useful for making systematic, factual, and accurate explanations of the facts and characteristics of a particular population or area.

This research was conducted in the coastal area of the city of Padang. The location selection was done purposely. The data collected includes primary data and secondary data. Primary data obtained from respondents was carried out through interview techniques with prepared interview guides. In addition to primary data, data collection in this study also uses secondary data. Secondary data sources can be obtained from the sub-district office, Central Bureau of Statistics (BPS), the Department of Fisheries and Marine Affairs of Padang City, as well

as research reports that are related to this research. Data analysis techniques were carried out from the beginning of data collection. The results of in-depth interviews and observations are presented in the form of daily notes which are analyzed since the first time they came to the field and continue continuously consisting of data collection, data analysis, data reduction, data presentation, and drawing conclusions.

## FINDINGS

Ecosystem changes have occurred in the coastal region of Padang City. Apart from marine disaster factors and community activities in utilizing the ecosystem. Changes in ecosystems that affect fisheries productivity are also caused by damage to mangrove forest ecosystems and coral reefs due to increased sea surface temperature and changes in groundwater [21-25]. A number of ecosystem change problems have had an impact on fishermen's fisheries business as previously described. The impact is felt not only by fishermen but all communities in the coastal region of Padang City.

One of the changes in the ecosystem has caused a decrease in the catch of fishermen. This condition causes some people to start to realize that their life will be increasingly insecure if they continue to survive in this condition. Realizing this, the fishermen community in the coastal region of Padang City did not give up but took a number of steps. One of the steps taken is an adaptation to adapt to change. [26] explained that the adaptation carried out is an action to reduce the vulnerability that occurs. However, the adaptation made by fishermen is a reactive adaptation. Reactive adaptation is a form of behavior adjustments made after the impact of changes has occurred. As for some of the reactive adaptations carried out by fishermen, namely as follows:

### Developing diversification of work

When not going to sea because the fish catch is getting less and less. Fishermen undertake livelihood development in other sectors. The fisherman community has developed a variety of livelihoods to meet household economic needs. This was done when natural conditions made it impossible to go to

sea. Activities that are carried out outside fisherman activities are one of the adaptations made in dealing with fluctuations in fisherman seasons and erratic weather [26, 27]. Activities outside fisherman activities are an alternative way for fishermen to cover their daily needs by having a side job [28]. The fisheries sector in the coastal region of Padang City is very vulnerable to changes in the ecosystem. Meanwhile, fisherman communities in the coastal regions of Padang City are generally traditional fishermen who are very dependent on sea and fishery conditions. When the fish crisis occurred, the impact of changes in the ecosystem, most fishermen chose to develop a variety of livelihoods in the non-fishery sector.

In order to meet household needs, the development of various livelihoods is carried out by selling on the beach, being a guard officer for lodging places, and for fishermen who own boats. When not going to sea, boats are rented out to take tourists around the small islands in Padang City. For fishermen who do not own a boat, adaptation efforts are made by selling on the beach. Merchandise sold on the beach are generally snacks, boiled noodles, and young coconut. According to them, the step of selling young coconuts is more profitable because they don't need to spend a lot of capital. This is because the geographical conditions of the community houses in the coastal region of Padang City have a large area of land where almost every house has coconut trees. When not fisherman, fishermen who do not have stalls to sell choose to work like cleaning and security officers in the lodging area. The choice to become a security officer is considered easier and can be done by a system shift. Those who work as the security supervisor at the place of the inn earn between Rp. 50 thousand to even more than Rp. 300 thousand days. At the end of the year, there is an event or exhibition that can get 500 thousand days. Meanwhile, fishermen who only work as fishermen do not necessarily get that much income.

Developing job diversity is a way for fishermen in the coastal region of Padang City to adapt to changing ecosystems. This is because in general, the people on the island have very low mobilization. The low mobility is due to the low availability of marine

transportation facilities and infrastructure, and the low frequency of transportation services that connect between archipelagic areas, so that transportation costs are very expensive. There is no other choice but to survive the conditions of change and to use the abilities from within the community to adapt to the changes that occur. When sea conditions improve, they immediately leave the side job to go back to sea.

### **Modifying the boat fleet**

The adjustment made by fishermen to face changes in the ecosystem is by modifying the boat fleet. According to [29], the modernization of fisherman gear will affect the operational range of fishermen. The condition of fishermen in the coastal region of Padang City. Fishermen who have motorized boats, make adjustments by changing the function of the boat from catching fish to being a function of transporting tourists. When the dry season arrives, fishermen who own boats use their boats as tourist transportation services. The boats are modified and decorated in such a way that they are then rented as a means of transporting tourists who want to visit small islands. The activity of shuttle tourists is often referred to as a rental pull. Pulling boat rentals has become a lucrative profession for some fishermen who own boats. However, not everyone who modifies boats has made a fortune by changing the boat. Not a few also complain about the absence of tenants.

The condition of fishermen who pull boat rental now is an apprehensive shortage because of their tenants. The rise of online tourism service businesses that offer pick-up, lodging, and boat rental services to deliver to islands. In addition, foreign tourists usually prefer boats driven by fishermen who can speak English. Meanwhile, fishermen generally have very minimal language mastery. This limitation results in minimal rental activity for tenants. Withdrawal only relies on ordinary local tourists, and usually only a lot at certain times, such as New Year and the coming month of Ramadan. Fishermen who rely on local tourists are able to survive because they build social networks with subscriptions. Subscribers who put their trust in will usually call to order a boat from the fisherman. On the other hand, fishermen put their hopes in subscribers to continue to make their own

fleets leased by customers. The fisherman community in the coastal region of Padang City has solidarity with each other. This can be seen from the cooperative action to help each other. Fishermen who do not own a boat, choose to go to sea with fishermen groups. Going to the sea together is an alternative to looking for income when there are very strong winds and waves.

### **Arranging the time with the natural mark and the moon**

The fisherman in the community in the coastal region of Padang City, there are guidelines for the culture of the sea from their ancestors to determine when to go to sea. Culture is formed more dominantly due to a process of experience, which is socialized from generation to generation [30]. In the fisherman community in the coastal region of Padang City, there are cultural values and rules related to fisherman time. The culture and rules relating to the timing of the fisherman provide knowledge, direction, and guidance to adapt to the changes that occur. Changes in the ecosystem have made it difficult for fishermen to catch fish in an area plus the reduced diversity of reef fish in the sea of Padang City. In the knowledge that develops in the fisherman community. There is an understanding related to the time when fish and other types of marine life in certain conditions were very abundant and passed through the sea. Experiencing these conditions gives knowledge of time and natural conditions.

Learning from these conditions then produces a form of adaptation to changes by adjusting the fisherman time. Managing time the arrest is made with the knowledge of reading the signs of Nature. Based on the natural signs and the signs of the moon, most fishermen who understand will arrange the fisherman's time at that time and do not go out to sea outside that time. Here is a sign of the growing nature and fishermen used to set the time of the arrest. The sign first, the sky is scaly. According to senior fishermen, the fish will rise to the surface when the sky is scaly. The sky is scaly filled with striped clouds, usually, fishermen will go to the sea to catch fish and almost certainly always get an abundant catch. The sign second sees the flow of



currents (flow of currents to the west). In the developing knowledge in fisherman communities, the fisherman season can be determined based on the direction of the current flowing. According to fishermen, if the seawater flows to the west, the seawater temperature becomes hot (warm) so that the fish come to the surface and are very easy to catch. However, if the current is to the east, the seawater will be very cold and the fish will enter the seabed so that at that time it is a famine period for fishermen. The Natural sign third sees a period of shade between the west monsoons and the east monsoons. This period, according to lobster fishermen, will emerge from the surface of the reef, and many types of reef fish and other types of fish will be found. The shading period for plankton congregates at a point close to the reef due to changing seasons. The Gathering plankton point is usually the gathering point for many types of fish. In this condition, fishermen usually compete to catch fish. The Sign of nature fourth, seeing the leaves on the trees have started to fall. When the leaves on hardy trees have started to fall (autumn leaves). So according to The knowledge that has developed in the fisherman community, this condition is one of the signs that the season for fish such as mackerel, ame-ame, and skipjack has begun to be abundant. This means that an indication of the fall in the leaves is a sign of a certain fisherman season. In regulating fisherman time. The fisherman community is known as a horoscope system based on date calculations. By using this timing, it can predict the abundance of fish, the passing of dolphins, the presence of sharks, the return of turtles to lay eggs to the coastal region of Padang City, and others.

Adaptation by adjusting fisherman time through natural signs and moon signs is a major concern with regard to subsistence activities and economic regulation. The knowledge system developed by the fisherman community has overcome the vulnerabilities that arise due to changes in the ecosystem. Knowledge and The ability to read natural and moon signs possessed by fisherman communities in the coastal region of Padang City has provided space for people to adapt to changes in the ecosystem.

The fisherman community is able to act and think by reading certain natural conditions because it has been socialized in the culture they accept. So that the discussion about the impact of changes in ecosystems is actually not only related to adaptation and livelihood culture. But far from its changes in the ecosystem have caused adjustments in the arrangement of the livelihoods of fisherman communities in the coastal region of Padang City. This is in line with [7]; [31] communities in coastal regions have their own socio-cultural characteristics, as a consequence of the process of cultural evolution that occurs in a series of processes of human interaction and their environment. Fishermen generally have knowledge of the adjustment strategies that must be carried out in relation to the impacts of changing ecosystems. However, some of this local knowledge is not always correct with the current conditions which are very uncertain and are anomalies of the changing conditions of ecosystems that are commonly faced. Besides the current condition, having knowledge is not enough, fishermen need special skills. This was also conveyed by [32] states that it is not enough for fishermen to only have knowledge and skills, they must also have the great and prime physical strength and endurance so that when working, fishermen are able to go to see a long-distance according to the location of the fish shown by fisherman technology.

### **Taking collaborative action on ecosystem rehabilitation**

Although many people do not understand changes in ecosystems, those whose livelihoods are from fisheries and depend on natural resources (fish) feel the impact. The ecosystem condition in the coastal area of Padang City is getting worse day by day. This makes for a valuable experience and understanding for the community. The impact of change makes fisherman communities themselves learn from the uncertainty of their eyes, livelihoods, and income. The uncertainty of livelihoods has moved some members of the fisherman community to take joint actions to rehabilitate and restore the ecosystem as usual. Ecosystem rehabilitation is carried out by replanting mangroves and damaged coral reefs. Mangrove replanting and coral reefs are actions that

proactive, planned lead to the repair of damaged ecosystems.

Initially, fishermen only planted 500 mangroves. However, in the year last the fisherman community has collaborated with members PT. Pertamina also helps replant mangroves on the pier in the Cindakir Bungus area. One way that communities do fisherman in order to rehabilitate the ecosystem is by building connectivity with the community and between other communities. By taking care of people outside the community to help and work together to rehabilitate the ecosystem coral damaged reefs and mangroves. The collective action carried out by the fisherman community and the outside community who care about the damage to the ecosystem cannot be separated from the existence of the fisherman community.

The role of the fisherman community and the government is important in mobilizing collective action. Even so, the next step is so that mangroves are not damaged. The fisherman community develops customary mechanisms in resource management. The customary fine mechanism collaborates with the sanction system. Apart from collective action to rehabilitate the ecosystem. Joint action which is still strong in the community still does fisherman as help you adjacency (blood brotherhood).

## CONCLUSION

The form of change is the ecosystem seen from the damage to mangroves and coral reefs. Ecosystem changes are caused by the exploitation of coastal resources which tend to be exploitative or due to sea disasters. The adaptation carried out by the community fisherman overcomes the impact of changes in the ecosystem by adopting a reactive adaptation pattern. Adaptations are carried out after changes in the ecosystem. Adaptations carried out by fisherman communities tend to use abilities from within the community. Adaptation is carried out by developing job diversification, modifying the boat fleet, managing fisherman time with natural signs, and taking joint actions on ecosystem rehabilitation.

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