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REGULAR RESEARCH ARTICLE

Changing Livelihood Strategies in a Conservation Area: Fishers, Farmers, and Sand Mining in Merauke, Indonesia

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ABSTRACT

The Wasur National Park (WNP) includes the Ramsar Site, an important area for global conservation efforts in wetlands. This coastal area also supports the socio-economic activities of local and non-local communities who are highly dependent on natural resources. Conservation efforts in the area are sometimes at odds with the sustainability of local livelihoods and poverty alleviation initiatives for the community. The aim of this study is to describe the sources of community livelihoods in the Wasur Naukenjerai National Park area, specifically around agricultural, fisheries, and sand mining dynamics. Using a qualitative research design, this study uses a field survey to collect primary data sourced from key informants with in-depth interviews from 15 community respondents in three sample villages on the coast, and seven key informants from relevant government agencies. The results show that the main livelihood source for people in the protected area are as fishermen and farmers. Sand mining has emerged as an alternative source of livelihood but has caused degradation of beaches and land in the Wasur National Park area. In addition, there are activities of buying and selling agricultural land in protected areas. The protection of the rights of the community in the area and government support programs have been unable to guarantee the welfare of the community. For this reason, it is necessary to strengthen and further support local institutions livelihoods to ensure the sustainability of Wasur National Park area management.

KEYWORDS
Socio-economic; national park; coastal area; livelihoods; Papua

1. INTRODUCTION

Indonesia has 54 national parks, of which six are included as world heritage sites, while nine national parks are included in the world's bio-reserves, and another five national parks are included in the Ramsar site protected by the international community. One of these is the Wasur National Park in Merauke Regency, Papua Province. The area of the Wasur National Park is spread over 4 administrative districts, namely Merauke, Jagebob, Sota, and Naukenjerai District (Kosmaryandi, 2012). The main objective of establishing a national park area as a protected area in this region is for conservation interests. Conservation is an effort to protect forests that store unique and important biodiversity, which also supports many functions (Feeley & Terborgh, 2005; Stokstad, 2014). Forest ecosystems have greater conservation benefits than ecosystems that are already degraded (Haddad et al., 2015; Larekeng et al., 2022). This is a strong reason for conservation management to be carried out (Watson et al., 2018).

However, conservation efforts can have negative and positive impacts on communities living in areas designated as protected areas (Adams & Hutton, 2007; Clements et al., 2014; Roe, 2008; Batiran et al., 2021). There are many cross-sectoral challenges between local, provincial, and national governments in national park management (Asriyani & Verheijen, 2020; Fatem et al., 2020; Fisher et al., 2020). Before

the establishment of the national park, there were people who lived in and looked for sources of livelihood in the area. The establishment of a national park limits community access in managing resources and who in many instances directly or indirectly bears the cost of conservation. This compounds issues of poverty for communities, which can lead tonew and often extractive utilization of forest resources in protected areas (Adams & Hutton, 2007; Babigumira et al., 2014; Cernea & Schmidt-Soltau, 2006). Furthermore, these sites are places for people to carry out their economic and social activities (West et al., 2006; Herrawan et al., 2022). Thus, efforts to protect areas with conservation can often be contrary to efforts to alleviate poverty, especially in developing countries (Adams, 2004) ~~(Adams, 2004).~~ This is because in the management of protected areas not all parties have the power to manage ecosystem services (Felipe-Lucia et al., 2015). For this reason, the formation of protected areas is a form of complex social and political processes, in that social, cultural, and political structures and dynamics of society must be considered so that area management can benefit all parties (Mendoza et al., 2020).

Management of protected areas such as Wasur National Park in Merauke Indonesia have been ineffective and there are significant threats to mangrove forests. Damage to mangrove forests is caused by abrasion and the use of mangrove wood as building material or as fuel (Untari et al., 2020). This is one of the contributing factors to carbon emissions from the land sector in Merauke (Untari et al., 2018). To reduce carbon emissions from mangrove areas, the local government has compiled six low-emission mitigation actions, one of which is mitigation actions in mangrove areas with community participation (Rahail et al., 2019).

This paper examines the extent of the dynamics and changes in communities' livelihoods in Naukenjerai District, which is within the Wasur Merauke National Park area. In Naukenjerai settlements are located on the coast. Before the establishment of the Wasur National Park area, the local community made their living as fishermen, maintaining small gardens, and hunting. Over time there was a social transformation marked by the in-migration and marriage of local with non-local communities (Javanese, Ambon, NTT, and Makassar tribes). With the occurrence of social transformation, the life of the traditional community has changed. In order to meet growing economic needs of the family, some people seek out livelihood from agriculture and illegal sand mining. The designation of an area as a protected area and prohibition against certain extractive practices influence opinions of the local community (Jagger et al., 2014). The rights and capacities of local communities in the area must be protected for the sake of social and economic sustainability of the community (Porter-Bolland et al., 2011). For this reason, the agricultural sector has begun to be developed in the Wasur National Park area as a form of realizing the rights and capacities of the people living in the area. In addition, people who live on the coast will be threatened with losing their homes due to sea water eroding the land.

This study describes the sources of community livelihoods in the Wasur National Park area in Naukenjerai by surveying local forms of agriculture, fisheries, and sand mining sectors that affect the dynamics of the social and economic life of the community. This paper also discusses the existence of the community in the Wasur National Park area in meeting the needs of families who are limited by the national park zoning system.

2. MATERIALS AND METHODS

2.1 Research location

The research was conducted in the Wasur Merauke National Park area, namely in Naukenjerai District in January-February 2021. The Wasur National Park area is included in the area of 4 customary land rights owners in the area. The original tribes that own the customary rights are the Marori Men-Gey, Kanum, Marind, and Yei tribes which are well known in the four administrative areas of the Jagebob, Sota, Merauke and Naukenjerai Districts covering a total area of 431,425 hectares. Naukenjerai District is an area that is included in the Wasur National Park area covering an area of 1,697.82 square kilometers consisting of 5 villages namely Kuler, Onggaya, Tomer, Tomerau, and Kondo Villages. These villages are generally dominated by 2 tribes of customary land owners, namely the Kanum and Marind tribes. The reasons for selecting Naukenjerai District as a research area were: 1) there are community settlements (local and non-local communities) in the coastal area, 2) overlap with the National Park, rendering exploitation of natural resources illegal, 3) efforts by the government to address livelihood concerns. The research location is shown in Figure 1.

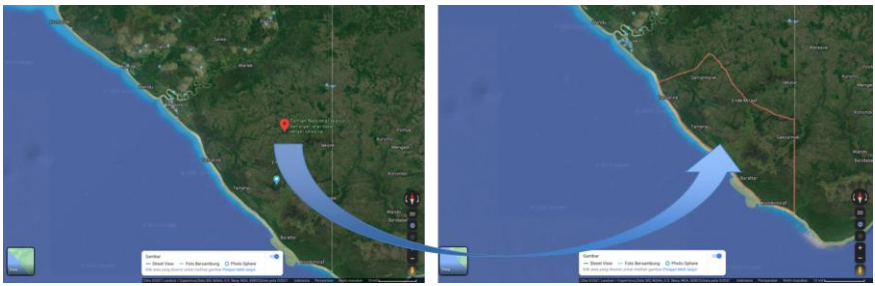

Figure 1. Research Location.

2.2 Research methods

We conducted a study on a group of fishing communities who live in the Wasur National Park area in Merauke, Papua Province, Indonesia. We explored livelihood sources for local and non-local fishing groups that have an impact on the environment of the national park area as a protected area by using a qualitative research design with a case study approach (Creswell, 2009). A case study approach can be used to explain the management of protected forests by local communities to meet social and economic needs (Porter-Bolland et al., 2011), poverty and livelihoods (Clements et al., 2014) and changes in land status in protected areas (Travers et al., 2015). This research helps explain socio-economic phenomena that occur among coastal communities in the Wasur National Park area of Merauke.

2.3 Data sources

The primary data of this research draws from information collected on community activities in coastal areas in fulfilling the needs of life in the family. Primary data comes from survey data using in-depth interviews (Maryudi & Fisher, 2020) with people living in the coastal area of Naukenjerai and key informants from representatives of village and regional government agencies of Merauke Regency, such as the village head, representatives of the Fisheries Service, the Cooperatives Office, the Merauke Regency Urban Spatial and Regional Planning Office and the Wasur Merauke National Park Office. Meanwhile, secondary research data was obtained in the form of zoning maps of

the Wasur Merauke national park area, a map of the customary area of the owner of customary land in the Wasur National Park area, as well as demographic data of Naukenjerai District from related agencies.

2.4 Data sources

There were 15 total respondents from Naukenjerai District from three villages, namely Kuler, Onggaya and Tomer Villages (five people each). Meanwhile, respondents from key informants were three village heads, four representatives from four agencies related to development in the coastal area of Merauke Regency. There was a total of 22 respondents in this study. The method of determining the sample of research respondents and key informants is proportional random sampling between different stakeholder groups.

2.5 Data sources

The research data collection technique used Cresswell (2009), which posits that qualitative research data collection techniques can use three data collection techniques, namely qualitative observation, interviews, and documentation techniques.

2.5.1 Observation

The observation technique was carried out to observe the behavior and activities of the community at the research location. In a structured manner, the researcher recorded the activities of the Naukenjerai community in earning a family income from fishing, agriculture, as well as sand mining.

2.5.2 Interview

The interview technique included face to face discussions using question guidelines that were generally unstructured and open-ended. This research included interviews with the community to explore the socio-economic activities related to finding sources of family livelihoods in the Wasur National Park area.

2.5.3 Document analysis

Secondary data were collected using the documentation study method, namely studying official documents, archives from related agencies or institutions for the purpose of research. The study used secondary data from the Wasur National Park Office, Merauke Fisheries Service, and BPS-statistic of Merauke Regency Merauke (Merauke ~~Regency~~ District in the figures 2020 and Naukenjerai District in the figures 2020).

2.6 Data analysis techniques

The data from the qualitative research results were analyzed descriptively with the steps of analysis, namely data collection, data reduction, data display, verification and conclusion drawing.

3. RESULTS

3.1 Context

3.1.1 The character of the local communities

The results of the research survey found that the main sources of livelihood for the community are fishermen and farmers. Coastal communities in Naukenjerai District consist of local and non-local communities. The local community consists of the Malind and Kanume tribes, while the non-local community is dominated by the Tepa from East

Nusa Tenggara, Bugis Makassar, Ambon, and Java. However, in this area there have been inter-tribal marriages which have resulted in a shift in the cultural system of the Malind indigenous people as owners of customary rights in the protected forest area of Wasur National Park. This has an impact on the socio-economic life of the local community. Development changes have also affected the life system of local communities moving away from more traditional subsistence systems, affecting overall economic needs. To meet daily needs, local communities who previously engaged with natural resources for family consumption (hunting, gardening, fishing in swamps and along the coast) have introduced more sedentary systems of cultivating food crops. In addition, illegal sand mining activities have also grown, which has also entered into Wasur National Park. Local government efforts to teach local communities about agricultural cultivation systems are carried out in order to create new sources of livelihoods and income to support economic needs of families and to deal with future environmental change scenarios. To achieve this, the local government through several programs has provided guidance to increase the capacity of local human resources to reduce dependence on natural resources and provide support for facilities and infrastructure with capital from agricultural land clearing, land management, nurseries, and harvesting.

The local government through several programs has provided guidance to increase the capacity of local human resources to reduce dependence on natural resources and provide support for facilities and infrastructure with capital for land clearing, land management, nurseries and harvesting of agricultural products. This is done to motivate local people to learn how to grow crops so that they can provide economic benefits for family life and improve welfare. The provision of agricultural capital for farming aims to reduce illegal sand mining in the national park area.

The local government's efforts to facilitate change for communities to transition into farming communities has not gone as planned. Many challenges are faced in developing agriculture in this area, such as the community does not have knowledge about farming systems being introduced, which has also clashed with local cultural practices and tenure systems. The local community has full authority over the natural resources that exist in their customary territory which still has abundant natural resources. This causes the community to continue to exploit natural resources to meet family consumption. Since 2002, however, the Wasur National Park Authority has identified illegal sand mining in coastal areas, which are sold as building materials. Sand mining is even carried out in residents' yards, leading to precarious situations to households. Local residents have been driven to sand mining by lack of economic opportunities when it is not the fishing season in waterlogged coastal areas and swamps. The local government's development approach has not provided a solution to the economic difficulties of the people in Naukenjerai who have long resided within the protected area. Furthermore, in ensuing sections we also reveal in-depth findings about 3 sources of income for the people in Naukenjerai, that drive both local and non-local community economies, which are fisheries, farming, and sand mining. We also contextualize this within the zoning system in the Wasur National Park area in Naukenjerai District.

3.1.2 Wasur National Park policies and zoning system

Based on the decree of the Minister of Forestry in 1997, the Wasur National Park in Merauke Regency was designated as a national park area covering an area of 413,810 hectares. It also notes the importance of protecting the rights of indigenous peoples in

the area such as giving the community authority to manage or utilize existing natural resources practices. A map of customary land ownership in the Wasur National Park area is presented in Figure 2.

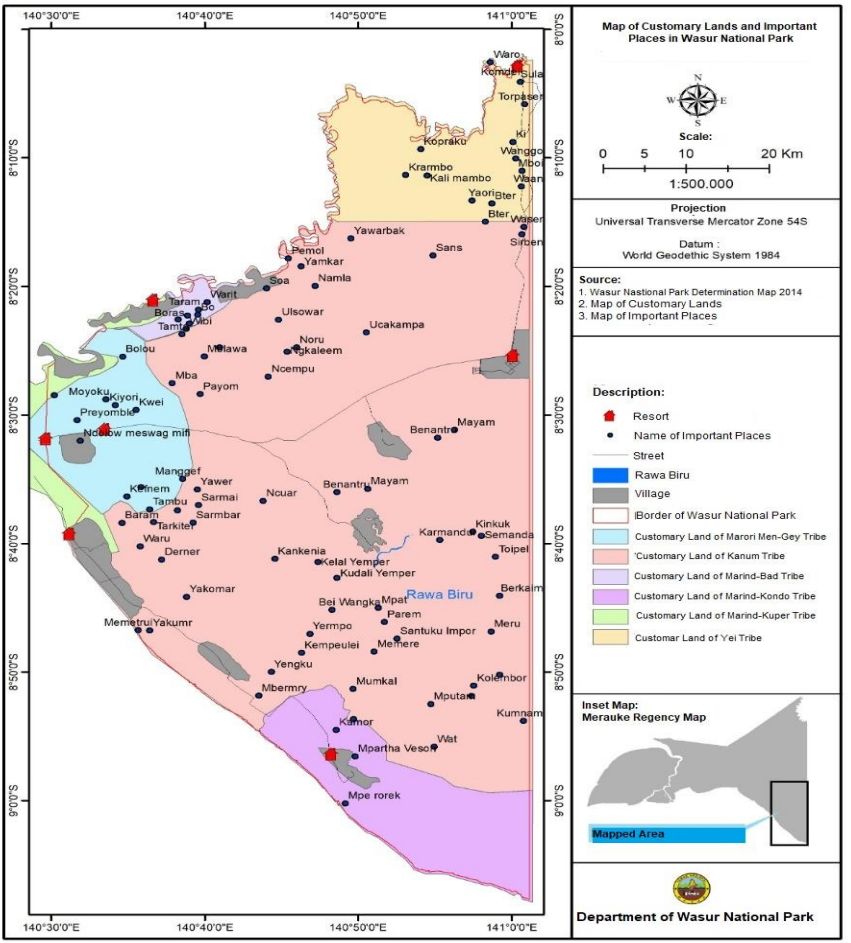

Figure 2. Map of Customary Lands and Important Places in Wasur National Park, Merauke.
[Source: Wasur National Park Office, Merauke Regency, 2021]

Figure 2 shows that in the Wasur National Park area there are 4 major tribes that serve as customary land owners, namely the Marori Men-Gei Tribe, Kanum Tribe, Marind Tribe, and Yei Tribe. In the local culture there is local wisdom in the use of natural resources that has been carried out for generations that maintains the balance of the ecosystem. According to local Papuan culture, Indigenous Peoples of the region can manage or extract natural resources only in their customary territory. In the utilization of natural resources, there are several utilization patterns that have positive values for environmental and socio-economic sustainability. Such patterns are broadly the sasi and pamali cultures, which are tied to local hunting and fishing systems. Since the arrival of management systems from establishment as the Wasur National Park, the

government introduced new zoning systems. One of the objectives of the establishment of a zoning system is to protect the basic rights of local communities in ensuring economic sustainability and household needs of people who are already domiciled in Wasur National Park by prioritizing local wisdom. The zoning map of Wasur Merauke National Park is presented in Figure 3.

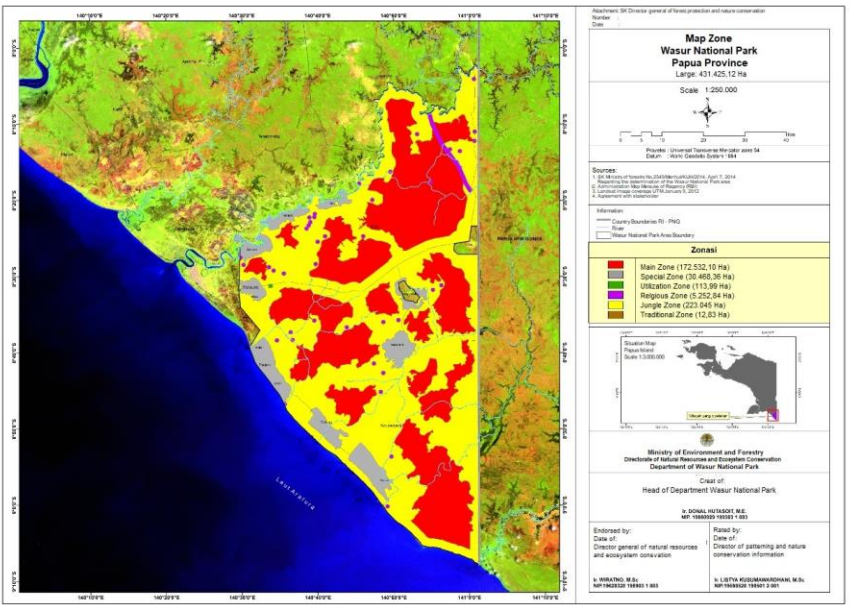

Figure 3. Zoning map of Wasur National Park - Merauke
[Source: Wasur National Park Office, Merauke Regency, 2021]

Figure 3 shows that Wasur National Park is divided into 6 (six) zones, namely the core zone, special zone, utilization zone, religious zone, jungle zone, and traditional zone. The zone that provides space for local communities within the area is a special area used as a residential area, cultivation area, and infrastructure development. The zoning system in protected areas in each country or area is determined based on conditions and what is to be achieved. Similarly in China, the establishment of 3 use zones in protected areas in the giant Panda National Park to protect Panda populations consisted of core, buffer, and experimental zones (Zhuang et al., 2021), and developed functional zones to protect ecological elements (Tang et al., 2021; Wei et al., 2020). In Wasur, a special area was added for settlement and cultivation, which is currently used by Indigenous and local communities. However, ownership has shifted from local communities to non-local communities. There are land sales taking place, such as transactions within the national Wasur area. Proof of land sale and purchase transactions is evidenced by the existence of a land sale and purchase deeds issued by the local village government, but the issuance of land certificates cannot be carried out because the Naukenjerai District area is included in the national park area. The activity of buying and selling land in the Wasur National Park area has occurred since the opening of agricultural land was assisted by village funds. Forest land cleared for cultivation by local communities is being sold to non-local communities. Community resistance to established zoning systems also occurs in Batang Gadis National Park with open land in the jungle zone as a protected animal roaming area (Kwatrina &

Kuswanda, 2011). In addition, the status of recognition of the rights of local communities (in these case adat, or Indigenous Peoples) in the area is a factor causing conflicts with the national park management system (Kosmaryandi et al., 2012). For this reason, to avoid conflicts in the management of protected areas, namely national parks, guidelines for area management can be established to increase the effectiveness of area management (Magfiroh et al., 2005).

Several studies on the zoning system policy in a land-based area are a form of intervention in sustainable regional development planning, and serves as the basis for consideration of government decision making in the development of an area (Domingo et al., 2021), or for protection of endangered animals and community development (Li et al., 2021; Zhuang et al., 2021) as well as maintaining the environmental ecological system (Wei et al., 2020).

3.2 Fisheries

Community livelihoods in coastal areas in and around the national park are as fishers, and is an especially longstanding tradition of local communities (Malind and Kanume tribes). Based on the results of field surveys and in-depth interviews, local people catch marine products in coastal areas and are greatly affected by the uncertain fishing season. From December to March, the high tide season, also known as the westerly season by the locals, creates conditions that make it difficult to go to sea. From April to July there was a high production of fish and shrimp so that the selling price decreased. Meanwhile, from August to November, the production of fish and shrimp is not too high but the selling price is high. However, when marine fish production is low, people in groups switch to catching snakehead fish in swamps that are starting to dry up.

Table 1 shows the structure of the potential main source of income for the community from the fisheries sector within the Wasur National Park area in Naukenjerai. The data shows that people from the capture fisheries sector come from catching marine fish (fish and shrimp) and freshwater fish (cork fish). The current system of catching snakehead fish by fishermen is more often done in groups of 7 to 9 people using machetes and electric fishing gear, while catching marine fisheries is done individually using nets.

Local fishermen catch fish on the coast at high tide. In this condition, local fishermen catch fish with simple technologies, namely using fishing rods. This condition has an impact on the income of local fisher families and affects livelihoods as fishers who continue looking for fish with uncertain fish catches and sometimes the catch is only enough for family consumption. However, it is different from non-local communities. Under the same conditions, non-local communities cultivate agricultural land to grow rice and vegetables. These inmigrant communities are bringing in their own farm cultivation skills before moving to Naukenjerai.

This study also found that within one year the community could not rely on fishery products for their family's source of livelihood. This is because the production of fish and shrimp throughout the year is influenced by the seasons and erratic climatic changes so that the number of fish catches is unstable. Table 1 shows that April to July is a high fish production season with an average fisher income of IDR 1,650,000/month, and for shrimp yields can fetch IDR 4,541,667/month. Meanwhile, from August to November the production of fish and shrimp was low so that the income of fishermen decreased with an average income from marine fish of IDR 404,000/month, and shrimp income of IDR 845,833/month. Potential income from the inland fishery sector that

supports the economy of the families living in Naukenjerai, namely snakehead fish catchers in October and November when the swamp water dries up results in an average potential family income of IDR 6,637,037/month and IDR 3,133,333/month when production is low.

In 1 year, the total income of fishers who live in coastal areas within the Wasur National Park area is IDR 49,306,740 with a total cost incurred by fishermen of IDRR 1,063,333, so that the total income of fishermen is obtained from a reduction in the number of income is reduced by the total cost of IDR 3,045,562/month/year. The current level of fisher income cannot guarantee the welfare of the fishing community, both local and non-local fishermen. The living cost of the community's household, both local and non-local per day is IDR 100,000 only for household consumption. This community expenditure does not include other expenses such as house repairs, education, health, and other family needs such as savings. If the community is going to meet the needs of life in Naukenjerai, in a month the household expenditure that must be met is ± IDR 4,000,000 / month. To meet the unmet needs of fishermen's families, some local people do illegal sand mining or work as laborers in sand trucks. As for non-local people, they farm by planting rice and vegetables. The increasing level of family needs and the limited skills of local communities have resulted in local people who have customary rights to illegally mine sand or become sand transporters to meet the economic needs of their families which cannot be fully met from being fishermen.

Table 1. Potential income of fishermen in one year in Naukenjerai District, Papua

No.	Variable	Season Period	Potential revenue/month (IDR)	Potential revenue/season (IDR)
1	Sea food			
	a High Production	April-July	1,650,000	6,600,000
	b Low Production	August-November	404,000	1,616,000
	c Total Revenue		2,054,000	8,216,000
2	Shrimp			
	a High Production	April-July	4,541,667	18,166,668
	b Low Production	August-November	845,833	3,383,332
	c Total Revenue		5,387,500	21,550,000
3	Snakehead fish			
	a High Production	October-November	6,637,037	13,274,074
	b Low Production	August-September	3,133,333	6,266,666
	c Total Revenue		9,770,370	19,540,740
4	Revenue/year			
	a High production (1a + 2a + 3a)		12,828,704	38,040,742
	b Low production (1b + 2b + 3b)		4,383,166	11,265,998
	c Total Revenue		17,211,870	49,306,740
5	Average revenue/month [(4a + 4b/12)]			4,108,895
6	Cost			
	a Variable cost (IDR)			766,667
	b Fixed cost (IDR)			296,667
	c Total cost (IDR)			1,063,333
7	Income/month (5 - 6c)			3,045,562

[Source: Processed Primary Data, 2021]

The fish caught are sold to collectors in the village or who come directly to the district capital to purchase fresh fish. Efforts to increase the capacity of fishermen, especially housewives, have been carried out by the local government to process fish catches into various products so that the selling value of the product increases and creates a source of new livelihood revenue streams for the community in Naukenjerai. However, the program did not run well. Based on information from respondents and key informants, the capacity building program has not been accompanied by continuous assistance until the community can access the market. The low knowledge of human resources, especially the ability to market processed products plus the competitiveness of products with similar products, is also one of the causes of failure of the program.

Government programs that have been implemented in the fisheries sector are listed as follows. First, the formation of fishery processing groups included housewives with 5 members per group. This program aimed to improve the skills of housewives in processing fishery products for sale to increase family sources of livelihoods. In this program, each group is given initial capital assistance, fishery processing equipment assistance, and fish processing structures. After participating in this program, housewives who are included in the target group developed skills in processing fishery products into shrimp and fish paste, fish balls, and salted fish.

A second program provided tools and machine assistance for catching fish for fishers. This program aims to increase catches among fishers. This program is prioritized for local fishers who have limited economic opportunities in procuring fishing gear independently. Fishing gear assistance that has been provided to local fishermen includes boats and fishing machines and nets. Boat and engine assistance is provided in groups, but nets are given in turn so that all fishermen can be served. Currently, there are village funds that have been allocated specifically for the purchase of nets intended for fishermen in stages.

A third program includes training for maintenance and repair of fishing gear. This program aims to improve community skills in overall maintenance, such as maintenance of boat nets and engines. The implementation of these programs does not run well, as the people who are included in the target groups generally already have the skills according to the program objectives. However, several factors caused the program not to provide sustainable economic benefits for the community, namely conflicts between members of the assisted group. Disagreements in the management of facilities or equipment assistance provided to the groups caused larger conflicts. The conflict causes the objectives of the activity program to be unsustainable and people returned to their previous livelihood patterns. To resolve the prolonged conflict, group members sold fishing gear to non-local fishermen and the proceeds from the sale were shared equally among group members. This also happened to the fish processing group. Processing equipment would only be distributed to each member and processing activities do not run continuously. In addition, efforts to increase the production of capture fishermen are not accompanied by good market availability and road access. When the fishermen's production is abundant, the fishermen will only sell their catch to collectors in the village or to those that come directly from the regency/city. With the limited capacity of fish storage, sometimes there is a game-over price of fish so that fishermen do not get a good economic benefit when fish production is high. The road access to the main market is in a damaged condition, so that only special transportation can reach the road to Naukenjerai. In addition, the ability to sell processed products from the community is still low. Increasing the capacity of the housewife-assisted group to process fish is not accompanied by the ability to sell processed products. This is the

cause of motivation for the community to maintain the sustainability of production to decline. Finally, program activities are not implemented in a sustainable manner. The community needs to be accompanied for a long time to be able to make the community independent and be able to run a system that is introduced to become a new culture for them and become a part of life that can continuously provide better economic and social benefits.

3.3 Farmers

Agriculture is one of the key sources of livelihood for people living in the coastal area of Wasur National Park. Agricultural activities in Naukenjerai are occupied by local and non-local people. However, in practice, farming activities are dominated by non-local people with skills in rice cultivation, vegetables and other secondary crop production. Non-local community agricultural products other than for household consumption are also sold as a source of family income. Meanwhile, the agricultural activities of the local community are more than dominated by gardening activities on narrow land with traditional cultivation skills. Agricultural commodities that are local to the community include tubers and bananas. These are cultivated for the main purpose of family consumption. In 2015, the local government through village funds began to develop programs to increase the capacity of local communities in terms of cultivating rice and other commodities that have higher economic value to increase local income. The program objectives included programs for land preparation methods, seed selection, planting, maintenance and harvesting of rice for local communities. This effort has not been well run, however, because local people, namely the Kanume and Malind tribes, are not only fishermen, but also garden and hunt in the forest. The cultural background and patterns of local communities that are still traditional are the objectives of government programs to increase family income so that the level of community welfare can increase. Efforts to use land in an area that is included in a special zone for agricultural land are currently still in the designated area and under the supervision of the Wasur National Park Office so as not to threaten the ecosystem in the area. The agricultural land in Onggaya Village, Naukenjerai District within the Wasur National Park is shown in Figure 3.

Figure 4. Condition of paddy fields and gardens of the Naukenjerai community, Merauke-Papua within the Wasur National Park area.

Non-local farmers are more consistent with cultivation and are more accustomed to generating products for sale as a source of family economic income. The people of Naukenjerai, both local and non-local, do rice farming during the rainy season which starts from December to April. The area of agricultural land in 2019 in Naukenjerai District is 1,455.95 hectares which is designated for rice, mung bean, sweet potato, and

cassava. Meanwhile, the harvested area is only 398 hectares (BPS, 2021). The area of rice farming land for non-local communities is at least 1 hectare per family, and some even have up to 3 hectares of rice fields. The local communities generally prefer cultivating tubers, bananas, taro, limes, and chilies. As for non-local communities, the commodities cultivated in the gardens or fields are more diverse, such as corn, bananas, peanuts, green beans, chilies, cassava, and sweet potatoes. The condition of the rice fields and gardens of the Naukenjerai community is depicted in Figure 4.

Agricultural development in Naukenjerai has been supported by agricultural machinery, such as hand tractors, mini tractors, rice thresher machines, water pumps. These agricultural tools and machines are mostly government assistance programs for local and non-local community farmer groups which are expected to help the community to carry out their work on agricultural land.

3.4 Sand mining

Sand mining in Naekenjerai has attracted the attention of various parties, both the government and the private sector, because mining activities have occurred in the Wasur National Park area, which has been going on since 2002 and is increasingly difficult to stop. One of the areas in Naukenjerai that is still actively mining for sand is Kuler Village. One of the reasons people do this activity is because mining for sand can make quick money. From 2014 to 2017, 1 truck or the equivalent of 3 cubic feet of sand was sold at a price of Rp. 200,000/truck. In 2018 until now the price is Rp. 300,000/truck. Based on the results of an in-depth interview with the Kuler Village Head, it was stated that in 2014 in 1 day there were 50 trucks with 3 transportations/day or equivalent to 450 cubic/day out of Naukenjerai sub-district. In 2018, in 1 day the number of trucks carrying sand was reduced to 20 trucks/day so that in a day the amount of sand mined was 180 cubic meters. The high use of sand as a building material is one of the factors that makes sand mining in this area difficult to stop.

Efforts to stop sand mining in Naukenjerai District have been carried out by village and local governments, but so far have not been fully successful. One of these villages is Onggaya village. In the past the community also carried out sand mining but with the preparation of village regulation documents supported by experts that helped regulate community activities in utilizing natural resources. The efforts made in Onggaya Village succeeded in stopping the community from mining sand in their area.

The village whose community is still actively mining illegal sand is Kampung Kuler. Various approaches have been taken to stop illegal sand mining. For example, a dialogue was held with the community which was attended by representatives of the Regional People's Representative Council (DPRD), academics, representatives of the Wasur District National Park Office, representatives of non-governmental organizations, traditional institutions and local local governments to make an agreement to stop mining activities. Agreement was reached for some time. However, according to the Kuler Village Head, this did not last long. The community returned to illegally mining sand because there is no alternative source of income during the low fish and shrimp production seasons. Sand mining is a source of income that is considered by the community to quickly make money and can meet the needs of their families that cannot be postponed. Sand excavation during the rainy season is carried out on community yards because the road to the coast or beach is damaged. In summer, people dig sand on the beach. One example of sand mining activities carried out by the community in the yard and the coast can be seen in Figure 5.

Figure 5. Sand mining activities in Naukejerai District

The impact of sand mining in the Wasur National Park area is beach abrasion. The main road is badly damaged. The level of beach abrasion in coastal areas is concerned if there is no real action to stop illegal sand mining activities. Based on information in the field, currently the abrasion has reached 3 meters per year. Abrasion has damaged mangrove forests and eroded parts of roads at key junctures. The damage to the main road that connects the district city to Naukenjerai and the connecting village roads is impacted by trucks carrying sand every day and has disrupted the economic mobility of the community and caused transportation costs to increase. Main road conditions and abrasion are depicted in Figures 6 and 7.

Figure 6. Condition of part of the road and sand transporting activities from Naukenjerai District

Figure 7. The conditions of abrasion in the coastal area of Naukejerai District

4. DISCUSSION

The interaction of local and non-local communities in the national park area in Naukenjerai is a dynamic process. So far, what is meant by welfare for the local community is when they are able to meet their consumption needs. This is shaped by the abundance of natural resources such as fish, meat, sago, requiring limited effort to

cultivate or without having to buy. However, this is different from the definition of welfare for migrant communities in the area. They (non-local people) come and become residents in Naukenjerai with the aim of improving their welfare, so they work cultivating land and utilizing natural resources to become a source of livelihood for families with skills as fishermen and farmers that match government assistance programs. The transformation of knowledge and culture encouraged changes in livelihoods of some local communities from collectors to farmers and sand miners to achieve the same targets of welfare. In addition, it also brings changes in fishing technology, such as cork fishing technology that uses electric shocks and the transformation of agricultural technology in the form of using agricultural machinery. The phenomenon that occurs in the Naukenjerai community can lead to increased knowledge and information that leads to wealth productivity and economic transformation that encourages the growth of innovation. However, social and technological transformation has not guaranteed the sustainability of the livelihoods of coastal communities in Naukenjerai, and technological innovations have had uneven benefits to household welfare (Fatchiya et al., 2016). To achieve this, a participatory, comprehensive, and flexible approach is needed in preparing coastal communities included in protected areas to be more adaptive and increase community resilience in facing future environmental change scenarios (Ferro-Azcona et al., 2019; Nikijuluw, 2001; Rahail et al., 2019). Agricultural development in protected areas can be done with different and more sustainable approaches to livelihood and commodity development based on the potential of each area (Untari et al., 2019; Untari & Herdjiono, 2019). This would help to reduce community dependence on natural resources to meet family needs. In particular, greater efforts should be made to address the overexploitation of coastal resources by digging sand that enters the national park illegally.

Increasing local capacity also occurs naturally with the formation of social networks between communities. Local and non-local community communication forms new social network, which can lead to knowledge exchange, leading to innovation and new technologies (Cofré-Bravo et al., 2019; Wood et al., 2014). Based on in-depth interviews with local governments and local communities, the capacity building program for coastal communities has not been implemented intensively and sustainably. This is due to limited human resources, limited funding, the large coastal area in Merauke which affects local government performance, challenges in focusing on one area, and there is no activity monitoring system. Support programs require regular and frequent training and group discussion programs, quality assistance and capital loan support for fishermen in developing businesses, and various others (Khuman & Singh, 2019), moreover bonding, bridging and linking social capital plays a vital role in a livelihood system, within which the access to livelihood assets depend on social relations (Salman et al., 2021). When done correctly, assistance programs with the right institutional structure can support the formation or change of existing local institutions to maximize wealth, income, and goals (North, 1991).

Law enforcement in protected state forest areas such as the Wasur National Park area, especially the misuse of community use zones, needs to be enforced in creative ways. This is to prevent forest degradation, but must be seen in the context of potential impacts on declining community income (Jagger et al., 2014). A fundamental element in the transition of status from customary forests into protected areas is that it must be able to protect the tenure rights of Indigenous Peoples from outside influences, especially migrants (Travers et al., 2015). In addition, communities in more diverse forest areas have higher cultural capital to survive in their ecological environments

(Turner, N. J. et al., 2003). The relationship between humans and the environment to meet community needs and ecological sustainability needs to be built to suppress disturbances and pressures inside and outside the system (Turner, B. L. et al., 2003). In addition, the concept of resilience-capacity to sustain change, learn, and develop provides a framework for understanding how to maintain and enhance the adaptive capacity of complex communities undergoing rapid transformations (Folke et al., 2002)

Program connectivity between agencies in local government and development programs needed by local communities to overcome poverty has not yet come together in strategic ways. Formal institutions in the village can increase the role of the community in a sustainable manner and can form a partnership between the community and the government in program implementation (Islam & Nursey-Bray, 2017; Batiran et al., 2021) or can help in strengthening existing local institutions (Pratiwi, 2016). One of the institutions that can be formed arefisher cooperatives or farmer cooperatives (Indarti, 2015). Currently local institutions in the Naukenejrai community such as Village-Owned Enterprises and fishery product processing groups directly by the local village government have not been able to produce new sources of sustainable livelihoods for the community but currently there are efforts to strengthen these local organizations.

5. CONCLUSIONS

In our study, we found that in the research area, community livelihoods in the Wasur national park area rely on natural resources and have deviated from the spatial use zone in the area, such as land buying and selling activities and illegal sand mining by the community. So that the results of our study can be used as material for evaluating the management of Wasur National Park as the largest Ramsar site area in the world, it can be maintained while prioritizing the rights of the community to live in the area. In the future, it is hoped that there will be a study on the socio-economic elements of the community to ensure the welfare of the people living in the Wasur National Park area as a protected area.

The community's sources of livelihood from fishing and farming have not provided sufficient and sustainable economic benefits for the people living in the Wasur National Park area. Working as fishers and farmers are influenced by seasons with uncertain income. The income from fishing and farming is only sufficient to meet subsistence needs. Sand excavation as an alternative source of income is carried out intensively and disrupts the ecology of the coastal area of Wasur National Park, resulting in significant coastal abrasion. There are people who buy and sell land in protected areas without any law enforcement of area protection against these activities. Weak law enforcement and program activities that have not been integrated between institutions and are not sustainable have caused the community's source of livelihood in the national park area to remain stagnant. For this reason, we suggest any law enforcement initiatives work to and improve the lives and livelihoods of communities in the Wasur national park. This is especially important as part of the larger goals to reduce the rate of deforestation and land degradation in the Wasur national park area. The guarantee and sustainability of community livelihood sources in the area will realize sustainable natural resource management.

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manuscript. P. Betaubun, A. Andi Arief, and L. Fudjaja provided vauable inputs for the formulation of research design, including interpreted the collected data and editing manuscript.

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