

## **<sup>1</sup>Challenges in Developing Ecotourism in The Region of Lake Sentani Papua**

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### **ARTICLE INFO**

Received  
28 November 2016  
Accepted  
15 March 2017  
Available online  
31 March 2017

### **ABSTRACT**

The concept of community-based ecotourism is one of the sustainable development concepts suitable to be applied to traditional regions with nature tourism potential. Differences in culture between traditional communities and the outside world are not an obstacle in developing the region because with their local wisdom traditional communities can participate in protecting and managing their natural surrounding and at the same time become an attraction for other communities. However, outside societies can influence the culture of the traditional communities that originally tends to be oriented on biocentrism to shift towards anthropocentrism. This can eventually hamper the continuity of ecotourism development. This can be seen from the traditional communities at Lake Sentani, the case study of the author. The study is based on literature and secondary data and used descriptive analysis. The traditional communities of Sentani do not yet fully participate in the development of tourism in its surroundings. Their involvement in tourism development is more focused on ceremonial activities such as can be seen at the Lake Sentani Festival which is organized every year by the government. Besides this, after coming into contact with modern life the traditional communities of Lake Sentani rarely perform their daily activities based on local wisdom aimed at natural conservation of the lake. The development of urban areas in the surroundings also influences changes in land use in the Lake Sentani region which then causes among others erosion, sedimentation, and pollution of the lake water. Socio-economic and cultural changes in the traditional communities of Sentani and the growth of development also contribute towards ecological change in the area of Lake Sentani, the place they live in.

Keywords: ecotourism, traditional communities, cultural change

### **Introduction**

#### **Background**

Lake Sentani is one of the tourist destinations in Jayapura Regency, Papua that has natural (landscape) attraction, and where

still many indigenous people can be found living. The life of the indigenous inhabitants of Papua consisting of about 250 ethnicities still depends on nature (forest, rivers, sea, etc.). With the enactment of special autonomy in Papua, traditional villages where indigenous communities of Papua live, are given greater authority to regulate their own government according to their customs, this includes the villages in the Sentani Lake region. However,

<sup>1</sup>The article had been presented in The International Tourism Conference "Promoting Cultural & Heritage Tourism" at Udayana University, 1-3 September 2016.

tourism management is still largely regulated and managed by local governments and the private sector, especially in constructing physical facilities to support tourism, which usually requires substantial funding.

One type of tourism program that is more easily adopted by traditional communities is ecotourism. Local residents are encouraged to use their culture in the natural conservation of their surroundings, which at the same time forms an attraction for tourists. The uniqueness of each regional culture is expected to attract tourists from outside the region. There are 12 elements of culture that attract tourists' attention namely: the tradition of community life that is still close to nature; crafts; food and eating habits; music and art; history of a place; work methods and technology; religion expressed in stories or which can be observed; the dressing habits; educational system; and leisure time activities (Simatupang, 2015). But how long can a tourism region with ecotourism based on empowerment of traditional communities survive? Can the culture of traditional communities survive or will it experience a change in meanings and values resulting from outside influences?

### Research Objective

Research was designed to examine challenges in Developing Ecotourism in The Region of Lake Sentani Papua

### Literature review

#### Community-Based Ecotourism

Ecotourism is tourism based on nature while incorporating aspects of education and interpretation of the natural environment and local culture with ecological conservation (Tuwo, 2011, p.28). Development of tourism regions of this type does not need a large budget because nature is the tourist attraction which is already available by itself. These tourism activities aim at enjoying the beauty of nature, serving as a means of education, understanding and supporting conservation as well as increasing the income of local communities. The following table shows the criteria that an ecotourism region needs to possess.

Development of ecotourism in Indonesia involves many parties, namely: the government in a role as regulator and planner; the private sector as developer; NGOs in a role of among others as donor and by providing expertise; and local communities that gain work opportunities and a better life. Community-based ecotourism involves the development of local communities' social, environmental and economic needs through providing tourism services and products. In fact, the element of community involvement is already stressed in the concept of developing ecotourism and this is further emphasized in community-based ecotourism.

Table 1. Criteria for Ecotourism Region

Main Criteria	Additional Criteria
- Wonders and beauty of nature (topography)*	- Not too far from the airport or seaport
- Diversity of flora*	- Acceptable duration and
- Diversity of fauna*	comfort of travel
- Ease to observe wildlife *	- Availability of other natural
- Availability of accurate information about vegetation	attractions in the ecotourism region
- Availability of unspoiled ecosystems	- Heritage sites or historical remnants
- Opportunities to swim (waterfalls, lakes, beaches)	- Local culture
- Uniqueness of the object	- Availability or possibility to develop accommodation that meets hygienic standards
- Opportunities for cross-country (trekking, rafting, snorkeling, etc.)	- Availability of practical and hygienic food
- Megalithic objects	- Assurance of safety for tourists
- Comfortable temperature and humidity	- Availability of medical assistance and care
- Average rainfall	

Note: \* Absolute criteria

Source: Steck, et.al.1999, in Damanik & Weber, 2006.

The fact that local communities not only play a role as an object but also as a subject or actors of development is a development concept that is based on empowerment of communities in ecotourism programs. This concept is more appropriate when applied to developing small-scale ecotourism in rural areas, run by local communities using traditional technology and equipped with basic amenities. Meanwhile, at a larger scale, it is more fitting to be run by the private sector using more advanced techniques, of course while still doing social and environmental preservation (Nirwandar, 2016).

This development concept is considered appropriate when applied to traditional communities in Papua who live in areas with natural beauty that can be used as a tourism destination. Since the enactment of special autonomy and the start of regulations on villages, traditional villages in Papua are given the authority to regulate the government in their villages according to provisions of the customs they hold. The difference in culture between traditional communities and modern societies does not hamper the implementation of these development concepts in traditional villages because the communities' local wisdom is needed to preserve the natural environment and to become an attraction for tourists due to their unique characteristics. While still practicing their culture, traditional communities are involved in managing natural resources or in development activities in the village. However, communities like this cannot be separated from the influence of modern societies, especially since the era of globalization, which makes it impossible to avoid changes in their indigenous culture. The construction of services and physical infrastructure to support modern life are some of the things that influence changes in the lifestyle of traditional communities.

The development of tourism, in general, is directed at fulfilling the modern needs of the majority of tourists, even in ecotourism regions. This is because basic needs such as the provision of road infrastructure are an absolute necessity for a region with tourism objects regardless the type of tourism. Sociologically speaking, tourists can be categorized based on specific

phenomena, motivation and the way they travel and therefore can be divided into two major groups: package tourists and independent tourists. Package tourist is related to the modern needs so that direction of development follows the pattern found in developed countries, while independent tourist is directed more towards the local environment. So far only a very small group of independent tourists visits Indonesia (Tuwo, 2011, p.34-35). Ecosystem destruction is not uncommon in tourism areas in order to meet these modern needs. Clearing forests or changing land use is done to fulfill the need for space to build these modern facilities. Managers of tourism, be it elements of business, government or even traditional communities, in the end, cannot avoid this from happening for the sake of supporting the progress of tourism in the region. However what needs to be considered in developing ecotourism regions is that all efforts of development, including the construction of facilities and utilities, still have to be in harmony with nature because disharmony with nature can destroy the product of ecotourism itself. Additionally, restrictions on demand are also necessary because generally the carrying capacity of natural ecosystems is lower than that of manmade ecosystems (Tuwo, 2011, p. 32). In addition to ecological carrying capacity, it is also necessary to consider the social, cultural and economic carrying capacity. An ecotourism project can be considered harmonious with social, cultural, economical and ecological carrying capacity if the project does not have the potential to cause degradation to the quality of life of the surrounding community, both in the long-term as well as short-term (Damanik & Weber, 2006, p.55).

### **Traditional Communities**

Based on their characteristics, traditional communities can be divided into four groups, namely (AMAN, in Ministry of National Development Planning / BAPPENAS, 2013, p. 8-9):

1. 'Kanekes' traditional community type in Banten and 'Kajang' or 'To Kajang' (Kajang Dalam) in the regency of Bulukumba South Sulawesi, who place

- themselves as 'Pertapa Bumi' (Earth Ascetic). They believe that they are a 'chosen' community that was given the task to preserve the conservation of the earth by prayer and an ascetic lifestyle.
2. 'Kasepuhan Banten Kidul' and 'Suku Naga' traditional community types that can be found in West Java. These communities are fundamentally quite strict in maintaining and applying their traditions and customs but are still open to having commercial relations with the outside world.
  3. Traditional community types whose lives are reliant on nature (forests, rivers, sea, etc.). They developed a unique system of natural resource management but did not develop strict traditions for housing or choice of crops compared to the traditional communities of Kanekes, To Kajang, or Kasepuhan. Examples of these communities are the traditional communities of Dayak and Penan in Kalimantan, Pakava and Lindu in Central Sulawesi, and Dani and Dafonsoro in Papua.
  4. Traditional community types that have already been 'uprooted' from their 'indigenous' system of natural resource management as a result of colonization that evolved over hundreds of years. This category includes the traditional communities of Melayu Deli that live in the area of tobacco plantations in North Sumatra and Betawi in Jabodetabek.

The first three types of communities form are called '*masyarakat hukum adat*' (customary law community) according to the Law Number 41 Year 1999 about Forestry because they meet the following elements: (a) the community still lives in the form of societal group (*rechts-gemeenschap*); (b) there are institutions in the form of customary authorities; (c) there is a clear area of traditional law; (d) there are institutions and a legal apparatus, particularly in traditional justice, which is still adhered to; (e) they still harvest forest products in the surrounding

forest area to meet the needs of daily life (Ministry of National Development Planning / BAPPENAS, 2013, p.9).

Large cultural change in the fourth group of communities causes a loss of strong social-cultural ties within the community and no demands are made anymore to undertake traditional rituals. This has changed the natural environment where the communities lived into a manmade environment and from an economical perspective has changed the pattern of community subsistence lifestyle to become one of capitalistic individuals. There has been a shift from biocentrism towards anthropocentrism in traditional communities in an effort to use natural resources and this keeps shifting further in the fourth group of communities mentioned above. Anthropocentrism considers humans and their interests to be most decisive in structuring ecosystems and nature as a tool for human interests. Meanwhile, biocentrism considers that nature has intrinsic value which is apart from human interest and that life in the universe has to be respected like humans respect the social system in their life (Susilo, 2012). In today's terms, people who embrace biocentrism can also be referred to as ecology-minded communities.

Cultural lag theory states that the most apparent cultural lag in human's life is a lag in thought with very rapid technological development, which generally occurs in traditional communities that are developing (Ogburn, in Lauer, 2003). Some experts claim that there are differences in characteristics between traditional and modern communities and that there are phases of change of economic structure that traditional communities have to go through to become modern communities (Parson, 1951, Rostow, 1960, in Amien, 2005). Meanwhile, other experts claim that characteristics of traditional communities can also be found in modern communities in various advanced countries and that to become a modern society they do not always need to go through all phases of economic structural change (Frank, 1969, Gerschenkron, 1962, in Amien, 2005). Based on the development, other experts claim that modernization is the rationalization of social behaviors and social organization. Modernization is the development of the ability to apply knowledge that has been tested

in all branches of production and they interpret modernity as a socio-cultural and psychological framework and that supports the application of science in the production process (Moore, 1977, Hettne, 1990, in Amien, 2005). Thus a community that carries out traditional rituals in their daily life can be categorized as a modern society as long as there are scientific explanations for any such action (rationalization).

The concept of ethnodevelopment involves making indigenous people become more resilient towards communities in their surroundings that are more dominant through programs that pay attention to their culture and that produce a level of economic, social and political autonomy, making the community able to work based on their own levels of adaptation, forming their own social, cultural and economic synthesis (Talalla, 1984, in Amien, 2005) since basically traditional communities in many countries have been living in harmony with the natural surroundings and have ecological values and the ability to meet basic human needs through social, economic and political structures that are essentially community-based (Ife and Tesoriero, 2008). The concept of traditional community-based ecotourism can be categorized into the above-mentioned concept.

## **Results and Discussion**

### **Traditional Papuan Communities**

Unlike other regions in Indonesia, Papua did not experience long-term colonization by the Dutch and has not yet experienced much social and cultural change. Papua formally became part of the Unitary State of the Republic of Indonesia (NKRI) after the PEPERA referendum in Papua in 1969, which stated that Papua will follow NKRI. The central government then implemented various development programs in Papua. After the enactment of special autonomy in the province of Papua in 2001 traditional communities have greater authority in developing their villages. Full decentralization as received by the Papua government created traditional community democracy through the establishment of the Papua People's Assembly. Further, the recognition of customary law in Papua

supports the implementation of development based on empowerment of traditional communities (ethnodevelopment).

Several cultural aspects of traditional communities in Papua have survived while other cultural aspects have changed as an unavoidable result of development. An example of a cultural aspect that has survived is *Sasi*. This is a ritual of indigenous communities living in the coastal areas of Papua, which involves regulations that prohibit taking high-value marine products such as mussels, snails, sea cucumbers, lobster, certain fish species and other marine products for an agreed period. After a certain time period, deliberations will decide if these marine products can be caught again and whether or not the sea life that will be caught is of a certain size (large enough). If this custom is violated the perpetrator will be subjected to customary sanctions, will be banished and it is believed he will be judged by nature. While it is possible that traditional communities undertake these rituals to ensure their own food supply of marine products and do not understand that this is marine science, they actually embrace a biocentrism understanding of awareness that their lives depend on marine products. What these traditional communities do can be explained scientifically as efforts to safeguard the energy metabolism in nature and maintain the food chain cycle within an ecosystem that humans are part of. If this ritual is carried out continuously without outside interference they will continue to catch enough for the season because the marine resources will be maintained. By doing this the members of the traditional communities have economic sufficiency. Indirectly they are aware that they are part of a system of life of which its sustainability will depend on the interaction between agents or any member within the system.

However, other cultural aspects change due to outside influences. Changing cultural aspects in traditional communities in Papua can be seen from lifestyle changes of villages in the interior of Papua of which the majority are traditional communities. The results of a study by NGOs sponsored by the UNDP in 2005 showed that residents from villages far from service centers (urban areas)

in general earn their livelihood by farming, hunting or by gathering forest products. They have a subsistence lifestyle and are still heavily dependent on natural resources while residents of villages close to urban areas are less dependent on nature as a result from resources becoming scarcely available. They have more varied livelihoods, for example working as a retailer, civil servant, or employee at a company, leaving behind their tradition. Often conflicts that occur over indigenous land are also a result of increasing scarcity of resources as a result of nearby urban development.

Although traditional communities control all natural resources in their traditional region, particularly in villages far from urban areas, their position in economic activities tends to be weak as a result of them not knowing the market price of the natural commodities they take from the forest and due to the low accessibility between villages and towns which is used by traders to keep the selling price of their commodities low. In addition to this, traditional communities tend to spend all of their income from the sale of their natural resources without saving. This leads to them increasingly exploiting their natural resources when they need money.

A subsistence lifestyle of traditional communities who use natural products to fulfill their basic needs is, in fact, a form of local wisdom that preserves their natural environment. However, outside influences then make them change their patterns of using natural resources to fulfill not only their basic needs but also other needs. Exploitation of nature increases as a result of maintaining a subsistence lifestyle attitude towards money (finishing it in a flash without saving) which is considered as a natural resource (that needs to be used so it will not spoil).

### **Lake Sentani region**

The Lake Sentani region is located between Jayapura City, the capital of Papua Province and Sentani City, the capital of Jayapura Regency and is found on the main road that connects the provincial capital with the main airport of Papua, Sentani Airport. The lake is located at the bottom of the slope of the Cyclops Mountain Strict Nature

Reserve. It contains about 14 rivers and has an area of approximately 9.360 hectares and an altitude of 75 meters above sea level and there are 21 small islands in the middle of the lake. Lake Sentani is the largest lake in Papua that has natural beauty. The lake also has a diversity of flora and fauna with several animal species endemic to Lake Sentani namely the Sentani gudgeon (*Oxyeleotris heterodon*), Sentani rainbowfish (*Chilatherina sentaniensis*), red rainbowfish (*Glossolepis incisus*), and largemouth sawfish (*Pristis microdon*). The largemouth sawfish is a unique species because it is a type of fresh water shark (LIPI, n.d.).

Lake Sentani was introduced as a tourist destination by the Papua government since 2007 when the Lake Sentani Festival was first organized. This festival is usually held in June and lasting a few days, traditional communities demonstrate different types of dances on top of boats sailing on Lake Sentani. The show is centered at the Kalkhote Pier. In addition to dances on the water, handicrafts of traditional communities are exhibited on the pier, among others clay pottery which is handicraft from the people of Kampung Abar and paintings with traditional motifs on white wood from Kampung Asei. The type of tourism promoted is Lake Sentani nature tourism and Sentani traditional community culture tourism. Several criteria for determining an ecotourism region can be found in the Lake Sentani region so it would be appropriate to develop the area into an ecotourism region, in order to achieve sustainable development which of course will be based on empowerment of local communities. The Lake Sentani area accommodates elements of natural beauty (examples are the characteristic Ultra Basik forest and the area of Sereh waterfall in the Cyclops Mountain Strict Nature Reserve); diversity of flora and fauna; opportunities for swimming and cross country; comfortable temperature and humidity for a tropical region; average rainfall; not too far from the Sentani airport; acceptable duration and comfort of travel with the availability of roads and transportation facilities; local culture; cultural/historical heritage sites (the old church from 1950 in Kampung Ifar Gunung, the megalithic Tatuari site in Doyo Baru, and the Mac Arthur Monument in the Ifar Gunung

area); and availability of medical accommodation and care in the nearby urban area (Sentani City and Jayapura City).



Source: Google Maps (2016)

Figure 1. Location Map of Lake Sentani



Source: Tourism Office Jayapura Regency (2014)

Figure 2. The view of Lake Sentani

### Traditional Communities of Lake Sentani

There are about 27 villages in the Lake Sentani region. The indigenous communities of Lake Sentani have specific customs for natural preservation. The highest position in their customary government is held by the *ondofolo* (big chief) who has the function of providing service and protection for his citizens. Broadly speaking some literature mention that there are certain customary rules that the traditional communities have to carry out when planning to go hunting on land (catching wild boar,

moles, lizards, and other forest animals), hunting in the water (fishing) and when taking wood to build houses (Yeny and Alhamid, 2005; Yektiningtyas-Modouw, 2010).

In general, the livelihood of indigenous communities of Sentani consists of processing sago (*Metroxylon sp*), farming, fishing, and hunting. Sago is a food source for the indigenous communities of Papua living in the coastal areas. According to customary tradition, there are clans who are in charge of taking care of sago, which is referred to as *eiyoayo* by the communities. Their task is to regulate the use of sago forests by the communities, give sanctions to the public when they intentionally or unintentionally take sago from another village, carry out sago replanting efforts. Each family can only take sago from specific locations belonging to their clan. Utilization of other areas must be authorized by the *ondofolo* or chief of the tribe (Yektiningtyas-Modouw, 2010, p.47). Sago farmers need approximately two weeks to process one tree trunk of sago the in the traditional way. Sago is then cooked into *papeda* (porridge from sago flour), the primary food source of carbohydrate. In farming the Sentani communities recognize the existence of customary farmland owned by an alliance or *keret* which is managed together. Men play a role in land clearing for farming while women have the task of planting, cultivating and harvesting the yield as well as processing it for family meals. The produce of the first and best harvest they usually present to the *ondofolo*, before then consuming it themselves, and if there is excess produce it will be sold at the market (Yektiningtyas-Modouw, 2010). Catching fish is usually the task of women. In customary tradition, there are certain locations where fish is only used for traditional ceremonies. In the tradition, there is also recognition of a customary caretaker who manages the water and fish, *burefi-karefi*, who has the task of overseeing any fishing activity and has the authority to impose sanctions for fishing activities contaminating the lake and for fishing in improper ways. Just as with farming produce the best catches will be given to the *ondofolo* for the interest of the villagers, particularly the big black catfish (Yektiningtyas- Modouw, 2010).

Hunting is a men's duty. There are certain rituals that have to be performed before hunting starts, such as abstinence from sexual intercourse with their partner for men that will go hunting; no talking to women; not exposed to children's urine; hunting tools cannot be touched by women; and the hunters have to leave early in the morning before everyone else is awake. There are two types of hunting, namely hunting to provide food for the family and hunting for customary purposes (Yektiningtyas-Modouw, 2010).

Local residential settlements in the Lake Sentani region generally consist of stilt houses that stand above the water. Sentani traditional community houses are known by the term gaba-gaba houses. The frame of these houses is made out of wood from the *Xanthostemon sp.* tree and is covered with sago palm leaves for the walls and roof. This wood may only be taken from particular areas of the mountains near the lake or from a certain radius from the top of the mountain. There are specific rituals before using this type of wood as a frame for houses because the wood is considered to contain a spirit (Yeny and Alhamid, 2005).

These customary rituals are actually meant to regulate or restrict human activities in taking resources provided by nature. When all these restrictions are carried out, nature is given the chance to restore itself.

### **Social, Cultural, Economical and Ecological Change in the Lake Sentani region**

The following are some examples of changes happening in the Lake Sentani region according to literature. Although this overview may not be complete, at least some of the following examples can shed light on the influence of modern life for the society of the Sentani traditional communities and the ecological conditions of the Lake Sentani region.

As with other lakes, Lake Sentani has two main functions, namely: ecological (regulator of water management, flood control, wildlife habitat and reservoir for sediments, nutrients, and contaminants) and social, cultural and economical for the Sentani traditional communities (providing necessities

for life for humans). With the progress of developments and impacts from the growth of cities in the surrounding areas, Sentani traditional communities begin to experience social, cultural and economical changes, among others in the types of livelihood, diet, and types of houses inhabited. The previous means of living which consists of appropriating natural produce and is subsistent in nature is beginning to be left behind. Although some work as civil servants, teachers or in other service professions, the majority of the community still earns their livelihood as fishermen, however with more advanced systems and technology, especially in the case of fish farming. One of the advancements in fish farming is the cultivation of several new freshwater fish species such as tilapia, Nile tilapia, common carp and gourami in floating cages. The development of cages is followed by the growth of settlements at the edge of the lake. These activities are performed by indigenous inhabitants as well as migrant groups, causing an increase in pollution, among others in water turbidity and stench (Simbiak, 2005).

Lake Sentani experiences not only an addition of new aquatic animal species but also a decline in the number of aquatic animal species endemic to the lake, with the extinction of the largemouth sawfish. The use of modern fishing equipment is thought to have contributed to its extinction, since the introduction of monofilament gill nets in 1969. The local population does not eat the largemouth sawfish but many were caught in nets and died. The last largemouth sawfish was caught in 1974 and after that, there has been not been any more news about one being caught in Lake Sentani (LIPI, n.d.).

Other changes that are happening relate to local diet. The results of a research by Alhamid in 1994 show that after its introduction to the Sentani communities, rice started to replace the function of sago as a source of the daily food staple. Sago was even harvested and sold at the market so the Sentani communities could buy rice (Yeny & Alhamid, 2005). In his article Arif (2016) states that the change in diet of the Mentawai community, who originally consumed sago and taro and then changed to rice, started to impact badly on the health of the local

community, caused ecological damage and also threatened food security. It is not impossible that this will also happen in the Sentani community.

In Indonesia, Papua is known to have great sago potential and the Sentani region is one of the sago producing regions in Papua. Keeping this in mind and to in an attempt protect the sago forests, Jayapura Regency local government has issued Local Government Regulation Number 3 Year 2000 about Conservation of Sago Forest Areas. Sago from Papua has a higher quality than sago from Malaysia, a country that started cultivating sago earlier. Papuan sago trees can reach 12 meters while sago trees in Malaysia are relatively short. Moreover, one sago tree trunk from Papua can produce 900 kg while one Malaysian sago tree trunk produces 250 kg on average (Omona, 2014; Sutianto, 2014). In addition to a lack of resoluteness of the government in surveillance of sago forests, the event of logging and burning of sago trees in Kampung Asei and Kampung Harapan, Sentani, for the sake of the broadening of the main road in 2012, also did not lead to any significant opposition from local communities, who should feel threatened because the forest used as their local food source was destroyed. This is caused by the change in diet in the Sentani traditional communities mentioned before. Their source of carbohydrates which has been changed with rice can disturb food security, especially if this destruction of sago forest continues because geographically the land in Sentani is less suitable to grow rice so the Sentani communities will be dependent on other rice producing areas to obtain their food staple.

The type of houses inhabited by the local population is also changing. Research by Alhamid in 2001 shows that sago palm leaves houses are being replaced with plank houses. These are more expensive because they are made of a material that needs to be purchased. As a result, each newly formed family cannot immediately build their own house and is forced to still stay with their parents. The density of homes increases because one house can be occupied by more than one family which is expected to influence the quality of social life (Yeny and Alhamid, 2005).

Besides the extinction of the largetooth sawfish, other ecological changes can also be seen in the major land use changes in the Lake Sentani region based on land use in the Sentani watershed in 2007, 2001, 2010 and 2012. Forest and swamp area continues to decrease and is replaced with build up land, savanna bush and vacant land (Fauzi, Rispingtati, & Hendrawan, 2014, p. 47).

Table 2. Land Area of Sentani Watershed According to its Function

Land Use	Land Area (Ha)			Explanation
	2007	2010	2012	
Forest	35.587,070	33.895,525	32.209,980	Decrease
Building	1.755,480	1.849,435	1.943,390	Increase
Savanna bush	14.469,280	16.163,850	17.858,420	Increase
Vacant land	5.187,470	5.315,231	5.442,992	Increase
Swamp/ponds	1.224,592	999,851	775,110	Decrease

Source: Fauzi, et al, 2014

These changes in land use generally are meant to accommodate human activities which increases a lot in the area, in the form of agricultural activities, mining, building of settlements (among others to meet the housing needs of residents of Jayapura City), as well as trading and service activities such as: stores, hotels, and restaurants, which eventually gives impacts in among others: erosion, landslides, and water pollution in the lake. Analysis of water quality in several sampling locations shows that Lake Sentani is mildly, moderately and severely polluted (LIPI, n.d.).

One of the human activities that damages forests and causes landslides and erosion is the clearing of farmland in the mountainous areas around the lake which is generally done by the Papua population from Dani ethnicity (originating from outside Jayapura Regency). The indigenous Sentani population already does not rely on farming as a livelihood and they themselves do not enter the mountain areas at a certain radius from the top of the mountain because in their belief that is their sacred ancestors' residence (Yeny and Alhamid, 2005).

In addition to migrants, the Sentani traditional community also contributes in changes to land use in the area. Mining efforts to meet the needs for raw construction materials in developments which are done by locals also influences the morphology of the area (the bottom of the slopes of the mountain), causing erosion on the slopes and ultimately increasing sedimentation in Lake Sentani. Other activities include the making of traditional paintings on bark. The production of these bark paintings increased after the Lake Sentani Festival was organized and is expected to cause damage to trees because their bark is taken. When this is done continuously without paying attention to the ability of the forest to restore itself this will cause damage to the forest (Yeny and Alhamid, 2005).

### Conclusion

External influences are clearly evident in social, cultural and economic changes in traditional communities and in ecological changes in the region of Lake Sentani. The use of more modern fishing gear led to the extinction of the largetooth sawfish, and the increased sedimentation and water pollution due to human activity can disrupt the function of the lake among others as wildlife habitat, water resource and in flood control. This it is a challenge for the development of traditional community-based ecotourism in Lake Sentani.

Traditional communities need to learn to understand the scientific reasons behind all their culture or traditional rituals that they have carried out. In this way, they can reject any outside influences that will negatively impact on their lives later on. In addition to building a critical awareness of traditional communities, another thing that needs to be taken into consideration is to build a *biocentrism* understanding in communities outside of them, be it migrant groups, elements of government, or the private sector. Social, cultural and economic changes in traditional communities of Sentani due to developments are estimated to have taken place for 47 years (starting from 1969 when Papua officially became part of the Unitary State of the Republic of Indonesia (NKRI) after the PEPERA referendum). However, changes in the physical function of the lake region are

clearly evident in a fairly short period of time (since 2007 when the Lake Sentani Festival was proclaimed by the government). Other parties outside the traditional communities of Sentani play a substantial role in these changes. In the attempt to carry out customs to maintain the sustainability of natural resources, traditional communities cannot be separated from outside influences. Therefore, this means that a lack of agreement regarding nature management could give way to outside cultural influences which in general are more excessive in exploiting nature as a result of a capitalist way of thinking, substituting traditional communities' local wisdom which has always been good.

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