

# ADAPTATION STRATEGY OF ASIENARA TRIBE TOWARD CLIMATE CHANGE IN BURUWAY DISTRICT, KAIMANA REGENCY, WEST PAPUA, INDONESIA

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## ABSTRACT

*This study aims to reveal the adaptation strategy of Asienara's tribal community to climate change. Method used in this research is a descriptive method. Data and information of respondents obtained in participatory manner using open-interview, semi-structured and in-depth interview techniques, focus group discussion (FGD), participatory observation and documentation. Data analysis was carried out using a qualitative descriptive approach with an emic-ethical perspective. Results of this study showed that East season is an extreme climate change phenomenon in the territory of the Asienara tribe. To deal with this extreme East season, adaptation strategy used by Asienarans was to divert their fisheries activity to farming, hunting and gathering activities. This occupational diversion during extreme climate showed that Asienarans did not have adequate tools for fisheries in order to survive during East season. Practical and integrated community empowerment program with the local culture and natural resources was necessary to improve Asienaran's ability in responding to the local climate season. This study showed that local climate change or particularly East season in this area has a tremendous impact toward the lives of Asienarans. Abundance in natural resources has become the carrying capacity of Asienarans to survive while dealing with the local climate change.*

**Keywords:** Climate Change, Season, East Season, Adaptation Strategy, Fishing Gears

## INTRODUCTION

Adaptation is a process by which organisms would overcome pressure and make adjustments to a certain environment (Kottak, 2017; Scupin, 2016). Adaptation is a characteristic that helps organisms to adjust themselves in order to survive in their environment (Glass, 2005; Kahn, 2012). Adaptation is also the core concept of ecological study, because living organisms, either plants, animals, or humans, always involve themselves in the process of responding to the structural and functional characteristics of their environment (Moran 2018). Before the adaptation process occurs, people should be aware whether their surrounding climate is changing or not (Tripathi and Mishra., 2015). An effective adaptation toward climate change will greatly depend on the awareness level and how the community feels the impact of these climate changes (Ado *et al.*, 2018). Human adaptation toward their environment was the result of various individuals' decisions on how to conduct best interaction with their surrounding nature.

Regarding climate change, the notion of adaptation refers to all adjustments or moderations in natural systems or social systems as a response to climate change that is happening and or that will occur and taking advantage of opportunities that arise (Elum *et al.*, 2017). *United Nations Framework Convention on Climate Change* (2007) suggests that adaptation is a process that should be adopted by people to make themselves more prepared to

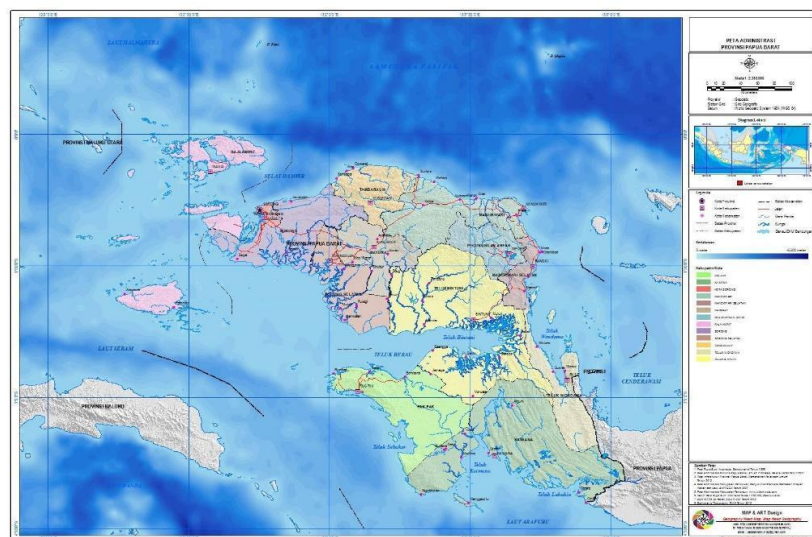
face uncertain times by taking precautionary steps and appropriate adjustment in order to minimize the negative effect of climate change. This is in line with Moroda et al., (2018), to overcome the negative influence of climate change, people should use different adaptation strategies. Adaptation strategy is various efforts planned by the population as a response to external or internal conditions in order to meet the necessary requirements and to solve their problems. (Bennett and Belshaw 1976; Moran, 2018) opined that adaptation strategy was essentially done by all living organisms to ensure their survival from less favorable environmental conditions.

The Asienara tribe is one of the tribes that inhabit the coastal region of Buruway District in Kaimana Regency. Their settlements are located on the border of the coastal and estuary region. Based on its ecological zone, studies showed that the main occupation of Asienarans are fishermen. Global climate change has affected the local climate of Asienarans in Buruway District of Kaimana Regency. Climate change is the major problem faced by fishermen communities. They were deemed to be the most vulnerable toward climate change risk (Ulfa, 2018; Kauneckis & Martin, 2020). The Asienara tribe recognized climate change in their region as seasonal change. The occurrence of local climate change or seasonal change will certainly affect the life of Asienarans. This is in line with Menike and Arachi (2016) which suggests that small farmers, or in this case fishermen, will be more likely to be affected by climate change due to their low adaptive capacity. To deal with this seasonal change, the Asienara tribe has their own adaptation strategy tailored to their adaptability.

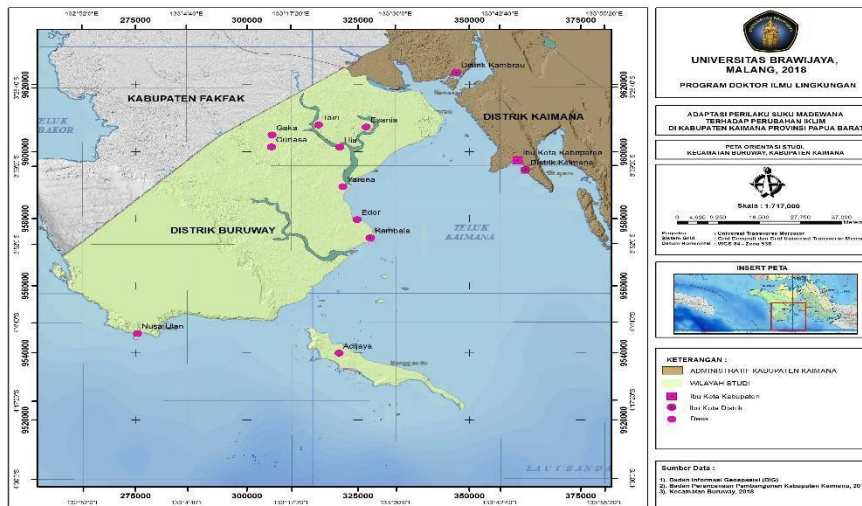
## METHOD

### Research Location

This research study was conducted in Yarona village, Buruway District, Kaimana Regency, West Papua from June 2018-April 2019. Kaimana Regency is located in the Southeast of West Papua Province. Village selection was carried out purposely from the five existing villages. This village was selected based on (1) the majority of the population living in Yarona village were those of Asienara tribe; (2) Yarona village was located in coastal region near the estuary, which is directly exposed to local climate change (season); (3) Location was quite accessible by long boat. Location of study site can be seen in Figures 1 and 2 below;



**FIGURE 1**  
**MAP OF WEST PAPUA PROVINCE**



**FIGURE 2**  
**MAP OF BURUWAY DISTRICT (LIGHT YELLOW COLOR) IN KAIMANA**  
**REGENCY**

**Data Collection and Analysis**

Data collection in this study used interviews, focus group discussions, participatory observation and documentation. Respondents in this study were 60 heads of families (KK) of the Asienara ethnic community. Information from respondents was obtained in a participatory manner using open interview techniques, semi-structured interviews and in-depth interviews. In-depth interviews were conducted with local elders, while all community leaders were invited for focus group discussions (FGD). Participatory observations were carried out along with Asienarans on their daily activities. Data obtained from respondents includes age, education, number of family members, occupation and social status in the family. Research data analysis was done in a descriptive qualitative manner, exploratory in nature (Denzin & Lincoln, 2009), with an emic-ethical perspective.

**RESULTS AND DISCUSSION**

Geographically, Yarona village is located at S.03042'07 "and E.133024'21". This village is about 43.5 km from the city of Kaimana (BPS Kaimana Regency 2020). Yarona village is part of Buruway District, Kaimana Regency, West Papua. It takes about 2-3 hours by a long boat to reach Yarona village from Kaimana. Yarona village is dominated by lowland forest, swamp and mangrove. According to BPS Kaimana Regency (2015), the topography of Yarona village consists of plains (70%), hills (20%) and mountains (10%). Its surroundings were mostly dominated by sandy soil in flat contours, lowland forest, secondary forest, swamp and sago swamps along the direction of the village.

On average, respondents in this study were 39 years old, the youngest was 21 years old, and the oldest was 66 years old. Respondents in this study were classified into a productive age group (Mantra, 2010). Based on this data, Yarona village has a potential productive workforce to develop their village and regional area. Respondents' formal education is classified as low, namely primary school (SD) 71.67%, junior high school (SMP) as much as 16.67%, high school (SMA) 5.00%, and the remaining 4.66% did not go to school. This data would be related with their ability to interpret various natural phenomena around them, including adaptation strategies in dealing with climate change. Average number of family members in this study was 5 people, with the lowest number of family members being 2 people and the highest number being 11 people. The Asienara community has fairly diverse working activities, which includes fishing, farming, hunting, gathering, making copra, and sometimes being laborers. However, of all these

activities, fishing is their main job, since most of their time and energy was devoted to this work and it mainly contributes to their income. According to Berman et al., (2019), fishing is an important occupation for coastal communities, and is one of the focuses of adaptation study regarding climate change. Apart from being the main source of income, fishing has also become the main source of family protein.

Fishermen's activities have a very close relationship with nature and are affected by local climate change. Global changes causes local climate change, which is recognized as changes in seasons by Asienarans. When the seasons change, the Asienara community faces the risk of being exposed to high waves, strong winds and strong ocean currents. All of these natural phenomena create safety hazards for Asienarans fishing at sea. According to Ulfa (2018), climate change indeed has social and economic impacts on fishing communities. Looking at it from economic perspective, impact brought by this changing seasons has made Asienarans unable to go fishing and thus cannot fulfill their daily needs and vulnerable to poverty, while its social impact was that they cannot visit their children and relatives who lived in cities or other villages since they cannot determine and predict the weather.

There were 4 seasons known by Asienarans, namely (1) East season which occurs in May-October; (2) Western transition season, in October-November; (3) West season occurs in November-March; and (4) East transition season, April-May. All respondents agreed that the East season, which occurs in May-October, is the season that brought adverse impact to their families. In the East season, natural phenomena that occur were high waves, very strong winds and strong ocean currents, hot and dry air, and also low rainfall. During the East season, Asienarans cannot carry out activities at sea, particularly fishing. When they did decide to catch some fish near the coast, it was only enough to meet family needs and not for sale. This is in line with Vincent-Akpu, (2020), which suggests that perceived changes in local climate/season affects fishing effort, fishing duration, and decreases in catchment, which in turn will affect all fishermen. Since they did not catch any fish during East season, there was no fish to be sold and thus it would decrease their income. This decrease in income weakens their purchase power of household goods and creates vulnerability among households of the Asienara tribe.

Based on the experience, there was high risk of Asienarans to be involved in accident or even death if they were to travel or catch fish during East season. This is in line with results from Ansaar (2019), in Bambu village, Mamuju Regency, that climate or seasonal changes could increase the risk of loss or even death due to high waves and strong winds. Marbun (2020), suggests that climate change has made it difficult for fishermen to determine the fishing season due to erratic weather. Moreover, according to Asienara community, current climate change is unpredictable, because the weather could change abruptly.

As a community who lived a simple life, adaptation strategies used by Asienara community are customized to their adaptability or capacity. Adaptation capacity would depend on the availability of natural, human, social, physical, financial and institutional resources, which can be measured by people's ability to convert these resources into useful adaptation strategies (Folke, et al., 2005; Smit & Wandel, 2005). However, recent evidence suggests that adaptive capacity was not only about having the necessary resources, but also about the willingness and ability to convert resources into effective adaptation measures (Cinner, et al., 2018). Building the adaptive capacity of farming communities, including fishermen, tends to reduce their vulnerability to climate change (Diallo et al., 2020). Results of this study found that adaptation strategy used by Asienara community as response to the local climate change, especially the East season, was by relocating work activities from the sea to land, such as farming, hunting, making copra, and processing sago (*menokok sago*), which would be explained in detail in the next section;

## Farming

Farming activities using *slash and burn*, with shifting cultivation pattern, is one of the activities done by Asienarans during East season. Low rainfall and moderate temperature was quite favorable for farming activities. Asienarans marked this period of time as the perfect time to clear the land for cultivation or cultivating previous land suitable for planting. Asienarans usually cleared out some land in the forest, where the soil is considered fertile by using slash and burn system. Shifting cultivation with slash-and-burn system was still widespread throughout the tropical region. This is the main agricultural production system for rural families living on the fringes of tropical forests (Bos, et al., 2020).

Shifting cultivation activities of Asienarans were highly related to the natural environment in their region. For Asienara community, fertile soil of the forest for cultivation was considered as a treasure that must be preserved for their children and grandchildren. For Asienara community, farming using a slash-and-burn system was a legacy that has been passed down from generation to generation from their ancestors. This is similar to the community in Ibasuf village, Aitinyo District, Maybrat Regency, West Papua, where shifting cultivation was done inter-generation and influenced by their age, education and number of dependents (Febriadi, & Saeni, 2019).

The cleared land for cultivation was not too large, and sometimes they look like irregular compartments. Farming activities are mostly done using family labor such as father, mother and children. This is in accordance with a statement from Matinahoru (2018), that the determining factors in shifting cultivation were the number of workers and the number of school-aged children in the family. From the results of this study, it is known that the productive workforce in Asienarans family was 2-4 people on average. Since the slash-and-burn system depends on human labor, of course, the small number of workers will greatly affect the family's ability to cultivate a wider land.

The equipment used by Asienarans in farming activities was still simple, such as axes, crowbars, hoes, machetes, and digging stick (*tugal*). The cultivated plants include high-carbohydrate plants and vegetables. The planting pattern was carried out randomly with an intercropping system, in which there were about 7-10 types of plants in one stretch of land, both seasonal and annual plants. This is different compared to some parts in South America and Africa whereas some traditional farmers grow as many as 20 different crops together on cleared small plots (Miller & Spoolman., 2017). One of Asienarans' plot can be seen in Figure 3 below;



**FIGURE 3**  
**FIELD PLOT OF ASIENARANS IN YARONA VILLAGE**

The seeds cultivated by the Asienara tribe were taken from their previous plants, and usually they never replaced them with new types of plants introduced by local agencies. This means that despite local climate changes, the types of plants cultivated and the practice of shifting cultivation have not changed at all. This differs from small farmers in Bangladesh, Ethiopia, and southern Mali. In order to deal with climate change, their adaptation strategy was farming in their yard, changing their cropping pattern, using better and early-harvest varieties and changing their planting and harvest dates (Maya, et al., 2019; Diallo, et al., 2020; Kenea, 2020; Sarker, et al., 2020).

For Asienara community, the harvest was not carried out simultaneously, because each type of plant has a different harvest time. This different harvest period was actually very beneficial for the Asienara community to maintain their food sustainability during East season. This is in line with Antaribaba et al., (2020), that said shifting cultivation was a traditional agricultural pattern applied evolutionarily by local communities to produce food security. If managed properly, shifting cultivation can be considered as a sustainable practice, especially in sparsely populated areas (Lincoln, 2020).

Shifting cultivation done by Asienarans was still subsistence in nature. Yields from their fields such as bananas (*Musa paradisiaca*), cassava (*Manihot esculenta*), taro (*Colocasia esculenta*), batatas (*Ipomoea batatas*), corn (*Zea mays*), rica (*Capsicum frutescens*), tomatoes (*Solanum lycopersicum*), spinach (*Amaranthus*), and gedi (*Abelmoschus manihot*) were mostly used to meet their family needs, exchanged (bartered), for relatives and also neighbors who were in need. Only a very small amount was being sold. Shifting cultivation system provides sustainable means of livelihood and food security for indigenous peoples (Pandey et al., 2020), as conducted by Asienarans during East season.

After planting it for about 3-4 years, soil fertility in their plots begins to decline. Decreasing soil fertility in their field was indicated by lower yields. If these conditions occur, usually the field will be abandoned, as fallow land. Results from Thet et al., (2020) stated that farmers in Myanmar who conduct shifting cultivation left swidden cultivation plots, as fallow land, for more than 15 years. However, based on information from Asienarans, they will return to the abandoned field in about 7-10 years or when natural vegetation in that field was about 10 meters high, as an indicator that the soil in that place has already increased its fertility. Longer fallow period was usually interpreted as better soil quality for the next cultivation period (Limba et al., 2017).

## Hunting

Although Asienarans' main occupation was fishermen, they still involved themselves in hunting. Hunting activity was commonly done during East season. Hunting is a human activity that seeks, kills, slaughtered, and consumed games (Sutton, & Anderson., 2013). An important part from this definition was the existence of a game pursued and captured in several ways. Hunting was usually done by men, both individually and in groups. In hunter-gatherer societies, activities were divided into hunting by men and gathering by women (Schutkowski, 2006). Furthermore, Veile, A., (2018) suggests that such division occurs because men aimed to obtain energy-dense food which was more difficult to obtain (by hunting) and women try to obtain food that was easy to obtain.

The purpose of hunting for Asienarans was mainly to meet their family's protein needs, and also to share it with fellow clans and neighbors. Francesconi et al., (2018) said that subsistence hunting has traditionally been an important livelihood for food security and nutritional health in a community. If hunting was done individually, its result was used for family consumption, it was sold if someone was willing to buy it and sometimes shared with fellow clans and also their closest neighbors. If hunting was done in groups, the game obtained would be divided evenly among those who are involved at that time. Sharing food was one of the characteristics of traditional hunter-gatherers (Schutkowski, 2006).

Hunters in Asienara community were still considered as traditional hunters. In the past, Asienarans used tools, machetes, spears, sago traps and also dogs. Today, hunting would use snares, machetes, spears and air rifles. Laying snares was done every day while doing other activities such as farming, processing sago or even while waiting to collect snares. Usually, a lot of snares were installed, especially in places that were deemed to be frequently traversed by animals. Hunting using snares would bring greater results compared to hunting using other equipment. Once entangled, the number might exceed one animal, and sometimes even up to 10 animals. However, due to the long distance between settlement and the hunting ground, many trapped animals die before being found out. Animal that often caught in the hunting ground was deer (*Cervus timorensis*), as shown in Figure 4 below;



**FIGURE 4**  
**DEER (CERVUS TIMORENSIS) CAUGHT BY ASIENARANS HUNTERS**

The hunting ground for Asienarans was a customary forest area in the Buruway District. The large hunting area allows wild animals in the forest to thrive and become the sustainable source of food for villagers. Large hunting grounds can be used as the source of food production (Smith, 2011), and also a food storage (Freeman & Anderies 2015). Hunting activities were very helpful for Asienarans to meet their needs, especially protein during the East season, which lasts about six months. Games obtained during hunting were deer (*Cervus timorensis*), wild boar (*Sus scrofa*), and local kangaroo (*Thylogale*). Other game animals were cassowary (*Casuarius*), maleo (*Macrocephalon maleo*), and mambruk (*Goura sp.*). According to information obtained from Asienarans, deer and pigs were abundant and thus these animals have become the main pests in their cultivation plot. Most of the game products such as deer (*Cervus timorensis*) and wild boar (*Sus scrofa*), that were caught alive, were sold in Kaimana market. Results from selling these games were usually used to buy things for the family, to buy gasoline, and to pay for their children's school fees.

### **Making Copra**

Making copra was also one of the adaptation strategies done by Asienarans as a response to the East season. Copra is one of the main traditional products which is processed from the coconut flesh. Drying coconut was done traditionally by using sun drying, smoking or drying over an open fire to reduce the moisture content of coconut flesh (Deepa et al., 2015; Nurhidayat et al., 2020). From the observation, Asienarans was making copra by smoking or drying over an open fire, as shown in Figure 5 below;



**FIGURE 5**  
**SHED FOR SMOKING AND DRYING COPRA**

In summary, making copra was done by collecting old and ripe coconuts, breaking it, gouging out its inner flesh, collecting it in sacks and carrying it to the drying site. The drying process took approximately 3 days. After allowing it to cool down, it was put into sacks and sold to traders. According to Apriyanto, M., & Rujiah, R., (2019), this type of smoking and drying would produce a low quality copra. A good standard for copra was containing 7% moisture content from the original 52% water content in fresh coconut (Deepa et al, 2015).

If the weather is good enough, copra produced by Asienarans would be sold to collectors in Kaimana city. However, if the weather was unpredictable and there was no gasoline, it would be sold to collectors in the village with a much lower price. Money obtained from selling copra was usually used to pay off their debts to kiosk owners in the village and also to buy necessities during East season.

### **Processing (Menokok) Sago**

Sago is a potential food source in Papua and West Papua to be developed and utilized to support national food security. Sago was considered to contribute greatly in solving the food crisis of this century (Ehara et al., 2018). Apart from being a food source, sago was also a potential source of energy because it has high carbohydrate content (Rostiwati et al., 2016). Superior sago plants were able to produce about 300- 674 kg dry starch per tree (Yamamoto, 2016 in Barahima. 2019). Sago starch can be used as raw material for industry, food and also artificial rice (Bintoro, H. M., 2020). For people in Maluku and Papua, sago starch was a staple food and can be processed into several other types of cuisine.

Sago (*Metroxylon sagu rottb*) was known as food crops, found in the region of Asienara community. In the past, sago whereabouts was the main factor that caused Asienarans ancestors to always move from one area to another in Buruway. Based on the interview, sago can be harvested around the age of 7-10 years. According to the local wisdom of Asienara community, ripe sago ready to be harvested was sago that already produced flowers. Moreover, they could check it by using the axe on the sago stem about 1 meter from the ground. If there was sago starch on the axe, it means that sago was ready to be cut down and harvested. The work of processing (menokok) sago was usually done by the whole family. Processing (menokok) sago requires good cooperation between men and women because starting from selecting plants to be harvested until producing sago flour, it cannot be done alone. One of the steps in processing sago among Asienarans can be seen in Figure 6 below;





**FIGURE 6**  
**PROCESS IN EXTRACTING SAGO STARCH**

Currently, sago flour can be made into various kinds of foods, such as pastries, sponge cake, flower cake (Sukamto et al., 2019), crackers (Syahrul et al., 2019; Rajab & Munisyah., 2020), noodles (Mukti & Elida., 2019; Sukamto et al., 2019), or traditional cake (kelepon) substitute to reduce the sugar content of traditional cake (kelepon) made from glutinous rice (Warsito, & Sa'diyah., 2019). Based on field observations, several types of traditional foods that are commonly consumed by Asienarans were papeda, sinoli, topet, and tiraga.

During East season, rice availability in kiosk traders within the village was quite rare. Even if it was available, not many Asienarans could afford it because they did not have any money. The Asienara community uses sago as a replacement for rice during East season because it has high carbohydrate content. In fact, all respondents agreed that processing (menokok) sago for consumption was the "last resort" to deal with the local climate change.

Based on the results, it can be said that natural resources were abundant in Asienara's territory. This abundance has become the supporting factor for the Asienarans to develop adaptation strategies in response to the threat of climate change. Abundance in natural resources was an indicator that the carrying capacity of the environment in the area of the Asienara tribe was still good. Results in this study have brought evidence that this community has never experienced a shortage of food crop, protein and minerals or even famine. Until now, this community has never worried about a shortage of foodstuffs, because nature was still able to support them. Chong (2014) suggests that a strong natural system was necessary for human welfare and was recognized as an important support for society to adapt toward climate change.

The adaptation strategy of diverting activities to the mainland was done by Asienarans to avoid the dangers and risks of accidents, loss and death and also to survive during East season. This was consistent with the study results of Scott (2006), which suggests that a traditional community, with simple effort to fulfill their daily needs, were more likely to prioritize safety rather than trying to obtain large profits by taking unnecessary risks. The adaptation strategy of diverting work activities to the mainland also showed that Asienarans have limited fishing gear technology. The impact of these limitations was their inability to face the changing forces of nature, such as the East season, so that they had to divert their main activities to the mainland. These livelihood activities were done by Asienarans based on their family needs. Each head of the family could choose livelihood activities that can be done during East season.

Although Asienarans have experienced climate change in their region, these changes still bring some ambiguity because these changes cannot be controlled and cannot be predicted. All respondents and key informants stated that "the current change in season was unpredictable compared to the past and we could only adapt and try to avoid it if it was dangerous for us, because it is impossible for us to rule over nature". Risk involved in climate change was

sometimes seen as a “feared risk”, meaning that it was a risk that can cause a disaster to occur and was difficult to control, also creates fear (Kais & Islam, 2019).

Findings in this study regarding the adaptation strategy of the Asienara community toward climate change can be used as a basis to formulate policy programs and development interventions for Asienara community, both by the government and non-governmental organizations. These programs should be formulated according to local cultural values and natural resources, with the aim to increase the adaptive capacity of Asienarans in facing climate change or seasonal changes. Seasonal changes will have different socio-economic impacts on Asienara community. This requires the community to prepare itself with appropriate adaptation strategies and behaviors, so that they are able to survive in times of extreme changes, such as the East season. Even so, adaptive behaviors would not be effective without understanding the perceptions of a community concerning climate change (Kibue et al., 2016; Alam et al., 2017). Therefore, research studies on adaptation strategies were deemed to be important supporting studies for risk analysis and to prepare public responses toward risks. Assessing adaptation strategies of local communities was an essential step to identify risks arising from local climate or seasonal changes, and to formulate appropriate anticipatory response plans to reduce vulnerability in Asienara communities.

## CONCLUSION

Based on the results regarding strategy adaptation of Asienara tribe toward climate change, it can be concluded that;

1. Local climate change was perceived by the Asienarans as the changing seasons
2. East Season is a phenomenon of extreme climate change that occurs in the area of the Asienara tribe from May to October.
3. Adaptation strategy of Asienarans as their response toward climate change, or which is locally known as East season, was done by relocating their occupational activities from the sea to the land such as by farming, hunting, making copra, and processing sago;
4. Adaptation strategy toward climate change by relocating their occupational activities to the mainland was an effort of this tribe to avoid any risk of accidents, loss and death and to be able to survive during the East season.
5. Adaptation strategy by relocating occupational activities to the mainland also shows that the Asienara tribe community has insufficient technology and limited fishing gear to deal with the climate change.
6. Processing (*menokok*) sago for consumption was perceived as the "last resort" of adaptation strategy to face the local climate change.

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