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Identifying Potential Trend of Natural Biodiversity Contribution in the Arfak Natural Preserve Area: Spurring Economic Growth Based on the Ecotourism Schema

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Abstract—Arfak Mountains nature reserve is included in 3 regencies of Manokwari, South Manokwari, and Arfak Mountains, West Papua. This area of biodiversity is a variety of protected flora and fauna. Among them are various types of orchids, butterfly species of birds. This is where tourists can enjoy the beauty or see firsthand. The natural wealth contained in the nature reserve area of arfak mountain that has the potential as an ecotourism location that prioritizes nature attraction (nature-based tourism). The tourism industry has an important role in the development and development of a region. Even in some areas shows that the tourism industry can lift the area from backwardness and make as the main source of income. Kwau village is one of several regional tourism as ecotourism is endemic to West Papua is rich in wildlife and conservation land then, education about conservation and wildlife endemic area maintenance and preservation is necessary, in order to awake animal population and conservation area preserved. Implementation activities are divided into three phases. The first stage is through field observation and debriefing, the second phase includes the implementation of activities on the ground and third stages through the evaluation and improvement program. Based on that, the research conducted the impact of ecotourism development based on endemic animals in Arfak Mountain Nature Reserve in June - August 2019. The purpose of this research is to know the impact of ecotourism development on endemic animals. The material used in the fauna is using the survey method. The data were obtained through direct interviews with communities around the nature reserve area, through related government in Manokwari Regency. The observed variables are 1) the condition of the existing animal in the location, 2) the society's income, from the data and the result of the discussion it can be concluded that the Ecotourism program is very good to be developed because it can give positive impact to the conservation effort, increase the people's income and the regional income.

Keywords—Ecotourism, Endemic animals, Arfak mountains Nature reserve

I. INTRODUCTION

Economic development and empowerment of the community are needed for regional sustainable development. One fundamental key to achieve better economic improvement and increase community capacity

are through the utilization of natural resources. By way of well-managed natural resources, it will generate more income for the rural community, engage more involvement of rural workers, provide a better quality of life, and open the gap of development with other regions [1], [2]. Numerous positive trends of contribution from the natural resources services have been shown the tangible result towards rural development and community building capacity for the long run. Developing ecotourism is one of the promising sectors that can be contributed significantly to local and regional economies. Through decent management and a good collaboration, a huge benefit can be gained and better prosperity among communities can be achieved. Providing ecotourism services by way of various natural resources are required in order to pump up the multi dynamic contributions of natural resources. Besides, ecotourism schema provides a conservative action, and more respectful towards involved stakeholders. It is obvious that the concept of ecotourism is more prevalent for the rural community who are willing to gain more benefits and a balanced ecosystem rather than a conventional tourism schema.

The Arfak natural preserve area lies in the bio-diverse region of Papua Island. It has been prominent with the abundance of floristic and faunal species that compose the area to be endemically resourceful. Physical condition of the Arfak natural preserve area is unique due to its conservation status that possesses highly abundant biodiversity species. It has been considered to be the first natural biological collection in Papua established by European researchers during their visit 1824 – 1875. Based on food and agricultural organization (FAO) surveyed in 2005, there were 2,770 species of orchids, various types of butterfly Ornithoptera spp., which have been well-known internationally for their unique wings size. Besides, there are approximately 110 species of mammalian, 80 of Aves of which a handful of them are endemic such as cendrawasih Arfak (*Astrapia nigra*), Parotia barat (*Parotia sefilata*), and Namdur polos (*Amblyornis inornatus*). In addition, the area of Arfak is still considered to be forested with the total of forest covers 68,325 hectare [3], [4].

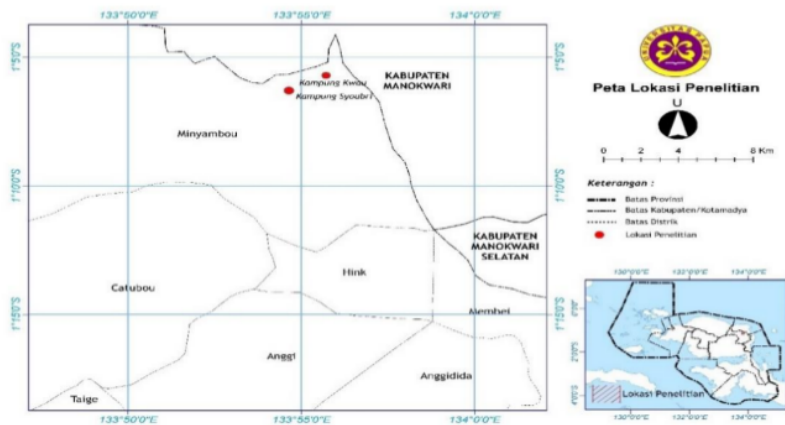
Even though the Arfak natural reserve area is promising for its abundant natural resource and forest diversity, but on the other hand, the contribution towards the rural communities is less than expected. Currently, the interdependent schema of benefit gained from the area is only firewood for cooking, wild animals for food, and other services such as river and forest vegetation for daily used. There is no decent pattern of utilization and structured management of natural resources in conjunction with the utilization [5]. It is an obvious indication of lack of management from multi-stakeholders who are responsible. As of 2016, the engagement of local government was not promising in order to generate better solutions and improvement for the rural communities around the Arfak preserve area. Seemed that more approaches are needed to identify problems, address the characteristics of rural knowledge, and provide tangible solutions for local economic development. Therefore, the objective of this study is to identify the condition of the Arfak natural preserve area for potential ecotourism development strategy

by considering the current potential of natural resources and biodiversity distribution in the area.

II. MATERIALS AND METHODS

A. Research site

The study was conducted from May to August 2019 in Kwau Village at coordinates 133°54'45.4"E, 133°54'45.4"S, in the Sub-district of Minyambouw, the District of Arfak Mountains, West Papua Province, Indonesia. It is the buffer zone of the Arfak Mountains Nature Reserve (CAPA) with an area of 68,325 hectares, located in the territory of the Bird's Head of West Papua Province. Kwau Village can be reached using a special four-wheeled vehicle for 2 hours (± 62 km) from Manokwari city of West Papua Province or for 2,5 hours (± 45 km) from the Anggi capital of the Mountain Sub-district Arfak. The location of research in Kwau Village can be seen in Figure 1.



B. Data collection

Socio-cultural data were taken through a number of methods such as direct site observation, in-depth interviews with the rural people who live in the area, asking questions through semi-structural questionnaires, focus group discussion to gain more participation from communities surrounding the Arfak natural preserve area. The main object of this method is rural communities in order to generate potential data of natural biodiversity potency and distribution as well as their interaction with open nature for daily use. Besides, we also ask multi-stakeholders who have been involved in the area such as nongovernmental organization (NGO's), and local government in regard to their participation and building capacity program for the surrounding rural communities. Besides, field observations of fauna was carried out to identify their distribution, place for living, and eating. Purposive plots for field observation were established through the consideration from their previous frequent appearances. Direct identification method for bird and butterfly were applied by identifying their living habit, eating habit, playing habit, voice, and range of migration. Digital cameras and loop were also included for capturing their physical appearances for identification.

C. Data analysis

In order to elaborate potency of natural biodiversity and its contribution to the rural community around the Arfak natural preserve area, we calculate frequency, mean, median, maximum, and a minimum number of faunal data identification from a field study. Socio-cultural data from various discussions were taken to generalize a standardized perception from the rural communities. The quantitative data from the interviews with the respondents were tabulated with simple statistics, that is by calculating the percentage of respondents' answers; the results were made in the narrative with descriptive analysis [6].

III. RESULTS AND DISCUSSION

A. Description of the Arfak Natural Preserve Area Status

In general, this study found that there was a changes of function from the Arfak natural preserve area. It has gradually become open areas where a number of over-exploited activities were seen in the area. Some endemic faunal and floristic species were extracted solely for the commercial purposes either by the rural communities or people outside the area. It turned out that during the visit of tourists and travelers, seemed that they do not follow the

standardized rule and procedure of visit that leads to imbalanced management of income contribution. It was seen managed by individuals who have the connection and did not pay taxes as mandated through local governmental regulation. In addition, the lack of implementation of regulation and control from multi-stakeholders who have responsibility were not glaringly seen. Those accumulations bring the gap of income distributions for the rural communities and gradually deteriorate natural biodiversity and threaten the conservation status of the area. Therefore, a huge threat of losing biodiversity and prosperity were obvious in the Arfak natural preserve area. The engagement of institutions through their programs did still not touch the bottom-line sectors of the rural communities. As of 2018, a product of regulations to govern natural resources and forest diversity extraction were not optimized. Rather, ecotourism services surrounding the area was illegal due to no transparency and managed by individuals without formal letter and prevent from the charge of tax payments. A non-governmental organizations such as Paradisea foundation was also established their program for more than decades to empower rural communities who live around the area. The foundation also develops strategies for economic growth through providing ecotourism services such as the cultivation of local agricultural commodities and managing nest of *Ornithoptera* spp. for attraction service for visitors. However, the extent of the program was also limited by grant support and formal regulation from the government. In addition, the condition of the area was also challenging to control in which lies in the mountain and hills that extremely difficult to reach.

B. Potential of Tourism Resources

The potential of ecotourism development in the Arfak natural preserve area is promising form the long run. Nothing that the distribution of exotic faunal and endemic floristic species are highly abundant that distribution surrounds the area. The faunal such as *Ornithoptera* spp. that has been well-known is distributed in the forest and easy to find when taking a field trip. We found 6 butterflies that were unique with their wings size and color that make them species for the Arfak natural preserve area. Besides, paradise birds are also abundant in the areas. The paradise birds are endemic species of Papua that possibly could not be found in other places around the world. Seemed like the Paradise birds have a permanent habitat of living around the Arfak natural preserve area. Some trees are likely to become a suitable homes for them and provide more food available for the paradise bird to eat. Another unique ecotourism commodity is local culture and custom that can be appealing to learn. The Arfak tribes are resourceful in managing various daily activities including how to manage the forest and natural resources in a sustainable way. Therefore, it has been important to incorporate those uniquely traditional customs into the ecotourism schema of services.

C. Community Knowledge about disturbance to endemic fauna in the Arfak Mountains Nature Reserve

According to the Animal Conservation Act, endangered endangered animals must be protected where the community is not given the opportunity to capture or care for them, with the above law Cendrawasih is one of the endemic animals in the Arfak mountain range which must

be protected. CAPA stores a high endemic flora and fauna biological wealth and has economic value if it continues to be protected and developed as a nature tourism activity with the appearance of typical local animals. The results showed that there is still a small portion of the community around the Arfak mountain nature reserve who carry out activities in the forest with community activities such as gardening or capturing wild animals such as wild pigs, maleo birds, couscous and so on. Interviews found that people who were aware of activities within the reserve were quite low, while those who were not aware of activities at the CAPA were quite high. Community activities around the nature reserve are to meet the needs of their families and to see the animals and the beauty of nature. Based on observations, there is still a small portion of the community around the Arfak Mountains Nature Reserve who have ever caught or hunted wild animals, especially for wild boar. For protected birds are rarely found, this shows that public awareness of its potential is very good and supports the development of endemic wildlife ecotourism. These results indicate that if there is a protection effort from various parties both the relevant Government, academics, and the community, the efforts to preserve protected endemic wildlife will go well.

D. Community response to the development of ecotourism in the Arfak Mountains Nature Reserve

Ecotourism development efforts are very beneficial not only for business people, and the government but for the local population and the environment. With this concept, it must minimize the negative impact of mass tourism in terms of the environment, culture, and society. Ecotourism has educational goals that spread the message of conservation and understanding of the areas visited. Based on the results of research that Arfak Mountains Nature Reserve has a variety of endemic fauna and unique flora, this endemic fauna can be developed and marketed throughout the world because it has its own uniqueness but it needs support and response from the local community towards the government's efforts to develop endemic fauna by making ecotourism areas. The analysis shows that the percentage of community response to the development of endemic fauna ecotourism in the Arfak Mountains Nature Reserve varies greatly. But in principle, the community has understood the intent of the development of ecotourism. The percentage of people who agreed was found to be 73.3% and those who did not agree 26.7%, this was possible because the community already understood and felt it had the potential in their area to develop endemic ecotourism. The results of the study show that people who do not understand what the purpose and objectives of the development of fauna ecotourism, because there are several reasons if ecotourism is developed it will damage the original ecosystem with the development because the status of the Nature Reserve is not a tourist forest, there is a threat or human disturbance (individuals as well as its development) and due to lack of socialization from related parties on this program. As the holder of power, the government must have the initiative and be able to independently develop tourism potential including endemic fauna-based ecotourism, because local governments have the authority to plan, implement and manage ecotourism activities for the welfare of the community and can indirectly increase PAD. The existence of regional authority in accordance with local policies and regulations makes local governments need to manage the

potential of ecotourism independently including the development of institutions in developing ecotourism at the regional level.

E. Role of Stakeholder in Supporting The Arfak Mountains Nature Reserve Area

Arfak Mountains Nature Reserve is one of the natural reserves in Papua which is located in 3 regencies in West Papua Province, which has biodiversity which must be a concern of the local government. The results of interviews with the people around the Arfak Mountains Nature Reserve indicate that there are only a few roles shown by the government in this case the relevant agencies. Not many local people who live around the CAPA know of the existence of a natural resource conservation officer (KSDA), because people who live close to the forest do not know of any officers who are always on duty in the forest. This illustration shows that the performance of KSDA officers in this region needs to be improved. There needs to be cooperation between the community and the government in order to protect and develop the potential of the region in this case endemic wildlife that exists to stay awake and avoid extinction.

F. Traditional Knowledge Systems / Local Wisdom

The Arfak community in general and the Hatam, Meyakh, Moile, and Sougb communities, in particular, are familiar with the division of forest areas based on natural biophysical characters such as elevation, topography, and climate and the rules for their use. The division of this forest area has the concept of "Igya ser Hanjob", from the Hatam language which literally means "we stand guarding the boundary". This concept is as a rule and warning for the large Arfak tribal community consisting of the Hatam, Meyakh, Moile and Sougb sub-tribes. For the Arfak tribe, guarding and not crossing the boundaries of the area determined when utilizing forest products. Finally the concept of "Igya ser hanjob" is broadly interpreted by the community motto "let's protect the forest for the common good". The Arfak community in general divides the forest zone (bigbebei = forest) into 4 (three) parts [7], namely: Zyaasi Igya Ser Hanjob is a traditional conservation technique that has been applied by the Arfak community for generations. Zonation of Igya Ser Hanjob is divided into 4 zones, namely Situmti, Nimahanti Bahamti, and Tumti. The zoning is divided based on the nature and characteristics of the land. Situmti is a zone used by people living and gardening. Nimahanti is a zone that was previously opened by the community to carry out gardening activities, after the harvest is finished the land will be abandoned, this zone can be said to be secondary forest. Bahamti Zone is a zone that is overgrown by large trees. This Bahamti is a zone that can be converted into a nimahanti zone because the forest floor

is not too full of moss. In this zone, it is still the primary forest. The last zone is Tumi. This zone is generally located at the top. This is why the process of making Elhanan cannot be done because the forest floor is filled with moss and is primary forest.

G. Community Livelihoods

Livelihoods are an effort to meet the necessities of life (economy) by working [8]. The people's livelihoods are different from one another, as well as the cultural style of the community in addition to their abilities. These factors greatly affect the livelihood patterns of a community. For example, people who live in the highlands generally work as farmers. This is because the upland area is suitable for agriculture which is supported by adequate water supply and favorable temperature for plant growth. The main livelihood of the people living in Kwau village is farming in the fields/gardens. At present, their economic orientation has begun to lead to markets marked by efforts to sell garden products to the market. They usually grow corn, beans, sweet potatoes, cassava, taro, cabbage, Chinese cabbage, mustard greens, carrots, passion fruit, and potatoes. Plants such as leeks, soup leaves, and passion fruit can be found in people's homes. Distribution of population according to livelihoods in Kwau Village includes groups of farmers/cultivators, hunting/gathering, civil servants, tour guides, and clergy. Field observations show that the number of family heads with side livelihoods hunting in Kwau village is possible because farming and farming are generally not carried out around settlements/home yards. This is due to the fact that there are still pigs roaming in the village (cattle are not caged), so they can damage plants in the garden. This condition is different from the people of Kwau village who have kept cattle in cages and raised far from the village. In addition, hunting and gathering activities generate relatively high income so that it becomes an attraction for the community to do so with the aim of adding additional revenue in addition to the sale of garden/farm produce. Hunting and / or gathering activities are also carried out by the community for their own consumption purposes, including for family purposes such as parties or other village activities.

H. Community Income through Endemic Animal Ecotourism

In addition to the livelihoods above, there are also other jobs that are owned by the community around the Arfak Mountains Nature Reserve, which is to open a place to stay or some of them are guides and inns they manage or lodging, previously their income range from IDR.500,000 - IDR.600,000 per month. IDR.1,000,000- IDR. 6,000,000 per month. Can clearly be seen in table 1.

TABLE I. AVERAGE INCOME OF LODGING OWNERS IN THE ARFAK MOUNTAINS NATURE RESERVE

No	Homestay	Average per month (IDR)	Average per Year (IDR)
1	Homestay Kwau	4.000.000	48.000.000
2	Homestay Wokwam	500.000	6.000.000
3	Homestay Syoubri	6.000.000	74.000.000
	Total	10.500.000	128.000.000

In Table 2, it can be seen that the amount of monthly from various inns varies and the most income is the

Tangkoko Ranger Home Stay lodging, and overall the inn gets an additional income of IDR.128,000,000 per year.

Other income derived from tourist contributions to schools and churches IDR. 50.000, - / day, a guide of IDR. 500.000 / day, potter, IDR. 150.000 / day and firewood seekers IDR. 50.000, - tied. Usually, the tourists provide funds to pay vegetables from the community in the amount of IDR.50.000, - tied. Based on the type of work obtained by the community around the Arfak Mountains Nature Reserve, the local government can pay more attention so that the development and preservation of flora and fauna efforts pursued by the government can run well. The development of tourism in an area will have an impact on changes in the economic structure of society, especially people's livelihoods arising from the opportunities of the sector and its participation [9].

I. Characteristics, Perceptions and Community Participation

In general, the community understands that as a Nature Reserve area, the area should not be disturbed by any activities other than research but because of economic pressure and no other employment makes the tourism sector as their permanent job. The profession as a tourism service provider for example: renting a homestay, as a potter, selling, and as a guide has been going on for a long time, making the profession as a tourism service provider as the main profession of the community. Seeing the trend of tourist visits that continues to increase for the community is a separate opportunity because it has an impact on increasing the income of the community around the Arfak Mountains Nature Reserve. Social problems related to the excavation around the forest area always have an impact and impact on the damage to the area because the community will switch professions as forest encroachers. Their hope is that there is a government policy to facilitate the existence of those who manage the tourism sector in the Arfak Mountains Nature Reserve area. All nature tourism businesses in the Arfak Mountains Nature Reserve expect that the arrangement and development of ecotourism is always done, and expect all parties to continue to preserve the existing natural resources while maintaining the value of existing local wisdom. With the preservation of existing natural attractions, more and more tourists are visiting the Arfak Mountains Nature Reserve and the community will be greatly benefited of course with responsible tourism activities. Participation/involvement of the surrounding community in the management and development of tourist areas is absolutely necessary because those who will be directly related to tourism activities and tourists in the region and most importantly are to foster a sense of ownership of the Nature Reserve area by utilizing them sustainably. Tourist activity business that has been very developed is a homestay business to foreign tourists and the archipelago, by providing services guide, potter and searching for firewood or agricultural crops to be eaten by tourists. In addition to a boat rental business, lodging houses also increased. Another facility that can be an opportunity to increase community income is to open a food stall around the homestay.

J. Potential Market and Implications of the Tourist Village

Tourism at this time is a hope for many regions as a reliable sector as economic development. The development of nature tourism in an area can be seen based on the number

of visitors visiting the tourist area. Tourists who visit a tourist attraction will be able to move the economy of a region. As for the data on the development of the number of visitors in the last year as follows: From the observations in the field, it appears that the average foreign tourists visiting the Arfak Mountains Nature Reserve area, especially in the Kwau village as many as 10-20 people per week or an average in the last 3 years totaled 130 people per year and domestic tourists 5 people per month. From these data, it is noted that the market sector has the potential for the development of ecotourism in the Arfak Mountains Nature Reserve specifically for foreign tourists. In its development every year has increased quite well, this proves that the Arfak Mountains Nature Reserve which has great tourism potential and becomes one of the main tourist destinations. On the other hand, the rapid development of information technology, especially the internet, also contributed to the increase in tourist visits to the Arfak Mountains Nature Reserve, this is evidenced from the results of interviews with tourists visiting the Arfak Mountains Nature Reserve where most tourists get information on the Arfak Mountains Nature Reserve Through the internet. The average number of visits per year from 2008 to 2018 in 90 people with a growth of 1.6%. By using the trend analysis formula for the number of tourists, we can predict the number of tourists visiting for the coming year. Based on the calculation of the growth rate it can be seen that every year there is an increase in the number of visits, even it is estimated that in 2027 it will reach approximately 700 - 1000 visitors. This could be an external force in the development of ecotourism in the Arfak Mountains Nature Reserve. These opportunities must be balanced with the readiness of managers and the community to maximize the opportunities that exist.

IV. CONCLUSION

1. Arfak Mountains Nature Reserve is a tourist area that can be developed into eco-tourism for domestic and international tourists who want endemic fauna-based ecotourism to have a positive impact on conservation efforts, and can also increase people's income.
2. Ecotourism Development in the Arfak Mountains Nature Reserve area should be harmonized with the social and economic conditions of the community.
3. Increasing cooperation needs to be improved with related institutions or institutions to generate creative ideas in the development of ecotourism areas.

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