

ALTERNATIVE LANDSCAPE UTILIZATION AT THE BIRD'S HEAD PENINSULA OF PAPUA: RESOURCE EXTRACTION VS ECOTOURISM

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INTRODUCTION

Indonesia New Guinea (Papua and West Papua provinces) encompasses 404,600 km² or approximately 42 million hectares (Baplan 2002) of which 80% is tropical forest. It is currently considered as an area of global priority for biodiversity conservation because, in part, of the species-rich forest environment of Australopapuan fauna, as well as of many uniquely New Guinean species (McPhee 1988).

Indonesia New Guinea represents one of the diversity levels of flora and fauna and species endemism in Indonesia comprising 15,000-20,000 plants species, 146 mammals, 329 reptiles and amphibians and 650 bird species occupied diverse ecosystems in Papua (Marshall & Beehler 2007). The Papuan Bird's Head Peninsula (BHP) is located in the heart of the Coral Triangle (CT) in south eastern Indonesia, encompassing over 22.5 million hectares of sea and small islands in West Papua (Pattiselanno & Arobaya 2013).

BHP is known as an area with the richest diversity of reef, fish and coral species in the world. It is also considered as the global epicentre of tropical shallow water marine biodiversity. Papua's greatest competitive advantage is its natural resources. Papua is rich in copper, gold, silver, oil, gas, timber and marine products, the extraction of natural resources by corporations is the primary source of income in the Papuan economy (GRM International 2009).

Despite its natural-resource rich environment, Papua and West Papua are among the provinces with the highest level of poverty in the country. According to the Central Statistics Agency (BPS) Report, until March 2013 West Papua was among the eight provinces with the highest poverty rate (26.67%)—second after neighbouring Papua (31.13%).

To reach targets set for Regional Income (Pendapatan Asli Daerah/PAD), forest conversions have been severely competed for other purposes, including for extractive

industries, such as mining and logging and for booming commercial plantations to improve the livelihoods of rural communities. Poverty often pushes people to overexploit forest resources to improve their livelihoods. The fact shows that close to 1.6 billion people—more than 25% of the world's population—rely on forest resources for their livelihoods and most of them (1.2 billion) use trees on farms to generate food and cash.¹ That is why governments depend on extractive industries, such as mining and logging to generate revenues. The forestry sector has played an important role and significantly contributed to the economic growth of Papua (Pattiselanno & Arobaya 2013). In Manokwari for example, 20% of the Gross Regional Domestic Product (Produk Domestik Regional Bruto/PDRB) is contributed by the forestry sector (Anggraeni & Watopa 2004).

Forests have long been considered as a mother for native Papuans. Thus, the loss of forests will lead to disenfranchisement of ethnic Papuans from their traditional landscapes and lifestyles. The short-term economic gains from forest conversions are obvious, but the long-term losses less so.

The current utilization of the natural resources is creating negative impact on the Province's biodiversity. First, this chapter aims to explain the development of a digitalized map containing digital information of the natural resources in the island of Papua, in particular BHP, and of the distribution of avifauna species and the natural beauty or features such as mountains, lakes and beaches. Second, this chapter will also describe the utilization of the developed digitalized map which is expected to offer an alternative economic development using Papua's natural beauty and terrestrial habitats by informing the potentials and the avifauna distribution for the development of economy creative and ecotourism.

USE OF A DIGITIZED MAP

To achieve the goal of this chapter, the discussions is focused on the current potentials and distribution of natural resources based on available information at the provincial level. With the prosperous potentials of the natural resources, almost all areas in the BHP are promising to gain revenue for economic development in the areas.

To be able to understand the potential of natural resources in the BHP, we developed a digitized map of Papua provinces (West Papua and Papua) containing

¹ <http://www.fao.org/forestry/livelihoods/en/>

digital information of the natural resources of the provinces, which is based on the fact that there are on-going conflicts among the utilization of the natural resources.

As shown in the map, there are two giant mining operations, i.e., Freeport mining site in Papua and BP Tangguh mining site in West Papua. The Freeport mine provides nearly 50% of Papua Province's GDP and is the largest tax payer to the Indonesian Government (Resosudarmo & Jotzo 2009). With reserves of 14.4 trillion cubic feet, BP Tangguh gas field is predicted to generate USD3.6 billion for the Government of West Papua and USD8.7 billion for the National/Central Government of Indonesia over the next 20 years (GRM International 2009).

Related to forest areas, approximately 57% of Papua's production forests have been allocated to around 38 large-scale timber concessions, which cover over 9.2 million hectares of land. Approximately 64% of the forests allocated for large-scale logging are lowland forests (CoE UNIPA 2016). Also, in the last five years, investments in oil palm plantations have been found in almost all districts in West Papua. With the development of the palm oil industry, land conversion for private plantation enterprises is increasing rapidly.

In this chapter, to develop an alternative to ecological friendly economic development should also consider Papua's natural beauty and the potential of biodiversity richness –avifauna distribution. Other objects to incorporate in the analysis of digitized map are the distribution of avifauna species and the natural beauty or features, such as mountains, lakes and beaches—that could make a trip to the areas worthwhile or simple offer other opportunities for the development of economy creative ecotourism.

The approach of developing and analysing the digitized map is based on three major aspects: (1) object of natural resources; (2) object for tourism (particularly related to endemic bird); and, (3) accessibility (airport/seaport and road). Potential areas of the natural resources were digitised based on available information from the provincial level. For example, we map the information on the Bird Endemic Bird Areas (EBA) including distribution of valued species, such as Birds of Paradise in Papua and identify the areas as the potential areas for ecotourism. Then, these areas were overlaid with the existing access (mainly, airports, roads and sea ports) to support ecotourism activity. Later, we list areas with highest number of endemic bird, and area that include other charismatic species, such as bird of paradise, bower birds and other option for

natural tourism (beaches or mountains) as the most potential area for ecotourism development in Papua in the near future.

NATURAL RESOURCE UTILIZATION

Potential Conflicts: Resource Extractions vs Ecotourism

Having an accurate and complete digitalized map containing ~~containing~~ information on the natural resources in the Papua Islands, in particular the Papuan Bird's Head Peninsula (BHP) area and overlay this information with information of the distribution of avifauna species and the natural beauty or features in Papua could help us to identify several potential conflicting land/natural resource uses in a certain area/location, i.e., for natural resource extractions vs for ecotourism.

One of these conflicts is due to, first, palm oil development. With the development of the palm oil industry, land conversion for private plantation enterprises is increasing rapidly. In the last five years, investments in oil palm plantations have been found in almost all districts in West Papua. With the declining land for oil palm business in western Indonesia, investors are now beginning to expand into the eastern regions of Indonesia and Papua and West Papua is a target of palm oil expansion.

The serious concern of palm oil investors has been due to the involvement of the tycoons who, according to Forbes Magazine (2014), is the richest man in Indonesia. Some of the corporations currently investing heavily in Papua and West Papua include tycoons, such as Garuda Mas (owned by SukantoTanoto), Sinar Mas Group (Eka Tjipta Wijaya), Salim Group (Antoni Salim), Austindo Nusantara Jaya Group (George S. Tahija), and Medco Group (Arifin Panigoro). In addition to those tycoons, investments also come from foreign corporations, particularly from Malaysia, Yemen, Hongkong, Srilanka, and China (Franky & Morgan 2015). Some companies even take advantage of areas previously used for industrial plywood as oil palm planting areas.

The second source of conflict is related to mining activities. Better mapping the potential mining resources is crucial. Potential mining resources in the West Papua Provincial Territory include: (1) Mineral Resources, such as metal mining materials, and coal mining materials and (2) oil and gas resources. In the province of West Papua, there are 12 mining prospects for metal mining. Metal excavation can be found at each location that is still a potential and not yet a metal quarry stock reserve. Therefore, the

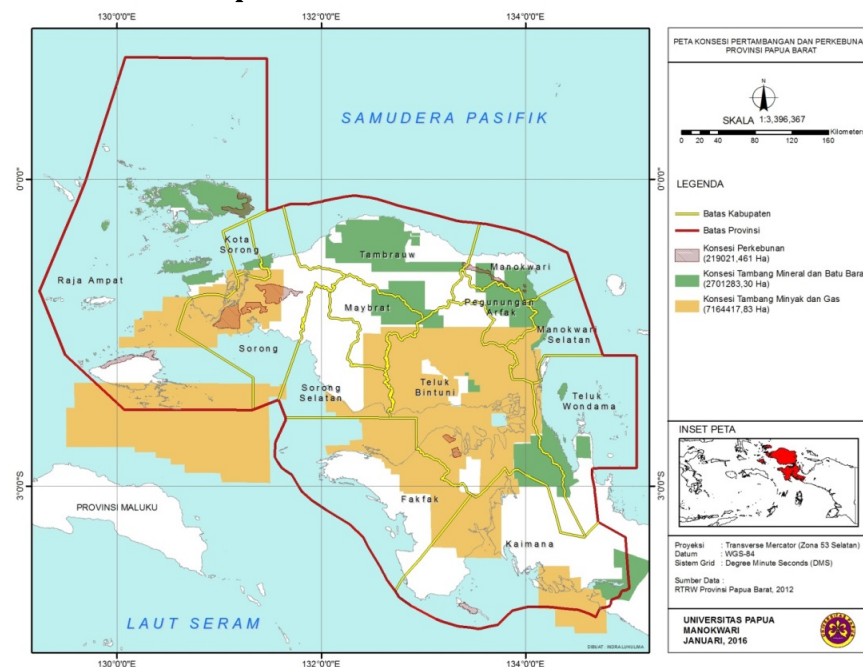
prospect areas of metal mining materials in West Papua still need to be inventoried in detail to know the available metal deposit.

Other Potential Sources of Conflict

The distribution of potential coal deposit areas in the province of West Papua is generally located in the southern south of the Bird's Head Peninsula. The distribution of coal prospecting locations is related to the process of formation and specific conditions of land physiography. Oil and natural gas in Papua was first built in the area around Sorong, Salawati, and Bintuni Bay. The first oil company that began operating in Papua since 1964 was Pertamina Operation EP whose operation covers the Klamono, Salawati, and Weriar regions.

Another prospect area that has the potential of oil and natural gas is the Kaimana area. In this region mining activities are still within the Type-D Seismic stage (Universitas Papua 2005). Areas that are geologically inhabited to hold oil and natural gas seeps are the areas of Arguni Bay and Besari Bay. Digitizing the map of plantation areas and mining deposit sites could help indicate the overlapped areas cultivated together in the form of private investment in mining and plantation (Figure 1).

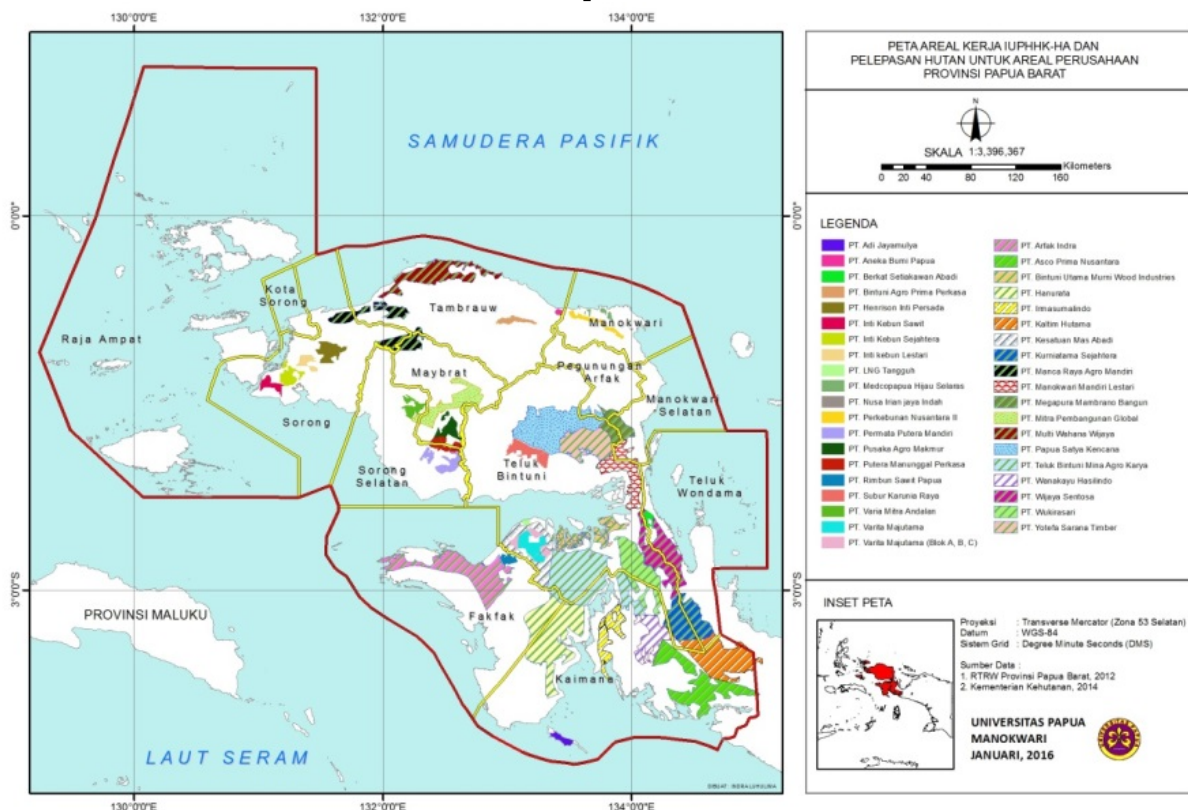
Figure 1. Overlaid Map of Mining and Modern Plantations Areas in West Papua Province



Another source of conflict is the logging activities. Logging activities in Papua began in the 1980s. The forestry sector has played an important role in the economic growth of Papua (Pattiselanno & Arobaya 2013), despite the fact that since 1994-2002 the contribution of the forestry sector in Papua GRDP continues to decline. However, in some districts including Manokwari, the forestry sector significantly contributes 20% to the total PDRB (Anggraeni & Watopa 2004).

The result of digitizing private investment enterprise sites operating in West Papua Province not only illustrates the potential sources of conflicts among the stakeholders involved (Figure 2), but also a negative impact on the remaining forest areas.

Figure 2. Overlaid Map of Logging Concession and Modern Plantation Areas in West Papua Province



The large population sizes combined with technological advances have allowed humans to exploit natural resources on a rapidly growing scale and with increasing levels of efficiency. Consequently, the use of natural resources represents a major threat to many plants and animals species. The opening of forests to logging sets off a domino

effect of road construction, immigration of job seekers and an escalation of commercial hunting and trade. Various forms of biodiversity use have impacted on the decline of species, including commercial fishing (Pauly et al. 2005), subsistence hunting (Fa & Brown 2009), extraction, collecting (Soehartono & Newton 2002) and trade.

IMPACTS OF DEVELOPMENT ON THE ENVIRONMENT

Some studies have identified the development particularly in extractive industries as the most threats on the environment, particularly on biodiversity. For example, mining, logging and modern agriculture and road development create more negative impact on the environment (Abood et al. 2015; Laurance et al. 2009). Abood et al. (2015) explained that 83% of the forest area or approximately 10.4 million ha was allocated by the Government for logging industries. About 64% of the forests allocated for large-scale logging are lowland forests. Deforestation and coastal development have escalated over the last 10 years but are yet unmeasured. Most of the lowland forests have been designated for logging and agriculture (Mangubhai et al. 2012).

Expansion of oil palm is a priority for both the central and the local government. Most of this expansion is expected to occur in Sumatra, Kalimantan and Papua, and the central government is keen to develop oil palm plantations in Papua and is offering investors the opportunity to establish concessions of up to 200,000 ha. Over 50,000 ha of oil palm has already been planted in Papua and permits have been allocated to develop another 500,000 ha (GRM International 2009). According to Abood et al. (2015), the total areas allocated for oil palm in Papua is approximately 500,000 ha or 3.3% out of the total forest areas allocated for industrial use.

Road development is currently a high priority of the Central and Local Government to boost local economy in Papua, although its negative impact has not been anticipated. Spatial analysis of road development in Papua, estimated that are 2,700 km of road (Anggaraeni & Watopa 2004). In his four-day trip to Papua and West Papua, President Joko Widodo promised to complete the construction of the Trans-Papua highway, which has been postponed due to various reasons since its start in 2013 including the 571 km stretch of the Trans-West Papua Highway along the coast that has split pristine forests and increased the trading of wildlife from remote villages into the nearest market towns at the Bird's Head Peninsula (Pattiselanno and Arobaya 2015).

Once roads are established, new entry points are created and provide more opportunities to access remote forest areas.

The conversion of massive forests and habitats was blamed for some plants and animals appearing to have become endangered or possibly extinct. Most importantly though, this is not just how we appreciate a biodiversity richness. The speedy forest conversion rate and the scale of plans for further conversion for industry may decrease ecological services crucial to human survival.

In this chapter we argue that maintaining the current EBA as an ecotourism and eliminating forest conversion activities within and surrounding EBAs could support the development of economic creative, as an alternative income, for local communities and at the same time create more ecological benefits to the environment.

ENDEMIC BIRD AREAS (EBA): ECOLOGICAL BENEFITS

The focus of this chapter on identifying ecological benefits is to promote and discuss the potential of Endemic Bird Areas as one of ecotourism destination areas. An environmental friendly tourism development is expected to conserve the endemic birds and so provide ecological benefits.

Currently there are eight Endemic Bird's Areas in Papua (both Papua and West Papua provinces), which occupied by 134 endemic species. Three are located in West Papua Province and the other five are distributed in Papua Province.² The EBA in Papua Province are Biak Numfor, Pegunungan di Bagian Utara Irian (Northern Mountain of Papua), Dataran Rendah di Bagian Utara Irian (Northern Lowland of Papua), Pegunungan Jayawijaya (Jayawijaya Mountain), Dataran Rendah di Bagian Selatan Irian (Southern Lowland of Papua) and Digul-Fly.

Each of Endemic Bird Area in Papua has its own value based on the unique species and habitat conditions that currently attract international bird watchers to visit Papua. At least each EBA contains 2 – 52 species, Yapen Island is one of EBAs with lowest number of endemic birds, while Central Highland has the richest EBA with 52 endemic species.

Using the EBA map (Figure 3), we put together important infrastructure that support ecotourism development in Papua, such as airport and seaport as well as road connections that link the closest arrival points to tourist destination. The difference of

²<http://www.burung.org/>, 24/07/2016.

brown colour in the figure shows number of endemic birds within the EBA. It is hope that by combining number of endemic birds, reliable accessibility (airport or sea port) and other natural objects, priority ecotourism area can be determined.

Figure 3. Infrastructures Accessible to the EBA Areas to Support Tourism in Papua

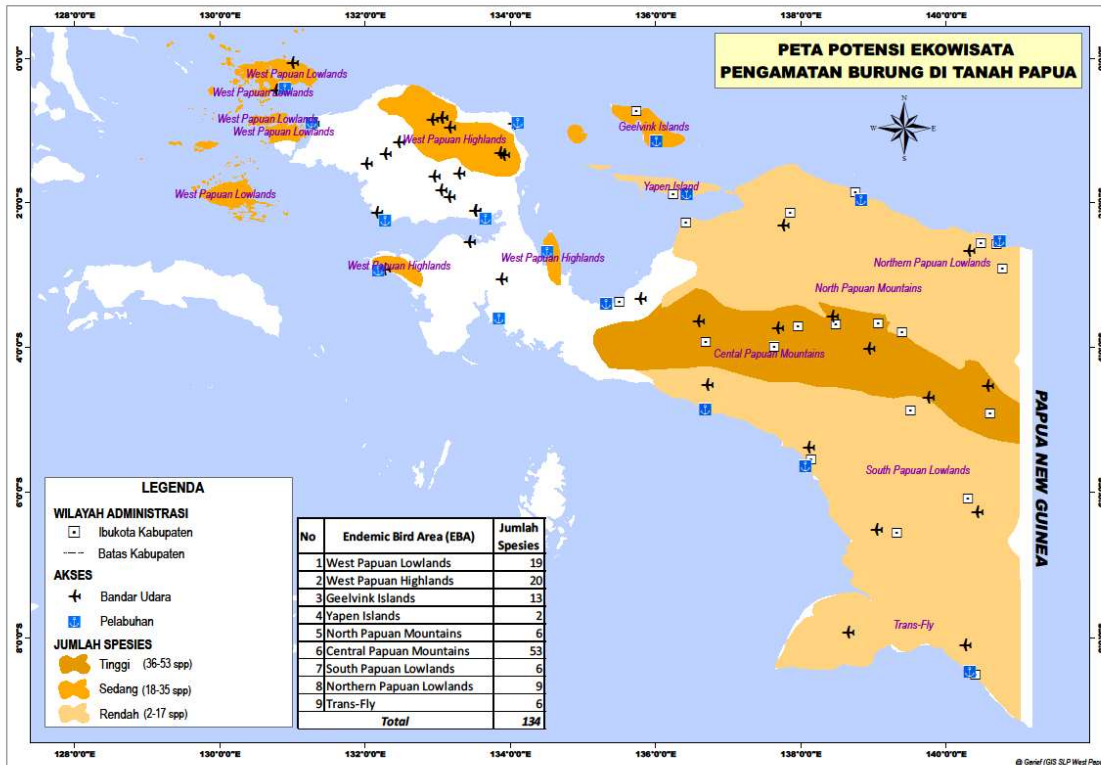
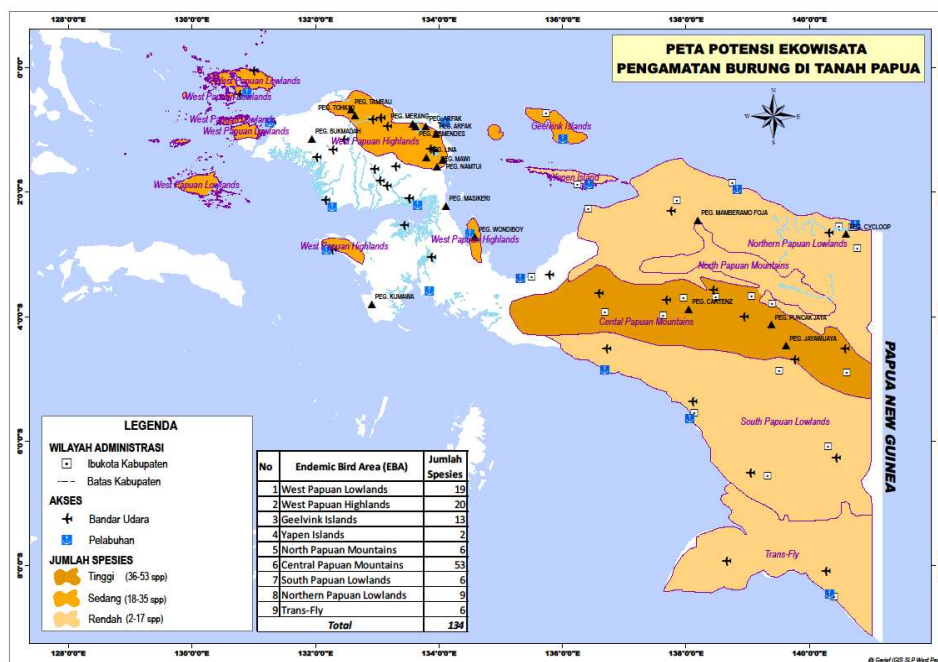


Figure 4 shows EBA with some features, like mountains and lakes, to give more information on the EBA, as some tourists prefer to climb and roam mountain and lake sites while watching birds. Almost all EBAs have nearby access, such as bigger airport or air strip that can hold single engine plane.

The map (Figure 4) gives more impressive actions for future development of birding sites because the local communities could benefit from the ecosystem service in the form of creative economy. In terms of habitat management, this will play important role to address the issue of biodiversity conservation and sustainable environment management. To boost the contribution of biodiversity on creative economy, the EBA especially birding sites that are advantageous to local communities should be protected for the sustainability of bird tourism. This needs to be included in the Government's commitment to support local communities by protecting the local important sites.

Figure 4. Specific Notations (Mountain and Lake) Closest to the EBA Areas for Bird Watching in Papua



ENDEMIC BIRD AREAS (EBA): ECONOMIC BENEFITS

The development of ecotourism in the Endemic Bird Areas is expected to bring economic benefit to local people and the government. This section will provide some lights on the benefits that could be achieved from these eco-tourism activities. We will look at the potentials of this tourism by observing the characteristics of tourist and what local people could gain.

Foreign Visitors

Currently, Indonesia's tourism sector accounts for approximately 4% of the total GDP. By 2019, the Indonesian Government aims to double this figure to 8% of the GDP.³ Data from Tourism and Telecommunication Ministry RI indicated that the number of tourist arrivals in Indonesia increased gradually from 8.8 million in 2013 to 9.4 million tourists in 2014 and to 9.7 million in 2015.

³ <http://www.indonesia-investments.com/business/industries-sectors/tourism/item6051/>, 20/08/2016.

In the World Economic Forum's Travel & Tourism Competitiveness Report, Indonesia jumped from rank on tourist destinations 70th in 2013 to 50th in 2015, an impressive improvement. This increase was initiated by Indonesia's rapidly growing number of foreign visitor arrivals, national policy on tourism industry and investment in infrastructure (for example the mobile phone network now covers most areas of the country, and air transport infrastructure has been expanded). The report states that the competitive advantages of Indonesia are price competitiveness, rich natural resources (biodiversity), and the presence of several heritage sites.

We do not have current data on tourist arrivals in Papua, but in general the number of visitors to Papua has increased.⁴ Data from the Fishery and Coastal Office of Raja Ampat for example, indicates the growth number of tourist arrivals in Raja Ampat in 2015 (Table 1).

Table 1. Tourist Arrivals in Raja Ampat (2015)

Description	Jul	Aug	Sep	Oct	Nov	Dec	Total
Domestic	177	43	104	296	204	574	2478
Domestic (Old)		1					1
International	322	447	786	1,358	1,326	1,952	11,655
International (Old)		1	1			1	22
Total	499	492	891	1,654	1,530	2,527	14,156
Description	Jul	Aug	Sep	Oct	Nov	Dec	Total
Domestic	176	43	100	225	172	327	1,960
Male	101	22	61	124	107	188	1,150
Female	75	21	39	101	65	139	810
International	304	413	764	1,115	1,028	1,009	8,961
Male	191	269	486	660	577	631	5,396
Female	113	144	278	455	451	378	3,565
Total	480	456	864	1,340	1,200	1,336	10,921
Male	292	291	547	784	684	819	6,546
Female	188	165	317	556	516	517	4,375

Source: Fishery and Coastal Office Raja Ampat Regency (2015)

According to the Raja Ampat Marine Protected Areas (RAMPA) Report, for the last two years, the number of tourist arrivals in Raja Ampat has increased, i.e., in 2016 international arrival reached 14,215 and domestic 3,457, and based on the available data until June 2017 international arrival reached 7,584 and domestic 1,404), as can be seen in the link of RAMPA website.⁵

⁴ <http://tabloidjubi.com/eng/more-than-114-201-tourists-visited-papua/>, 24/11/2017.

⁵ <http://www.kkpr4.net/index.php?page=page&id=34/>, 08/08/2017

We also have series of discussion with different stakeholders; and during informal discussion with Zeth Wonggor from Syoubri village in the Arfak Mountain Nature Reserve, he said that from his guest book it could be found out that annually between 20-30 tourists visit his bird's spots in Syoubri. Thus, utilising the EBA potency and the available infrastructure would help to increase benefits to local communities through bird tourism.

Expenditures

It is important to recognize that the tourism industry of Indonesia enhances its contribution towards the country's Gross Domestic Product (GDP) because it will trigger more foreign exchange earnings (on the average, each foreign visitor will spend between USD1,100 and USD1,200 per visit) while also providing employment opportunities to the Indonesian people (based on the latest data from Statistics Indonesia, the country's unemployment rate stood at 5.81% in February 2015). It is estimated that nearly 9% of Indonesia's total national workforce is employed in the tourism sector.

To give you a description of income obtained from tourism industries, the available and accessible data from Fishery and Coastal Office of Raja Ampat below shows the revenues from entry fees during the visit in 2015 (Table 2). The revenues from the entrance fee (the environmental services tariffs), were regulated by the "Peraturan Bupati No. 18 Tahun 2014" – to govern the operational of the marine conservation areas and public welfare funds.

Table 2. Revenues from Domestic and International Tourist Entry Fees (IDR) in 2015

Description	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ecosystem Services							
Domestic	72,225,000	18,257,000	44,200,000	125,800,000	86,700,000	243,950,000	986,900,000
Domestic (Old)		175,000					175,000
International	225,400,000	312,900,000	550,200,000	950,600,000	928,200,000	1,366,400,000	7,718,200,000
International (Old)		350,000	350,000			350,000	7,700,000
Sub-total	300,625,000	331,700,000	594,750,000	1,076,400,000	1,014,900,000	1,610,700,000	8,712,975,000
Retribution							
Domestic	13,275,000	3,225,000	7,800,000	22,200,000	15,300,000	43,050,000	185,850,000
Domestic (Old)		75,000					75,000

International	96,600,000	134,100,000	235,800,000	407,400,000	397,800,000	586,600,000	3,307,800,000
International (Old)		150,000	150,000			150,000	3,300,000
Sub-total	109,875,000	137,550,000	243,750,000	429,600,000	413,100,000	628,800,000	3,497,025,000
Total	410,500,000	469,250,000	838,500,000	1,506,000,000	1,428,000,000	2,239,500,000	12,210,000,000

Source: Fishery and Coastal Office Raja Ampat Regency (2015)

Our observations show that the structure of creative economy and tourism in Papua related to field of business consists of field of transportation, field guide, lodging, creative industries such as woven crafts, carvings, sculptural carvings, bark handicrafts and T-shirts as well as typical Papuan batik. In some sites, local vegetables, fruits, fish (salt fish, shredded fish, smoked fish), meat such as shredded meat and jerky – local culinary, could also be considered as creative economy business potential.

Amount of money tourists have spent during their visit to Indonesia more than enough and roughly between 6-8 Euros per person per day. For this coming 2017 there are many bird watching packages to Papua with various prices.⁶ One tourist operator for bird watching (Papua Bird Club) in Manokwari revealed that bird watchers will spend about US 220 - 300/person/day. A group bird watcher is ranging from 2 to 7-8 per group.

Benefits for Locals

Apparently, the bird business tourism or "bird tourism" is a promising business in Indonesia and could even be a strong link between the 'ecology' and 'economy'. For example, Jakarta Birder, starting from a hobby of bird watching, they began to receive requests from fellow birder from around the world to assist them.⁷ The result is seductive-a professional guide could put rates up to hundreds of thousands per day or even per hour.

In Syoubri of the Mountain Arfak Strict Nature Reserve, result from bird tourism was acknowledged in supporting school fee for children, building church, developing a village as well as villagers capacity. Those involved as tourist guide received benefits from English training, building homestay and guide training in

⁶ <http://www.birdquest-tours.com/Indonesia-West-Papua-New-Guinea-birding-tours-best/2017/30/08/2016>.

⁷ <http://www.mongabay.co.id/24/07/2016>.

collaboration with local NGO. Locals can also selling their fresh vegetables to the tourists when they stay in the village.

CONCLUSION

Bird Head of Papua (BHP) is known as an area with the richest diversity of reef, fish and coral species in the world. It is also considered the global epicentre of tropical shallow water marine biodiversity. Despite its rich environment, BHP is among areas with the highest level of poverty in Indonesia. It is estimated that in 2013, approximately 27 per cent of the population over there were considered poor people.

Poverty often pushes local government and the people to overexploit forest resources, through allowing plantation, mining and logging activities, to boost local development and to improve their livelihoods. Meanwhile, forests have long been considered a mother for native Papuans. Thus, the loss of forests will lead to disenfranchisement of ethnic Papuans from their traditional landscapes and lifestyles. The short-term economic gains from this forest exploitation are obvious, but the long-term losses less so.

In this chapter we argue that there is an alternative economic development for BHP. It is utilizing Papua's natural beauty and terrestrial habitats by informing the potentials and the avifauna distribution for the development of economy creative and ecotourism in the Endemic Bird Areas. These ecotourism activities could both generate both economic and ecological benefits for local people and governments.

The presence of eight endemic bird's areas in Papua (both Papua and West Papua provinces) occupied by 134 endemic species, supported by the natural beauty – terrestrial and coastal, offer potential bird watching and outdoor adventure from the coastal up to the mountain is very potential for the development of ecotourism.

The first step to achieve this goa is to develop an accurate digitized map of Papua pointing out to: (1) object of natural resources, 2) object for tourism (endemic bird), and 3) accessibility (airport/seaport and road).

This paper hence develops an example digitalized map containing containing information of the natural resources in the island of Papua, in particular the Papuan Bird's Head area and overlay this information with information of the distribution of

avifauna species and the natural beauty or features in Papua. This paper then shows that with this kind of map, we can identify possible conflicting uses of land/natural resources in a certain areas; i.e. for resource extractions vs for ecotourism. Finally, this paper presents general methods in analysing ecological and economic benefits of tourism activities in Endemic Bird Areas in BHP. Locally-generated revenues derived from tourism was from transportation, field guide, lodging and creative industries. In terms of local agricultural and fishery commodities, vegetables, fruits, fish – local culinary, was a potential creative economy business for local communities.

REFERENCES

- Abood, Sinan, N., Ser Huay Lee, Janice, Burivalova, Zuzana, Garcia-Ulloa, John, and Pin Koh, Lian. 2015. Relative Contributions of the Logging, Fiber, Oil Palm palm, and mining industries to forest loss in Indonesia. *Conservation Letters* 8(1): 58-67
- Anggraeni, Dessy, dan Watopa, Yoseph. 2004. Kajian Singkat Konservasi dan Ekonomi (RACE). Conservation International Indonesia
- Badan Planologi Kehutanan (BAPLAN). 2002. Data dan informasi Kehutanan Propinsi Irian Jaya. Pusat Inventarisasi Kehutanan. Badan Planologi Kehutanan, Jakarta. Departemen Kehutanan.
- Center of Excellence for Sustainable Development (CoE UNIPA). 2016. Review of the Importance of Natural Capital on Rural Livelihoods in West Papua Province. Report to Conservation International and Papua Barat Province. Lembaga Penelitian dan Pengabdian Kepada Masyarakat Universitas Papua, Manokwari.
- Fa, John, E. and Brown, David. 2009. Impacts of hunting on mammals in African tropical moist forests: a review and synthesis. *Mammal Review* 39(4), 231-264
- Franky, Y.L. and Morgan S. 2015. Papua Oil Palm Atlas: The companies behind the plantation explosion. Yayasan Pusaka, Jakarta
- GRM Internasional, 2009. Papua Assessment. USAID/Indonesia (Final Report). GRM Internasional
- Laurance, William, Goosem, Miriam. & Laurance, Susan. 2009.' Impacts of Roads and linear clearings on tropical forests.' *Trends in Ecology & Evolution* 24(12), 659-669. doi:10.1016/j.tree.2009.06.009
- Mangubhai, Sangeeta, Erdmann, Mark, V., Wilson, Joane,R., Huffard, Christine,L., Ballamu, Ferdiel, Hidayat, Nur, Ismu, H., Wen, Wen. 2012. Papuan Bird's Head Seascape: Emerging threats and challenges in the global center of marine biodiversity. *Marine Pollution Bulletin* 64, 2279-2295
- Marshall, Andrew, J. and Beehler, Bruce, M. 2007. *The Ecology of Papua: Part One*. (HK) Ltd: Periplus Editions.
- McPhee, E.C. 1988. Ecology and Diet of Some Rodents from the Lower Montane Region of Papua New Guinea.*Australian Wildlife Research* 15: 91-102
- Pattiselanno, Freddy, and Arobaya, Agustina, Y.S. 2013. The Global Center of Marine Biodiversity in Peril. Jakarta Post, 31 July 2013.

- Pattiselanno, Freddy, and Arobaya, Agustina, Y.S. 2015. Road Development versus Conservation. Jakarta Post, 21 May 2015
- Pauly, Daniel, Watson, Reg, and Alder, Jackie, 2005. 'Global Trends in World Fisheries: Impacts on Marine Ecosystems and Food Security.' *Philos Trans R Soc Lond B Biol Sci.* 360(1453): 5-12.
- Resosudarmo, Budy, P, and Jotzo, Frank. 2009. *Working with Nature against Poverty. Development, Resources and the Environment in Eastern Indonesia.* Institute of Southeast Asian Studies, Singapore.
- Soehartono, Tony, and Newton, Adrian, C. 2002. The Gaharu Trade in Indonesia: Is it Sustainable? *Economic Botany* 56(3): 271-284
- Universitas Negeri Papua (UNIPA). 2005. Atlas Sumberdaya Pesisir Kawasan Kabupaten Kaimana. Kerjasama Universitas Negeri Papua dan Kabupaten Kaimana
- West Papua Oil Palm Atlas, 2015. Yayasan Pusaka, Jakarta