

The Economic, Ecological, and Educational Benefits of Sea Turtle Conservation in North Bali Region

Gede Ananta Wijaya¹, I Nyoman Purwakanta², I Wayan Tantrawan³
^{1,2,3}PT Indonesia Power PLTGU Pemaron
 Singaraja, Indonesia

¹ananta.wijaya@indonesiapower.co.id, ²nyoman.purwakanta@indonesiapower.co.id, ³wayan.tantrawan@indonesiapower.co.id

Abstract—This study aimed at examining the economic benefits the sea turtle conservation brought to the coastal community, the impacts on the environment, and the benefits that it brings about to education sectors, especially as one of the biodiversity learning resources for the community and students in the region. The research design used in this study was qualitative descriptive. The data collection methods used were observation, questionnaires distribution, and interviews. The results revealed that the existence of the sea turtle conservation in North Bali region brought positive impacts on economic and educational sectors. In the economic sector, the sea turtle conservation has brought about positive impacts in developing the coastal areas particularly in Penimbangan Beach in North Bali region. Furthermore, in educational sector, the sea turtle conservation is often used as one of the learning resources for elementary school students in Pemaron Village near Penimbangan Beach.

Keywords—benefits; sea turtle conservation; economic; ecological; education sectors.

I. INTRODUCTION

North Bali has coastal resources that provide economic benefits to the region. The northern region, which is outlined by the North Bali Sea positively affects the community on the preservation of the sea and the sea lives. One of the beaches that stretch along North Bali region that has become the commodity of the region is the Penimbangan Beach. Penimbangan Beach is a unique coastal area with a variety of ecosystem, potentials, and activities. The beach is 738 m-length, with an area of 2,938 m². It is the ecosystem of various marine lives. Apart from that, Penimbangan Beach that has sandy sediments and freshwater springs under the sea, also provides positive impacts on the condition of the coral reef which could grow in shallow water, ranging from 3 - 12 meters and close to the beach.

The various types of underwater biota living in Penimbangan Beach must be preserved. Preliminary data from Kelompok Masyarakat Pengawas (POKMASWAS, or Supervisory Community Group) and North Maritime System (NMS, or a local community consisting of enthusiasts in North Bali Sea) showed that the local fishermen have carried out various activities in the area that provides economic values to the local residents. Many residents now open small food stalls and restaurants that sell various food and beverages. They also begin agricultural plantations in the surrounding area, and also

start housing and lodging business. What is more, the community usually conducts a number of religious activities and ceremonies at Segara Penimbangan Temple (Pura Segara Penimbangan) which is located at Penimbangan Beach. These circumstances have provided economic values to the region. Yet, on the other hand, the marine life is harmed by the large amount of liquid and solid waste disposed to the sea.

According to the head of the North Bali Scuba Diving Association, Mr. Mangku, the habitat of the marine life such as the green turtles which are locally known as the lekang turtles, have decreased due to environmental pollution. The economic values of Penimbangan Beach must be accompanied with a good management of the coastal areas so that the existing marine ecosystem can be preserved properly and can be used sustainably. Management of the coastal area of the Penimbangan Beach is important since it is home to a variety of activities and potentials that provide both ecological and economic benefits.

PLTGU Pemaron, a unit of PT Indonesia Power located in Pemaron village, North Bali region, concerned with the surrounding environment, one of which is the conservation of the sea turtles in Penimbangan Beach. This conservation is built in cooperation with POKMASWAS, NMS, SCUBA, and Marine Department of Ganesha University of Education. This conservation will bring about not only ecological and economic impacts, but also has benefits on education sector as one of marine life learning resources.

Regarding the above facts, the focus of the study is to describe the benefits of the sea turtle conservation pioneered by PT Indonesia Power in cooperation with the aforementioned parties, on the economic, ecological, and educational sectors of the community in the region.

II. METHODS

This study used a descriptive research design, describing the economic and educational impacts that the sea turtle conservation in coastal areas of Penimbangan Beach has brought to the local community. To be specific, this study was focused on Banjar Galiran, Bakti Seraga Village, Buleleng district.

The respondents in this study were various parties including the Supervisory Community Group (POKMASWAS), the merchants/sellers around Penimbangan Beach, and teachers and

endangering their life. The hatchlings then swim quickly until they are swept away by the waves which eventually carry them further into the ocean. Immediately after hatching, the hatchlings will disappear from shallow water near the hatching site. They will rarely be seen again in a few years. During this period, they follow the ocean currents and eat plankton that are close to sea level. Because observations are seldom made, very little is known about this 'absent year'. Young turtles may remain in one feeding site for several years before they move to another site. Hatchlings that are hatched in nature rather than in captivity tend to have higher risks of threatened by predators, thus, hatching turtle eggs are safer when done in captivity.

B. Sea Turtle Conservation Program through Hatchery Breeding in Penimbangan Beach, Bakti Seraga, Buleleng

Attempts to save the turtle population by establishing sea turtle breeding have been conducted for many years. The sea turtle conservation aims at keeping the natural cycles of the sea turtle reproduction. The conservation activities include rescuing the turtle eggs in their nests on the shore, moving the turtle eggs to the incubation site, and hatching, caring, raising the hatchlings to a certain size and finally, releasing (restocking) them into the ocean. Those processes become mandatory in a turtle conservation site. These attempts expected to be able to save the life span of the hatchlings to adulthood and reproduction phase, and increase the number of turtle populations living in the wild. The Penimbangan Beach Sea Turtle Conservation is one of the turtle conservations located in North Bali which is supported by PT Indonesia Power.

The Green Turtle (*Chelonia Mydas*) Conservation Program at the Penimbangan Beach Conservation in Bakti Seraga village, is a cooperation between Ganesha University of Education, Fishermen Group, and Pokmaswas of Bakti Seraga Village. The program is established by providing equipment in the form of flashlight and portable pumps petrol, as well as facilities for hatching and caring for the sea turtles, releasing sea turtles collected from confiscating, spoiling, found stranded, and collected by the community, as well as repairing the roof of the conservation building. The roof was modified in order to allow direct sunlight to come in to warm the turtle eggs in the incubation area. The sun lights can significantly assist the hatching process as an effort to conserve the endangered Green Turtle (*Chelonia Mydas*).



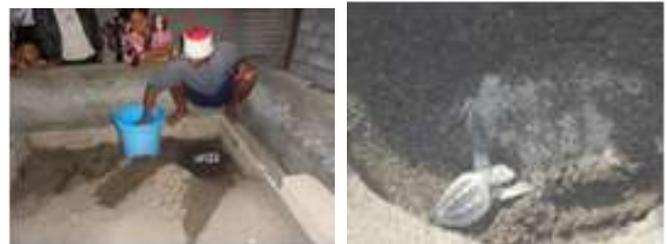
Turtle Breeding Locations



Search and Excavation of Hatching Eggs



Search and Excavation of Hatching Eggs



Eggs are placed in captivity



Figure 02 Hatchlings Conservation Program

The targeted achievement is to ensure and maintain the presence of the sea turtle eggs, to increase the number of eggs that hatch, and to re-release the hatchlings as an effort to conserve coral reefs on the coast of Penimbangan beach located in Bakti Seraga village, Buleleng, Bali. The number of eggs and hatchlings that have been released in the conservation site of the Penimbangan Coast is described in the following table.

NUMBER OF EGGS AND HATCHLINGS RELEASED

Data	Remarks	Year			
		2016	2017	2018	2019
Turtle Conservation Program through Hatchling Captivity at Penimbangan Beach, Bakti Seraga, Buleleng	Absolute results	1227	2984	3400	2015
	Number of eggs hatched and hatchling released	1017	2505	3150	4000

Based on the results of the research, the existence of the sea turtle conservation had positive impacts on economic, ecological, and educational sectors. The economic benefits that was brought about was an increase in the income of the community around the conservation area. Many local and international visitors came, either just to see or release the existing hatchlings. The percentage of income around the Penimbangan Beach shore had increased by 14% which was collected from donations from the surrounding community and from agencies which participated in hatchlings release. A hatchling release is valued at IDR 50,000.

With the large number of residents and visitors participating in the hatchling release, the donation collected by the organizer of the event could reach millions in each activity. A few agencies which have participated and donated in the hatchling release events included PT Indonesia Power Pemaron PLTGU, Employees Association of PT Indonesia Power employees, Buleleng Regional Police, Buleleng Regency PMD Office, Buleleng Fishery Department, Buleleng Natural Resources Conservation, Yonif Raider 900 / SBW, PKK (Women Association) of Bakti Seraga Village, domestic tourists and foreign tourists from Germany, Australia, Britain and India.

As for the biological aspect, there is an increase in sea turtle status data as follows table 01. Based on the above data, the sea turtle conservation could increase the number of turtles each year.

The educational aspect gained by the community is the training on how to breed hatchlings and how to release them. This turtle conservation involved a number of aspects such as providing facilities for hatching and captivating the sea turtles, releasing confiscated sea turtles, found on the shore, an /or voluntarily returned by the community. The program also involved repairing the roof of the captive breeding houses by modifying it, so that it could give access to direct sunlight to warm the turtle eggs in the turtle egg planting area. This consequently was expected could assist the hatching process.

For students, turtle conservation served as a marine life learning resource. When observing the hatchlings, students were given knowledge about how turtles lay eggs, how to care for turtle eggs, how to handle the hatching of the turtle eggs, and how to take care of the hatchlings.

During the release of the hatchling, students were taught about how to hold the hatchling, why the hatchling was placed inside the coconut shell cup, how long the hatchling could last

without being in the water, the right time to release the hatchling to the beach, and how to safely release the hatchling to the beach.

Similarly, the results of the questionnaire and interviews with teachers and students showed that the sea turtle conservation could be used as a learning resource. The teacher stated that students who were invited to go directly to the field to interact with nature had a better understanding of marine life especially about hatchlings, comparing to students who were only taught through books.

In addition, the students also mentioned that the conservation of hatchlings made them understand what marine life was like, especially the lives of sea turtles, how turtles lay eggs, how to care for turtle eggs, how to care for hatchlings, and how to release wild turtles. Students were also very excited to be able to directly touch the hatchlings and observed how the hatchlings swam in the sea.

The schools in North Bali region which have empowered hatchling conservation as a marine life learning resource were among others Dwi Aura Sukma Insani Pre-School, SD Negeri 1 Pemaron, SD Negeri 2 Pemaron, and a number of other elementary schools in Buleleng Regency.



Dwi Aura Sukma Insani Pre-School



Elementary Schools



PT Indonesia Power and other Company



PIKK Indonesia Power



Environmentalists

C. Discussion

The sea turtle conservation was managed by referring to community-based ecotourism, the development of ecotourism supporting and allowing full involvement of the local community from the phases of planning, implementing, through the management of the whole benefits. This conservation emphasized on the active role of the community. The coastal community were knowledgeable about their surrounding nature and culture that were potentials as tourist attractions. Thus, this conservation had positive impacts on the economic sector in the form of creating employment opportunities for the coastal community, providing additional income from tourism services, i.e. guide fees, and the opening of food stalls for visitors [1,2,3,4].

In ecological sector, the sea turtle conservation brought benefits on the change in mindset of the community to develop efforts to conserve sea turtles. The conservation conducted by establishing observation posts along the coast for observing turtles which went up to the land to lay eggs and saved their eggs from natural predators and human who wanted to take them. In addition, the local community also attempted in participating and disseminating the importance of the sea turtle conservation by socializing it to children, students, and visitors. The existence of the conservation was crucial to keep the beaches in Bali to be safe for the sea turtles to lay their eggs.

Finally, in education sector, the sea turtle conservation had become one of the most important learning resources and had very valuable values in the context of student learning processes. The environment could enrich the learning materials and activities. This conservation became a learning resource which could be used for learning purposes and its existence could be found, applied and utilized for learning purposes [5, 6, 7, 8].

According to The Ecotourism Society, ecotourism is a form of travel to natural areas which is carried out with the aim of conserving the environment and preserving the lives and well-being of the local population, is expected to be a solution to the decline in the turtle population [9, 10, 11]. Based on Peraturan Menteri Dalam Negeri Republik Indonesia Nomor 33 Tahun 2009 Tentang Pedoman Pengembangan Ekowisata di Daerah, in the first article of the first item, mentioning ecotourism in the Development of Ecotourism in Regions in the first article of the first item, mentioning ecotourism education, understanding and support for conservation efforts natural resources, and increasing local people's income. tourist attractions that can shade turtle conservation activities as well as educational activities such as research.

The function of ecotourism is emphasized into three main functions namely the education function, the tourism function and the conservation function [12,13,14,15]. This educational function aims to provide information to the tourists who come to the importance of maintaining their survival and how to maintain and preserve the habitat of sea turtles. Besides the educational function also serves to facilitate the research activities related to sea turtles. Activities will be undertaken in the education function is to research the type and classification of sea turtles; research on the types and causes of sea turtle diseases; monitoring turtle nesting activities; releasing hatchlings into the sea; seminars and observing turtle. Tourism activities in turtle breeding sites on the coast are maximizing natural potential. The nature of the coastline which is flat with the waves allows tourists to enjoy the natural scenery by just sitting enjoying the atmosphere of the beach or doing activities with nature such as swimming, diving, canoeing, snorkeling or other activities.

Conservation function is a function in which there are activities that can maintain the survival and breeding of sea turtles in order to increase the number of turtle populations. Activities undertaken in the conservation function are to see, touch and feed turtles; releasing hatchlings into the sea; monitoring turtle nesting activities; and move turtle eggs to safe areas

IV. CONCLUSION

The sea turtle conservation provided multiplayer effects on economic, ecological, and educational sectors. The income of the surrounding community had increased, the awareness in protecting the coastal environment and marine life was also increased especially the awareness on the sea turtle life, and that the existent sea turtle conservation could be used as a learning resource. Based on these conclusion, a number of suggestions were made to the concerned parties. This program provided many benefits both for PT. Indonesia Power and for the community. Therefore, the management of PT Indonesia Power is expected to support this program in a sustainable manner through the allocation of environmental assistance funds. This program would not be possible without a good cooperation with POKMASWAS, NMS, Scuba, and scholars of Undiksha.

Thus, all parties were expected to always establish good cooperation attempting and providing solutions to the problems occurred in the coastal area of Penimbangan Beach and its marine life. The turtle conservation was also expected to be developed in other coastal areas in the following years. The Department of Fisheries and Maritime Affairs was expected to continuously provide guidance for the community in participating, developing, and preserving the marine life. For the coastal community, the results of this study to were expected provide economic benefits.

The community around the coastline were expected to empower the utilization of turtle conservation as additional income sources by paying attention to environmental preservation and development of the marine life. The surrounding community was also expected to become water tourism tour guides who could provide tourists with awareness of the importance of protecting the sea and the ecosystem. For educators, this turtle conservation can be used as an alternative learning resource for students.

REFERENCES

- [1] Nontji, Anugerah, "Laut Nusantara", Jakarta, 2005, pg. 372.
- [2] Direktorat Konservasi dan Keanekaragaman Hayati Laut., "Pedoman Pengkayaan Populasi Kima (Tridacnae)" Jakarta: Kementerian Kelautan dan Perikanan, 2015.
- [3] Direktorat Konservasi dan Keanekaragaman Hayati Laut, "Dokumen Kerangka Acuan Kerja, Percontohan Pengelolaan Konservasi Kima", Jakarta: Kementerian Kelautan dan Perikanan, 2016.
- [4] Tisdell, C., Shang, Y.C., Leung, P., "Economics of Commercial Giant Clam Mariculture". ACIAR Monograph, No. 25, 1994, pg. 306.
- [5] Raden Ario, Edi Wibowo, Ibnu Pratikto, and Surya Fajar, "Pelestarian Habitat Penyu dari Ancaman Kepunahan di Turtle Conservation And Education Center (TCEC), Bali", *Jurnal Kelautan Tropis* Maret 2016 Vol. 19(1):pg. 60–66
- [6] Yayasan Alam Lestari, "Mengenal Penyu. Yayasan Alam Lestari dan Keidanren Nature Conservation Fund (KNCF) Jepang", 2000, pg. 81.
- [7] Sulaiman, P. S., Silfia, U., and Utama, A. A., "Konservasi Penyu di Pantai Batavia Kabupaten Bangka Provinsi Bangka Belitung", *Prosiding Forum Nasional Pemacuan Sumberdaya ikan III. Bangka* 18 Oktober 2011.
- [8] Syaiful, N. B., Nurdin, J., and Zukaria, I. J., "Penetasan Telur Penyu Lekang (*Lepidochelys olivacea*) Pada Lokasi Berbeda Di Kawasan Konservasi Penyu Kota Pariaman", *Jurnal Biologi Universitas Andalas (J. Bio. UA.)*. 2(3), 2013, pg 175-180.
- [9] Departemen Kehutanan, "Peraturan Pemerintah Republik Indonesia Nomor 7 tahun 1999 tentang Pemanfaatan Jenis Tumbuhan dan Satwa". Departemen Kehutanan Indonesia. Jakarta, 1999.
- [10] Luthfi, Oktiyas Muzaky, "Konservasi Terumbu Karang di Pulau Sempu Menggunakan Konsep Taman Karang". *Journal of. Innovation and Applied Technology*, Vol. 2 No. 1, Juni 2016.
- [11] Kazim, Faizal, "Pelestarian Terumbu Karang untuk Pembangunan Kelautan Daerah Berkelanjutan", Makalah disampaikan dalam Penyuluhan Kemah Bhakti UNG, 2011.
- [12] Ningsih, Fitria, and Umroh, "Perbandingan Keberhasilan Penetasan Telur Penyu Sisik (*Eretmochelys Imbricata*) di Penangkaran Penyu Pantai Tonggaci dan Upt Penangkaran Penyu Guntung", *Akuatik Jurnal Sumberdaya Perairan* Volume 11 Nomor 1, 2017, Pg 77-81
- [13] Purwati, E., "Keberhasilan Penetasan Telur Penyu Sisik (*Eretmochelys imbricata*) Pada Sarang Semi alami di Pulau Pramuka Taman Nasional Laut Kepulauan Seribu Jakarta", Skripsi, Jurusan Ilmu Kelautan. Fakultas Perikanan dan Ilmu Kelautan. Institut Pertanian Bogor, 2000.
- [14] Warikry, I, "Aktivitas Peneluran Penyu Lekang (*Lepidochelys olivacea*) di Pantai Kaironi Distrik Sidey, Kabupaten Manokwari", Skripsi Jurusan Manajemen Sumberdaya Perairan, FPIK. Universitas Negeri Papua, 2009.
- [15] Zamani, N.P., "Penyu laut reptil yang mendekati kepunahan", *Jurnal ilmu-ilmu perairan dan perikanan indonesia*. 4(2), 1996, pg. 91-97.