

RESEARCH ARTICLE

Sustainable Futures: Exploring Cenderawasih Bay National Park as Indonesia's Emerging Ecotourism Hub through Life Cycle Sustainability Assessment and Green Theory

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Abstract

This study examined the potential for ecotourism development centered around whale sharks in Cenderawasih Bay National Park. The preservation of Cenderawasih Bay National Park has been officially recognized as a national park and was regarded as a crucial conservation priority in Indonesia. Nonetheless, distinct obstructions and complexities were present during the execution of whale shark ecotourism in Cenderawasih Bay National Park. The implementation necessitated a careful and conscientious approach that adhered to the tenets of responsible and sustainable ecotourism. This research utilized the Life Cycle Sustainability Assessment (LCSA) and Green Theory to examine the ecological, social, and economic implications of the whale shark ecotourism sector in Cenderawasih Bay National Park comprehensively and sustainably. By integrating these two approaches, this research aimed to offer all-encompassing and enduring strategic suggestions for advancing whale shark ecotourism in Cenderawasih Bay National Park.

Keywords: Ecotourism, Whale Shark, Life Cycle Sustainability Assessment (LCSA), Green Theory, Cenderawasih Bay National Park

I. Introduction

Tourism is a significant driver of global economic expansion, representing one of the most rapidly expanding sectors worldwide. The tourism industry has witnessed a significant rise in the popularity of ecotourism, which is characterized by a growing number of individuals who are inclined towards travel experiences that are both culturally authentic and environmentally responsible. In recent years, there has been a notable increase in the number of tourists due to the advancements in globalization (Morales, 2020). The number of international trips individuals undertake exceeds one billion annually, representing a twofold increase from the figures recorded two decades ago. Empirical evidence suggests that tourism on a significant scale has adverse effects on the host community's environment, including heightened pollution levels and degradation of the local ecosystem. It is accountable not only for environmental issues but also for cultural commodification and a decline in the living standards of local communities (Corradi, 2017).

The present study encompasses a discourse on the potential of ecotourism as a means of promoting both the well-being of local communities and the preservation of natural resources. Ecotourism is presently characterized as a form of conscientious travel to natural areas that prioritizes the preservation of the environment, the maintenance of the local community's welfare, and the provision of educational and interpretive opportunities (TIES, 2015). Ecotourism presents a viable solution to the current crisis. If properly executed, ecotourism has the potential to offer an affordable and temporary remedy. The tourism industry in Indonesia exhibits substantial potential and has the capacity to emerge as a noteworthy contributor to the

state's revenue. The Cenderawasih Bay National Park in Papua, Indonesia, boasts the natural tourism potential of whale sharks. The Cenderawasih Bay National Park, spanning 1,453,500 hectares, presents significant opportunities for tourism and environmental conservation efforts, crucial for preserving its natural resources.

The conservation of Cenderawasih Bay National Park has been designated a national park and is considered a crucial conservation priority in Indonesia, as Erdmann et al. (2010) stated. Cenderawasih Bay National Park has diverse ecosystems and resources exhibiting high endemism levels. The pause shark, a marine creature, is frequently observed inhabiting the waters of the Cenderawasih Bay National Park. According to Stewart (2011), in certain nations, sharks' docile and friendly demeanor, coupled with their regular occurrence, has resulted in their loss of status as symbols of marine ecotourism. Unique obstacles and challenges exist during the implementation of whale shark ecotourism in Cenderawasih Bay National Park such as implementing whale shark ecotourism in Cenderawasih Bay National Park poses challenges such as managing visitor interactions to minimize negative impacts, establishing clear regulations to prevent overcrowding and habitat degradation, fostering community involvement and education, and addressing the potential effects of climate change on whale shark behavior. Balancing economic opportunities with environmental preservation is essential for sustainable success. The research aims to assess the ecological viability of Cenderawasih Bay National Park concerning the advancement of ecotourism. This statement explores various aspects, including preserving biodiversity, safeguarding habitats, maintaining water quality, and promoting ecosystem well-being. This research

additionally evaluates ecotourism's social and cultural viability of the undertakings carried out within the park. Furthermore, it considers the economic viability of ecotourism endeavors within the park. The study employs the life cycle sustainability assessment framework and green theory to assess the comprehensive sustainability performance of the national park in its capacity as an ecotourism site. Moreover, it furnishes pragmatic suggestions and tactics to augment sustainability.

II. Research Method

a. Location of The Research

The object of this research is located at Taman Nasional Teluk Cenderawasih, West Papua, Indonesia. According to Balai Besar Taman Nasional Teluk Cenderawasih (2023), TNTC has a total area equal to 1.453.500 Ha, with 68.200 Ha of land area, and 1.385.300 Ha of marine area.

b. Variable and Indicator of The Research

This research focused on examining the impact of each variable such as the economic aspect, social aspect, and environmental aspect which is linked to ecotourism at Taman Nasional Teluk Cenderawasih. The definition of operational variables shown in the table below.

Variable	Indicator	Item	Definition	Reference
Environment	<ul style="list-style-type: none"> <input type="checkbox"/> Species Conservation <input type="checkbox"/> Water Quality <input type="checkbox"/> Resource Sustainability 	<ul style="list-style-type: none"> <input type="checkbox"/> Controlling the number of whale shark ecotourism tourists, monitoring the condition and population of whale sharks, and the marine environment <input type="checkbox"/> SPL (Sea Surface Temperature) <input type="checkbox"/> Salinity <input type="checkbox"/> Pollution in Water <input type="checkbox"/> Marine fuel that is good for the environment 	Every aspect of whale shark ecotourism activities, whale shark numbers, and whale shark and marine ecosystem health. This covers water quality, vessel fuel use, and energy consumption in whale shark ecotourism activities.	Ly, 2014
Economy	<ul style="list-style-type: none"> <input type="checkbox"/> Local Economic Impact <input type="checkbox"/> Sustainability of Finance 	<ul style="list-style-type: none"> <input type="checkbox"/> Jobs for locals <input type="checkbox"/> Increase in local economic income <input type="checkbox"/> Development of tourism infrastructure <input type="checkbox"/> Operating costs <input type="checkbox"/> Income 	Aspects of whale shark ecotourism's contribution to the local economy, including income and all budget spending activities for the improvement or development of ecotourism infrastructure	Ly, 2014
Social	<ul style="list-style-type: none"> <input type="checkbox"/> Community's Involvement <input type="checkbox"/> Education and Awareness <input type="checkbox"/> Culture Acknowledgement 	<ul style="list-style-type: none"> <input type="checkbox"/> Empowering the community and including the community's role in the ecotourism sector <input type="checkbox"/> HR capacity building in the community <input type="checkbox"/> Cultural, religious, and historical zoning <input type="checkbox"/> Local knowledge on biodiversity management 	Aspects of ecotourism that promote the empowerment and welfare of local populations, such as initiatives that raise public knowledge and understanding of the need of whale shark protection and marine environment conservation in general	Ly, 2014

Tab. 1. Definition of Operational Variable
Source: Author

c. Data Collection Method

The author gathered secondary data from previous research and the official website of Taman Nasional Teluk Cenderawasih. To validate this information, semi-structured interviews with experts were conducted to obtain in-depth viewpoints on the results and recommendations for ecotourism at Taman Nasional Teluk Cenderawasih.

d. Data Analysis and Processing

This research used two different methods to analyse the data. The first is, Life Cycle Sustainability Assessment (LCSA) is a methodology to evaluate all sustainability pillars including environmental, social, and economic impacts in decision-making processes in order to create more sustainable outcomes in the life cycle (Life Cycle Initiative, 2023). In the methodology itself, LCSA frameworks consist of four phases, 1) LCSA goal and scope; 2) LCSA inventory analysis; 3) LCSA impact assessment; and 4) Interpretation (Shrivastava & Unnikrishnan, 2021). The second method used in this research is the Green Theory which emerged as a response to the inadequate acknowledgment of environmental issues within international

relations. Its objective is to provide fresh analytical and normative perspectives on global environmental transformation (Eckersley, 2013). This theory believes that if in a country there are many members of the population in it then to achieve a sustainable environment or environmental improvement will not be realized, a smaller community is needed. Decentralization, or the transfer of authority and decision-making from central to local level bodies, has certain attractive features, such as self-determination and democratic accountability.

III. Life Cycle Sustainability Assessment & Green Theory

a. Life Cycle Sustainability Assessment of Taman Nasional Teluk Cenderawasih

LCSA of Teluk Cenderawasih started with the planning stage, in which there are numerous steps in the planning stage to assess the Life Cycle Sustainability Assessment, such as identification, objectives, and potential impact. There is data in the identification stage that shows that in 2017 before the issuance of the Long Term Development Plan (RPJP) for Cenderawasih Bay, the whale shark population reached 115 individuals, and after the enactment of the 2018 RPJP – 2027, the whale shark population increased to 180 individuals. Government Regulation Number 12 of 2014 was implemented in Cenderawasih Bay National Park at the goals stage to boost ecotourism. Stakeholders such as the local fishing community, shark specialists, and local government were consulted. Government institutions and non-governmental organizations (NGOs) provided training and job possibilities to some coastal communities. Ecotourism places suited for whale sharks and the marine environment were identified during the planning stage. For ecotourism operators, rules and regulations like visitor

limits, safe distances, and ethical behavior were devised. The 2018-2027 RPJP created standard guidelines to govern visitor activities.

During the implementation stage, ecotourism operators are required to address resource sustainability, such as minimizing fuel and plastic waste. Diesel fuel consumption has significant environmental consequences, such as CO2 emissions and water pollution. There are regulations in place to limit the sulfur content of gasoline and to avoid pollution in the marine environment. In the operational stage, it is critical to monitor the whale shark population and the maritime environment. The presence of whale sharks is influenced by high levels of chlorophyll-a and Sea Surface Temperature. To reduce pollution and safeguard the Cenderawasih Bay tourism zone and whale shark population, efforts must be made. Practical adoption entails taking proactive, preventative, and punitive measures to reduce criminal activity and safeguard the environment. It is critical to include local populations in ecotourism initiatives for long-term sustainability and economic rewards. To facilitate their participation, training, and career possibilities are made available. Collaboration with multiple stakeholders, sustainability review, and repair and maintenance procedures are all part of maintenance. The RPJP 2018-2027 governs joint efforts between the governments of Nabire and Teluk Wondama Regencies, the University of Papua, WWF, Conservation International, and LIPI.

b. LCSA Impact Assessment

The calculation of LCSA is in three prominent aspects such as economic aspect, social aspect, and environmental aspect. The calculation of the impact assessment is shown in the Table. 2.

E n v i r o n m e n t	Species Conservation		Status	Reference
	Limiting the number of visitors to whale shark ecotourism		✓	RPJP 2018 - 2027 TNTC
	Monitoring the condition and population of whale sharks and the marine environment		✓	RPJP 2018 - 2027 TNTC
	Water Quality		Regulation	TNTC
	SST (Sea Surface Temperature)		18 - 30 Celcius	27 - 32 Celcius Rowat, 2007, Arip et al., 2017)
	Salinity		26% - 35%	33% - 34% Keputusan Menti Lingkungan Hidup 1984 dan 2004
	Water Pollution		1,23625 kg Ship and speed boat/trip pollution calculations	
	Resource Sustainability		Regulation	TNTC
	Environmentally friendly marine fuel		Biofuel	Fossil Surat Edaran Direktur Jenderal Perhubungan Laut No. SE.35 Tahun 2019 tanggal 18 Oktober 2019

Tab. 2. Environmental Aspect in LCSA Taman Nasional Teluk Cenderawasih
Source: Secondary Data Processing (2023)

In terms of local economic effect, as indicated in the 2018-2027 RPJP, TNTC has created job possibilities for local citizens. However, new connecting infrastructure and housing facilities are required to encourage tourism in the TNTC area. In recent years, the number of visitors has expanded dramatically, resulting in increased local economic gain. In terms of financial sustainability, TNTC's operational expenditures surpass the company's greatest revenue in 2022. Economic measures must be implemented to promote both the growth of tourism infrastructure and the improvement of the local economy. More information from Table 3 is required for the social aspect.

S o c i a l	Local Community Engagement		Status	Reference
	Community Empowerment and involve the role of the community in the ecotourism sector		✓	RPJP 2018 - 2027 TNTC
	Education and Awareness		Status	Reference
	Community training		✓	RPJP 2018 - 2027 TNTC
	HR capacity building		✓	RPJP 2018 - 2027 TNTC
	Cultural Award		Status	Reference
	Zoning Culture, Religion, History		✓	RPJP 2018 - 2027 TNTC
Local wisdom related to biodiversity management		✓	RPJP 2018 - 2027 TNTC	

Tab. 3. Social Aspect in LCSA Taman Nasional Teluk Cenderawasih
Source: Secondary Data Processing (2023)

TNTC has met all stages of evaluation, beginning with local community participation, education, and awareness, which includes community training and human resource capacity building, and cultural awards, as outlined in the 2018-2027 RPJP. However, according to the statistics reported in the 2018-2027 RPJP, there are still a few locals who participate in events or training offered by the

government or non-governmental organizations (NGOs). This can lead to assumptions based on Mukherje, N, and van Wijk's (2003) belief that poor community involvement might be caused by the community not being included in decision-making. The last aspect, which is the environmental aspect that is shown in the Table. 4.

E c o n o m y	Local Economic Impacts		Status	Detail	Reference
		Jobs for local residents	✓	Patrol, MMP, Etc.	RPJP 2018 - 2027 TNTC
		Development of tourism infrastructure	×	There is no connectivity infrastructure yet	RPJP 2018 - 2027 TNTC
		Increase in local economic income	✓	2-fold increase in 2022	RPJP 2018 - 2027 TNTC
	Keberlanjutan Keuangan		Value	Reference	
	Operating costs	155 Billions / Year		RPJP 2018 - 2027 TNTC	
	Income	102 Billions in 2022		BUKANS PERIS Nomor SP-108/18/MAS/PP/1845.1/1/2023	

Tab. 4. Economy Aspect in LCSA Taman Nasional Teluk Cenderawasih
 Source: Secondary Data Processing (2023)

The RPJP 2018-2027 controls whale shark ecotourism while also monitoring their numbers and the maritime environment for conservation purposes. SST, salinity, and pollution are all considered water quality variables. SST in the TNTC varies from 27 to 32 degrees Celsius, which might have an impact on migration patterns and whale shark populations. The salinity in TNTC is normal (33-34%). Water pollution from ship and speed boat emissions is not clearly regulated, however sulfur content in gasoline is. Transitioning to biodiesel and other environmentally friendly fuels is essential for long-term viability. Data on boat fuel use in Cenderawasih Bay is scarce.

c. Green Theory's Explanation in Taman Nasional Teluk Cenderawasih

Green Theory explains the need to respond to inadequate acknowledgment of environmental issues which broaden in sustainability pillars such as social and economic. In International Relations (IR), Green Theory aims to captures the orientation

of political relations, values, and agencies in regard with environmental issues. It also stressed on moving beyond environmentalism and political ecology to understand political, economics, and social relations with environmental point of view. Green Theory also gives IR scholarship a moral vision which is the green value or ecocentrism which include rejection of political boundaries between states or agencies with ecosystems (Goodin, 1992). In this paper, we use the combination of LCSA method and Green Theory on TNTC from the data the authors gathered. Green Theory used on this analysis consisted on five aspects including planning phase, implementation and operational stages, external relations, economic impacts, and social impacts regarding TNTC and its transformations. The authors have analysed the data gathered from the national park through the LCSA method and its four phases.

In this analysis, the authors point out the first phase of the planning. From the results, we can see that there are positive progressive impacts from the national park management in increasing the number of whale sharks up to 180. The national park has already developed strategic objectives to uphold its sustainable growth in line with the rules and right methods under Government Issue Number 12 the year of 2014. Not only that, but the national park has also drawn a commitment with the local communities to mitigate and partnerships including NGOs to withstand the growth progress. The authors see these planning actions as the first step to acknowledging the environmental issues in the national park. It captured a glimpse of the ecological viewpoint that there are security issues from within its management and its long-term vision in accordance with the RPJP up until 2027.

The second analysis drawing from the implementation and operational stages saw

growth progress in the national park. The management has drawn a great shift into a greener method of running the national park. Our analysis shows the national park is currently focusing on using greener transportation, controlling the national park protocol, regular monitoring, protection stages, and collaborating with indigenous communities around the national park. From the Green Theory perspective, the national park has shown more cooperative and collective decision-making to raise the boundaries and seek political community for solutions based on political association and ecological relationships (Dyer, 2017). The current RPJP demonstrates the willingness of the national park to transform the past vision into a more cooperative environment, yet encouraging application in the green economy. The authors also see the plan to collaborate with the indigenous communities or NGOs to represent the national parks to give social benefits to its surrounding. It also represents the moral vision in the form of green value which operates in human material development to support the national park's sustainable growth in the future.

We also gathered some data regarding the national park's partnership with local government, think-tank, and NGOs as our third analysis stage. Drawing from the current RPJP, we can recognize the ecocentrism which arises around the operational and maintenance control of the national park. The decentralization governed by the local government also gives some advantages to benefitting the local resources circling around the national park. In line with the Green Theory, the authors point out that national park management has transcended the political boundaries to acknowledge localization to promote cross-community cooperation. If the current partnerships can be retained in perpetuity, sustainable growth can

be increased annually. We also observed the desired outcomes from the partnerships will be a green social movement collaborating across local and national actors. We can accept the fact that the national park has embraced ecocentrism which coincides with the Green Theory's perspective on dealing with environmental issues.

The results of the LCSA examination reveal that Taman Nasional Teluk Cenderawasih (TNTC) has successfully met the evaluation criteria outlined in the RPJP 2018 – 2027, particularly with respect to the local economic impact. Specifically, as the fourth analysis, TNTC has demonstrated efficacy in providing employment opportunities for local inhabitants. The park's adherence to the established criteria underscores its positive influence on the local economy, contributing to job creation and economic growth within the community. Nevertheless, the assessment of tourism infrastructure development reveals a deficiency in infrastructure within the TNTC vicinity, necessitating the establishment of suitable accommodation options to cater to the needs of TNTC tourists. The development of ecotourism is contingent upon sufficient infrastructure within national parks. The presence of a good infrastructure is instrumental in enhancing accessibility to the national park, which can lead to an increase in the number of visitors. Accessibility is a central element of any responsible and sustainable development policy. It is both a human rights imperative, as well as an exceptional business opportunity (United Nations, 2017). Furthermore, it facilitates improved mobility within the park premises. Implementing this measure is expected to facilitate the navigation of visitors through various sections of the national park and enable them to reach spots where they can observe whale sharks.

In addition, it will facilitate the delivery of enhanced services for guests. Besides that, the

presence of a good infrastructure can create economic prospects for the neighboring communities of national parks. It is a vital ingredient to economic growth and development, which is the key to raising living standards (Henckel & McKibbin, 2010). Other than that, national park visitors' safety and security are contingent upon sufficient infrastructure, encompassing reliable evacuation routes and prompt access to emergency services. Therefore, national parks must invest in good infrastructure to ensure accessibility, service quality, environmental sustainability, local economic growth, and the safety and security of tourists. It is noteworthy that the design of the infrastructure must prioritize environmental sustainability to protect and preserve the national park's ecosystem. The Green Theory perspective emphasizes the significance of achieving equilibrium between the pursuit of economic expansion and safeguarding the environment in Cenderawasih Bay National Park. The main objectives of sustainable design are to reduce, or completely avoid, depletion of critical resources, prevent environmental degradation caused by facilities and infrastructure throughout their life cycle, and create built environments that are liveable, comfortable, safe, and productive (WBDG Sustainable Committee, 2021). Establishing infrastructure necessitates adopting sustainable measures, responsible management of scarce natural resources, economic sustainability in the construction of infrastructure and lodging in Cenderawasih Bay National Park, and sustainable economic diversification with a view to decreasing reliance on industries that have a detrimental impact on the environment. Furthermore, it can be observed that there has been a significant rise in the volume of visitors during the period spanning 2021 to 2022, exceeding twice the previous count. This suggests that there is a potential for a corresponding surge in the local

economic revenue within the vicinity of the Cenderawasih Bay National Park region. According to the financial sustainability assessment outlined in the 2018 – 2027 RPJP, the aggregate operational expenses incurred by Cenderawasih Bay National Park amount to 155 billion annually, surpassing the company's maximum revenue of 102 billion per year, which was recorded in 2022. Consequently, it is imperative to implement measures that facilitate compliance in the economic domain to bolster the operational expenses of the Cenderawasih Bay National Park. These measures should focus on the development of tourism infrastructure and the fortification of the local economic sector, with the aim of guaranteeing the long-term economic viability of the Cenderawasih Bay National Park. It is imperative to ensure transparency, accountability, and judicious financial management in the allocation and utilization of operational funds.

Lastly, as our fifth analysis from Green Theory perspectives regarding its social dimension, the Cenderawasih Bay National Park has undergone a comprehensive evaluation process, encompassing various aspects such as community engagement, education, and awareness-raising initiatives, including community training and human resource development, as well as cultural accolades that have been codified in the 2018 – 2027 RPJP. It may be inferred that the Cenderawasih Bay National Park has effectively engaged the local communities in the management and advancement of the region. The aforementioned observation demonstrates the dedication and involvement of the local populace towards initiatives aimed at preserving and regulating the exploitation of environmental resources within the region. Furthermore, Cenderawasih Bay National Park has successfully executed impactful educational and awareness initiatives, such as

community instruction and the development of human resources. This demonstrates that the local populace has been equipped with adequate knowledge and competencies to effectively participate in the preservation of the environment and promotion of tourism within the region. Finally, it should be noted that Teluk Cenderawasih National Park has duly acknowledged and expressed appreciation for the cultural values that are inherent to the area. The aforementioned indicates a concerted endeavour to advance cultural diversity and engage indigenous communities in the process of making decisions pertaining to sustainable tourism administration.

IV. Conclusions and Recommendation

The Life Cycle Sustainability Assessment (LCSA) process encompasses key stages such as identification, objectives, potential effects, and implementation strategies. Notably, data from the identification stage indicate a positive trend, with the whale shark population showing an increase following the execution of the Long Term Development Plan (RPJP) in Cenderawasih Bay National Park.

The objectives stage involves the execution of ecotourism activities within the park, with careful consideration of potential impacts by incorporating stakeholder input to prevent undesirable consequences. During implementation, efforts are directed at identifying suitable ecotourism destinations, establishing standards for operators, and promoting environmentally beneficial behaviors. Operational sustainability is emphasized, including initiatives to reduce fuel consumption and plastic waste.

In the maintenance stage, activities such as monitoring, practical adoption, collaboration, sustainability review, and repair

and maintenance contribute to ongoing success. The national park has demonstrated commendable strides in sustainable management through collaborations with local communities and non-governmental organizations. Economic benefits and infrastructural development have been addressed, but improvement in connection infrastructure is identified as a priority.

The LCSA findings underscore the importance of achieving a delicate balance between economic growth and environmental sustainability in national parks. This aligns with the principles of Green Theory, emphasizing the significance of adopting sustainable environmental management practices. The LCSA analysis reveals that Cenderawasih Bay National Park's initiatives are consistent with the environmentally conscious principles advocated by Green Theory, emphasizing the need for continued commitment to these practices for future ecotourism management.

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