

Research Article

Management policy of the Daab Natural Conservation Area in Maluku Tenggara Regency, Maluku Province

Debby Vemiancy Pattimahu^{1*}, Johan M Matinahoru¹, Frangky Tutuarima²

¹Forest Management Study Program, Postgraduate, Pattimura University,
Jl. Ir. M. Putuhena – Kampus Poka, Ambon-97233bon, Indonesia

²Climate Change Office, Region Maluku and Papua, Indonesia

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ABSTRACT

Maluku is one of the areas in eastern Indonesia with various habitats to its condition as a group of islands. One notable feature of the region is the Daab Nature Reserve is located in Southeast Maluku Regency of 14,218 hectares. According to the Decree of the Minister of Forestry No. 836/Kpts-II/1993 dated December 23, 1993, the reserve has been designated as a conservation area. This is due to its unique components, including plants, animals, the environment, and ecosystems. Therefore, this study aims to determine the stakeholders' potential in managing the Daab Nature Reserve and formulate a sustainability policy. The data obtained were analyzed using the Analytical Hierarchy Process (AHP). The results showed that the alternative management policies included co-management (44.7%), capacity building (40.4%), and community participation (14.9%).

Key words: conservation area, Daab Nature Reserve, management policy.

INTRODUCTION

Natural ecosystems are essential for ecological processes that sustain human life and support economic activities (Djajadiningrat *et al.* 2011). Among these ecosystems, nature reserves are particularly important because they contain biotic and abiotic components that can support surrounding habitats. However, nature reserves and their constituent elements can experience modification due to various factors, including population density, natural disasters, pests, diseases, community pressure, forest product extraction, hunting, and land grabbing.

Illegal logging is a form of organized crime that poses a threat to natural conservation (Kleinschmit *et al.*, 2016). Several studies have shown that various actors are involved in this activity, including legal and illegal entrepreneurs, corporations, and traditional communities. Therefore, it is important to prevent the destruction of the environment through illegal logging. Otto & Ozment (2017) have emphasized the importance of natural infrastructure development such as forests, over artificial infrastructure. This indicates that it is important to strike a balance between development and conservation goals.

In many countries, conflicts often arise in the management of conservation areas. For example, severe conflicts have been reported between reserve managers and local communities in the Nangun River reserve, Yunnan, China (Kui, 2000). The protection of the Khao Yai National Park, Thailand, has also been challenged by various activities, including rapid population growth, timber exploitation, Land and energy, tourism, and housing development (Panusittikorn & Prato, 2001). Furthermore, a previous study showed that the Van

Long Nature Reserve was threatened by forest fire, unsustainable land use in the core zone, the rapid development of tourism, and the presence of the adjacent cement plant (Nguyen, 2008). Conflicts also occurred in the preservation of elephant and or tiger habitat in India and Nepal. Due to these conflicts, humans and wild animals are forced to share common resources, which can lead to disputes (Bargali, 2016 and Neupane *et al.*, 2017). A previous study reported disputes between humans and rare tigers in Kerinci Seblat National Park, Sumatra, Indonesia (Nugraha & Sugardjito, 2009). According to Madden (2009), human-wildlife conflict is a serious obstacle to conservation worldwide and can become more common with increasing human populations, expansion of development, global climate change, and environmental factors. This conflict is a widespread problem that threatens both animals and local livelihoods and possesses an added risk to human life, specifically when predators are involved (Miranda *et al.*, 2016).

Tropical natural forests in Indonesia are currently experiencing increased damage due to massive logging and forest fires that occur every dry season. This has created the belief among several forestry experts that Indonesia's tropical natural forests are likely to become extinct by 2015, specifically in Sumatra and Kalimantan. (Holmes, 2000). The destruction and potential extinction of these natural ecosystems can lead to visible physical damage. They can also affect plant genetic resources, which play a major role in future forest regeneration. The sustainability of natural forests has been reported to depend on their ability to rejuvenate themselves. Consequently, the Indonesian government has implemented policies to prioritize the conservation and preservation of living natural

*Corresponding Author's E-mail: debbypattimahu@gmail.com

resources. The main objective of these policies is to maintain biodiversity, which is crucial for creating ecosystem stability. Biodiversity refers to the number of species as well as the variation and uniqueness of plant genes and their ecosystems (Holmes, 2000). Forest plant breeding requires a wide range of genetic diversity to achieve significant genetic gain. This diversity is characterized by the variability of genes and genotypes within and between species (Melchias, 2001). Variation within a species provides the ability to adapt and resist new pests, diseases, as well as environmental and climate changes.

Therefore, it is important to conserve genetic diversity and utilize forest products sustainably and harmoniously. Conservation majorly involves the preservation of biological information rather than materials. This is because each individual contains distinct genetic information that differs from others. Focused genetic conservation activities are expected to ensure the sustainability of future forest development by utilizing available resources (Finkeldey, 2005).

Maluku, situated in eastern Indonesia, comprises a group of islands with diverse habitat types. The Daab Nature Reserve is located in Southeast Maluku Regency, where it covers an area of 14,218 hectares. It has also been designated as a conservation area based on the Decree of the Minister of Forestry No. 836/Kpts-II/1993 dated December 23, 1993 due to its unique flora, fauna, and ecosystems. The Daab Nature Reserve is one of the habitats for endemic animals in the Wallacea area, including wild boar (*Sus scrova*), cuscus cuscus (*Phalanger spp*), Manila cockatoo (*Cacatua goffini*), Maluku parrot (*Eos bornea*), Green Lorikeet (*Trichoglossus haematodus*), Red Cheeked Lorikeet (*Charmosyna placentis*), Little Kei Parrot (*Micropsitta guillemiferti*), Monitor Lizard (*varanus indicus*), Yellow Crested Cockatoo (*Cacatua Galerita eleonor*), King Prawn (*Halcyon sonnet*), Lizard, Flying Squirrel, Python (*Python retic*).

The nature reserve area is a conservation area that has essential meaning because it contains biotic and abiotic potentials that can support ecosystems outside the nature reserve area. Nature reserve areas and the elements contained there may change or be modified due to various influencing factors, such as population density, natural disasters, pests and diseases, community pressure, harvesting of forest products, hunting, and land grabbing. Obstacles encountered based on activity evaluation and surveys of existing conservation areas, and which have been carried out by the Maluku KSDA office, are that there are still many areas whose potential has not been inventoried and a management plan has not been made by the mandate of the applicable laws and regulations in the field of conservation.

The Daab Nature Reserve should be conserved due to several reasons, including 1) the area has not been managed properly since it was designated as a conservation forest area in 1993, 2) it has unique and endemic biodiversity potential, 3) the local community has preserved their local wisdom (Larwul Ngabal), 3) the area has fairly good ecotourism and serves as a border between Wallacea and Sahul biogeography. The policy analysis for the management of the Daab Nature Reserve was prepared as a basis for stakeholders in formulating development programs in and around the area based on their respective authorities, roles, and interests.

Therefore, this study aims to determine the stakeholders' potential in managing the Daab Nature Reserve area as well as to formulate a sustainability policy.

MATERIALS AND METHODS

This study was carried out in the Daab Nature Reserve conservation area, which was located in the Southeast Maluku District, Maluku Province (Figure 1).

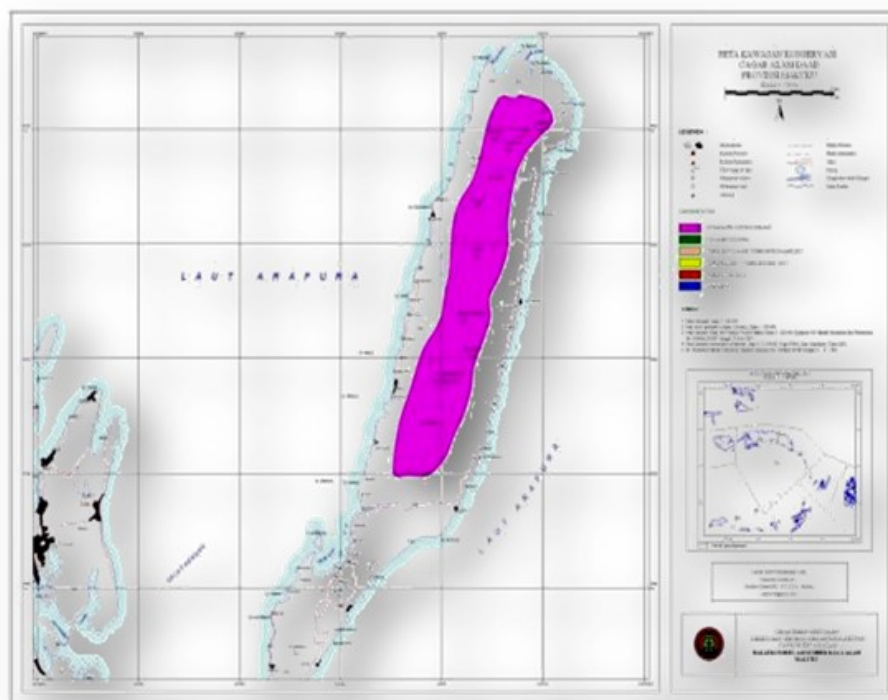


Figure 1. Map of the Daab Natural Reservation

Analysis Method

The data obtained in this study were analyzed using the Analytic Hierarchy Process (AHP) approach. This method was centered on identifying the most influential aspects and strategies that determined the priority level of policies for managing the Daab Nature Reserve, as perceived by each stakeholder. AHP aimed to obtain a choice of operational steps from the views of stakeholders related to the management of the area. Furthermore, complex and unstructured problems were simplified into a hierarchical structure that depicted a graphical representation of several levels, including focus, actors, aspects, strategies, and policies.

RESULTS AND DISCUSSION

The analytic Hierarchy Process is a multiple criteria decision making tool. This is an Eigen value approach to pairwise comparisons. Analytic Hierarchy Process (AHP), since its invention, has been a tool at the hands of decision-makers and researchers; and it is one of the most widely used multiple criteria decision-making tools. Many outstanding works have been published based on AHP: they include applications of AHP in different fields such as planning, selecting the best alternative, resource allocations, resolving conflict, optimization, and numerical extensions of AHP (Vaidya S. 2006).

AHP often began with the identification of the problem and determination of the desired solution or main goal (goal). Subsequently, a hierarchical structure was compiled, which involved various factors, including competent or interested stakeholders, aspects desired by each stakeholder, alternative solutions or strategies and policies to achieve the desired main goals. AHP provided an enabling framework for effective decision-making on complex issues by simplifying and accelerating

the process. This was achieved through the breakdown of a complex situation into its components, organizing the variables in a hierarchical arrangement, assigning a numerical value to each variable, and determining the variable with the highest priority and influence on the outcome in that situation (Saaty, 1993).

The hierarchical structure of the sustainable management of the Daab Nature Reserve area based on AHP results is presented in Figure 2.

Based on the calculation of the value at each AHP level, the following results are obtained :

Stakeholders Role

A total of four stakeholders played a role in decision-making on the management of the Daab sustainable conservation area in Southeast Maluku Regency, namely the government, community, NGOs, and researchers. The importance of the role of stakeholders in determining policy alternatives based on AHP is presented in Table 1.

Table 1. The Role of Stakeholders in the Sustainable Management of the Daab Nature Reserve Conservation Area

Number	Stakeholders	Value
1	Government	0.439
2	Community	0.405
3	Researcher	0.071
4	NGOs	0.085

Table 1 shows that the role of the government (0.439) in determining policy alternatives greatly determined the success of sustainable Daab conservation area management in Southeast Maluku. Furthermore, they served as a motivator as well as a facilitator during the process.

The Central Government and related agencies were expected to harmonize the goals and targets in

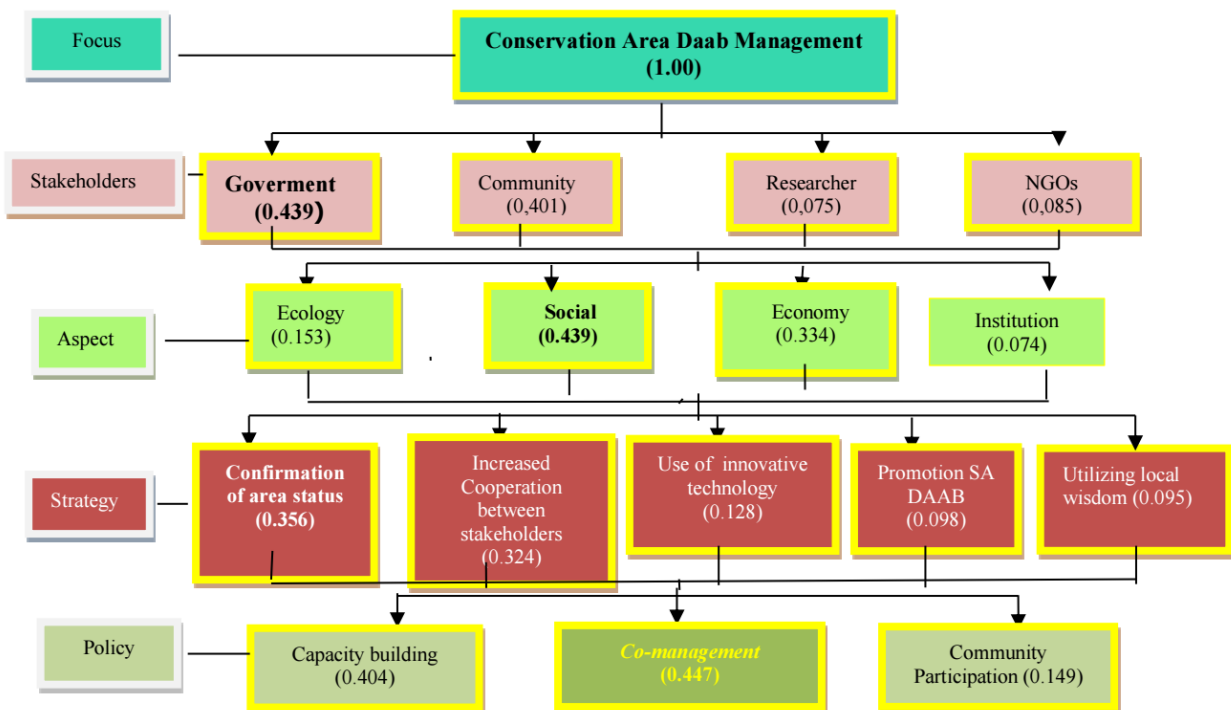


Figure 2. Hierarchy Structure of Sustainable Daab Conservation Management

formulating decisions on planning. This indicated that comprehensive socialization was needed in the management of the Daab Nature Reserve conservation area.

The existence of NGOs or non-governmental organizations involved in managing conservation areas is essential to be developed in voicing the interests of area conservation (0,085). This is demonstrated by the various roles of NGOs as new entity in natural resource management. The function of NGOs is to assist the community in self-introduction and strengthening community capacity as the base capital for the community in managing the Daab nature reserve conservation area.

Aspect Hierarchy by stakeholder

The analysis results showed that each actor had different priorities, with the social aspect being the most prioritized in the determination of alternative policies.

Furthermore, the synthesis of actors' perspectives revealed a clear hierarchy of aspects in the management of sustainable management of the Daab conservation area, including social (0.439), economic (0.334), ecological (0.153), and institutional (0.074).

Table 2. Hierarchy of Aspects in Sustainable Management of Daab Nature Reserve Conservation.

Number	Aspect	Stakeholders			
		1	2	3	4
1	Ecology	0.235	0.141	0.100	0.134
2	Social	0.370	0.492	0.539	0.356
3	Economy	0.310	0.294	0.283	0.450
4	Institutional	0.085	0.073	0.078	0.060

Table 3. Strategy Hierarchy in Sustainable Management of Daab Nature Reserve Conservation Areas

Number Strategy	Aspect	Aspect			
		1	2	3	4
1	Confirmation of area status	0.298	0.446	0.350	0.329
2	Increased cooperation Promotion	0.242	0.238	0.394	0.422
3	Daab Nature Reserve	0.173	0.134	0.113	0.092
4	Utilizing local wisdom	0.155	0.052	0.064	0.119
5	Innovative Use of technology	0.132	0.130	0.079	0.039

Information : Actors : 1 = Government; 2= Community; 3= Researcher; 4= NGOs

The aspect that should be considered in the sustainable management of the Daab Nature Reserve conservation area.

Strategy Hierarchy by Aspect

Based on the analysis results, each aspect had different levels of importance in determining the appropriate strategy, as shown in Table 3. Furthermore, the status of the area was the main strategy that should be considered in the management of Daab conservation area.

The synthesis of the dimensions showed that the strategic priorities included affirmation of area status (0.356), increasing cooperation between stakeholders (0.324), utilizing innovative technology (0.128), promoting Daab nature reserve as a study area (0.098), using the local wisdom of the community (0.095).

The high weight assigned to affirming the status of the area showed that the strategy should be given top priority in its implementation, specifically by the government

Hierarchy of policy alternatives based on strategy

The policy for managing the sustainable Daab Nature Reserve conservation area was largely determined by its management strategy. Based on AHP results, three alternative policies were determined, including:

1. Capacity building
2. Collaborative management (Co-management) based on local wisdom
3. Community participation

The analysis results showed that the alternative co-management policy was considered the most likely to be implemented (0.447 or 44.7%), followed by capacity building (0.404 or 40.4%), and community participation (0.149 or 14.9%), as shown in Figure 3 and Table 4.

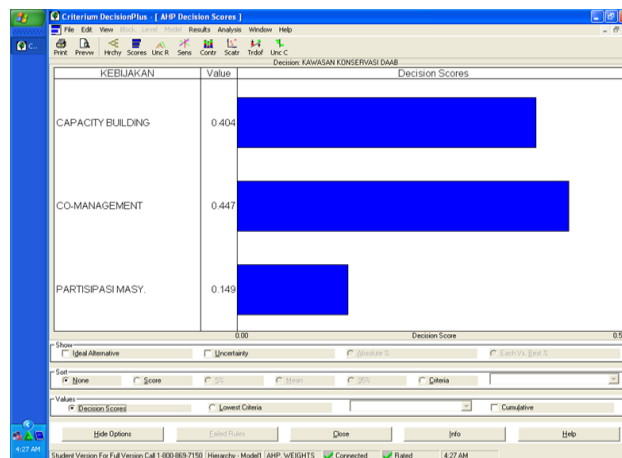


Figure 3. Priority Chart for Sustainable Management of the Daab Nature Reserve Conservation Area

Table 4. Policy Hierarchy in Daab Nature Reserve Management

Number	Police	Value
1.	Capacity Building	0.404
2.	Co-Management	0.447
3.	Community participation	0.149

Policy Priority for Sustainable Daab Conservation Area Management

The AHP results showed that the co-management policy (44.7%) was the top priority in the sustainable management of the Daab Nature Reserve conservation area in Southeast Maluku Regency. Co-Management in this context, referred to a collaborative approach where the community, as the main stakeholder, benefited from

the beginning of the process. This was because they possessed a deep understanding of the conditions in the area and have a clear vision of the major goal. Despite the potential benefit of co-management, the participation of the community as objects and subjects in management activities was still very limited. Therefore, it was necessary to develop partnership relationships between stakeholders based on the concept of equality, as well as mutual need, benefit, and sustainability.

The development of co-management was formulated to synergize the interests of various stakeholders while ensuring environmental sustainability. This approach can also increase regional income and improve the welfare of the community. Despite its potential benefits, it still faced several challenges during its implementation. One of these challenges included the declining environmental quality of the Daab Nature Reserve conservation area due to the high human activities in the vicinity. Furthermore, institutional and policy problems contributed to these issues, which stemmed from limited coordination and cooperation between sectors. This led to partial development planning, suboptimal management and supervision of the environmental conditions, and the lack of a co-management concept. The local community played a vital role in managing natural resources and the environment, but community-based management practices were still limited. To address this issue, alternative management policies were observed in this study. Although the co-management model was the most desirable, assistance and instructions from the government were still needed to prevent independent management.

In enacting this policy, attention should be paid to the main strategy of affirming the status of the Daab Nature Reserve conservation area. The social aspects of the community should also be prioritized because the pre-existing forestry sector activities have failed to meet the need of society, specifically people living around the study area. This lack of engagement led to reduced community concern for conservation efforts, making it difficult to maintain the social aspect of the region. Therefore, the government should follow up on existing policies with constructive programs and activities to ensure sustainability.

The government as the main actor played an important role in the management of conservation areas. The central arm, specifically related agencies, was expected to formulate operational technical policies. Furthermore, relevant agencies should cooperate with the regional government as an autonomous authority although they lacked the power to manage the Daab Nature Reserve conservation area.

Pattimahu (2017) also stated that the government had a unique position to integrate various sectors towards sustainable development. They were also expected to harmonize the right goals and objectives in formulating decisions on conservation area management planning along with other related agencies. Coordination between governments in formulating operational policies for the management of the Daab Nature Reserve should be carried out thoroughly by considering the ecological approach.

CONCLUSION

1. Stakeholders who played a major role in the management of the Daab Nature Reserve included the

Government (43.9%), the Community (40.5%), NGOs (8.5%), and researchers (7.1%). Furthermore, the government's role in determining policy alternatives influenced the success of sustainability.

2. Alternative policies for the management of the Daab Nature Reserve area were:
 - a. Co-Management (44.7%)
 - b. Capacity building (40.4%)
 - c. Community participation (14.9%)

CONFLICT OF INTEREST

The researcher declares that there is no financial, personal, or another conflict of interest with other people or organizations related to the material discussed in this article

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