SOCIO-ECOLOGICAL READINESS OF PROTECTED FOREST BUFFER VILLAGES IN EASTERN KALIMANTAN
(CASE STUDY: WAIN RIVER PROTECTED FOREST)

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Abstract. Climate change and ecological pressures such as forest fires, land conversion, and natural resource degradation have a significant impact on the sustainability of the lives of protected forest buffer village communities in East Kalimantan. This research aims to assess the social-ecological readiness of the community in facing these pressures and design an adaptive and contextual community-based strategic model, with a case study of the Sungai Wain Protection Forest (HLSW). The method used was a mixed-methods approach consisting of three main techniques: (1) household survey of 200 respondents from two villages (RT 38 Karang Joang Village (Sungai Wain Village) and Lamaru Village) directly adjacent to the HLSW area, (2) focus group discussions (FGDs) and in-depth interviews with 30 key informants from village government, customary, NGOs, and forestry agencies, and (3) social ecological mapping using a participatory approach with the help of GIS technology. The results identified three clusters of community readiness, namely: "strong adaptive", "transition moderation", and "ecologically vulnerable". Villages active in social forestry programs and involved in initiatives such as ProKlim and Green Growth Compact showed better economic and institutional readiness than villages dependent on traditional agriculture. This research has led to the development of community-based adaptation strategies that can be adopted by other forest buffer villages in Indonesia. This approach can increase the effectiveness of policy interventions within the framework of locally-based natural resource management and disaster risk reduction.

Keywords: social ecological readiness, forest buffer village, community participation, social forestry

I. INTRODUCTION

Increasingly extreme and rapid climate change, accompanied by ecological pressures due to human activities such as deforestation, land fires, and conversion of agricultural and mining land, have threatened the sustainability of protected forest functions in East Kalimantan. The buffer villages surrounding these forest areas are the most affected areas, both directly to the local ecology and to the social and economic aspects of the community. One of the strategic areas of concern in this study is the Sungai Wain Protection Forest (HLSW), an important ecosystem in the Balikpapan region that serves as a buffer for conservation areas and a source of raw water for the city. Efforts to protect and restore buffer zones such as HLSW cannot be separated from the national and regional regulatory framework. Government Regulation Number 23 of 2021 concerning Forestry Implementation emphasizes the importance of forest governance involving the community through social forestry schemes as an instrument of sustainable forest management. In addition, Law Number 32 of 2009 concerning Environmental Protection and Management provides a legal basis that every citizen has the right to a good and healthy environment, and emphasizes the importance of management based on ecological justice, carrying capacity, and environmental capacity. At the regional level, East Kalimantan Provincial Regulation No. 7/2019 on Climate Change Adaptation and Mitigation strengthens the mandate for local governments and communities to formulate local community-based adaptation strategies, including the integration of programs such as ProKlim into village planning and local institutions.

HLSW covers approximately 10,000 hectares and is an important habitat for endemic species such as proboscis monkeys (Nasalis larvatus) and several anura species, which are indicated as indicators of natural ecosystem quality (Gresya et al., 2025). In addition, the area is the focus of glamping-based nature tourism development as well as a collaborative conservation pilot between local government, NGOs (e.g. YKAN and BOSF) and indigenous communities (Dianovita et al., 2024; JAMSI, 2024). HLSW buffer village communities have a strategic role as the main actors in maintaining ecological balance and environmental

sustainability. However, their social ecological capacity still varies depending on institutional support, access to resources, and local knowledge. The unpreparedness of communities in the face of climate change can increase their vulnerability to the risk of ecological disasters. Therefore, it is important to assess the level of social and ecological readiness of communities in an integrative manner to better target policy interventions and conservation programs. Previous research has shown that community-based programs such as the Climate Village Program (ProKlim) and Green Growth Compact (GGC) can strengthen community readiness through multi-stakeholder collaboration and local institutional strengthening. Participatory studies have also been used to map village risks and potentials in landscape restoration (Sarminah et al., 2020; Sukristiyono et al., 2021). A similar model has also been applied in the Tarakan Island Protected Forest, where stakeholders such as UPTD KPH, the Forestry Service, and local communities play a significant role in maintaining the sustainability of the protected area (Rositah et al., 2022).

However, there are still gaps in the application of readiness models based on the local characteristics of buffer village communities, especially in the context of East Kalimantan and HLSW. Therefore, it is necessary to integrate social-ecological approaches, institutions, and local innovations including the optimization of ecotourism (such as glamping development in HLSW) as an adaptive economic diversification effort. The main problem investigated in this study is how the condition of social and ecological readiness of HLSW buffer village communities in facing climate change and environmental pressures, and what factors influence the level of readiness. This research also raises the urgent need for a participatory, inclusive and contextual readiness model, which can be used as a basis for developing locally-based adaptation strategies. The objectives of this study were to: (1) assess the level of community social ecological readiness in two HLSW buffer villages, (2) identify readiness clusters and their determining factors, and (3) design a social ecological readiness model based on community participation and spatial. This research uses the Community Readiness Model theory that measures community readiness based on social, institutional and local knowledge indicators. In addition, the institutional readiness approach and adaptive capacity framework are used to understand how interactions between actors and policies affect community responses to environmental changes. This theory is combined with the principles of social forestry and participatory approaches in ecological disaster mitigation.

II. RESEARCH METHOD

This research uses a mixed-methods approach with the integration of quantitative, qualitative and spatial approaches. This strategy aims to deeply understand the social-ecological readiness of buffer village communities to the dynamics of ecosystem pressures. The research sites were located in two HLSW buffer villages, namely RT 38 Kelurahan Karang Joang (Sungai Wain Village) (active in

ProKlim and GGC) and Kelurahan Lamaru (relying on traditional agriculture). The survey sample consisted of 200 households (100 per village), selected through stratified random sampling based on geographic distribution and economic activity. In-depth interviews and FGDs were conducted with 30 informants consisting of traditional leaders, village heads, local NGOs, forestry extension workers and forest farmer groups.

The survey was designed based on social-ecological readiness indicators: economic capacity, local institutions, ecological knowledge, and access to basic services. FGDs focused on identifying ecological risks, local adaptation practices and expectations of interventions. Participatory GIS was used to map risk-prone locations and community infrastructure distribution. This mapping practice adopted approaches such as in the Wain watershed water quality study by Sarminah et al. (2020) and the development of glamping zoning by Dianovita et al. (2024).

Quantitative analysis was conducted through cluster techniques to categorize readiness based on social-ecological dimensions. Qualitative data from FGDs and interviews were thematically coded using NVivo. Spatial analysis included mapping risk zones and overlaying vulnerability data with social networks and resources.

Validity was maintained through triangulation of methods and actors, and peer-review of interpretation results. Ethical aspects of the research were met through written informed consent and official permits from the village government and Balikpapan Forestry Agency. (previous methods section that already includes integration of fixed references, no need for duplication)

III. RESULT AND DISCUSSION

Preliminary Findings

"Indigenous peoples and village institutions play an important role in navigating the dynamics of buffer zone management. The role of groups such as LPM, religious leaders, and MPA is highly valued in maintaining social values and land use" (Sukristiyono et al., 2021).

Village Readiness Profile

Based on the survey results, significant differences were found between the two villages:

1. **RT 38 Karang Joang Village (Sungai Wain Village)** demonstrate economic diversity (livestock, tourism businesses), active local institutions, and active involvement in ProKlim and GGC.
2. **Lamaru Village** tends to rely on single farming, has a passive institutional structure, and lacks information related to climate change.

Readiness Cluster

Cluster analysis resulted in three categories of readiness:

1. **Strong Adaptive**: villages with institutional support, economic diversification, and high adaptive capacity (RT 38 Kelurahan Karang Joang (Sungai Wain Village)).
2. **Transitional Moderation**: communities with awareness but limited access to institutional information and programs.

3. **Ecologically Vulnerable:** communities with high dependence on nature, minimal diversification, and weak institutional access (Kelurahan Lamaru).

Determinants of Readiness

The main factors that influence readiness include:

1. Knowledge and perception of climate change (enhanced by ProKlim).
2. Access to social forestry schemes (promoting legality and collective management).
3. Multi-stakeholder partnerships involving NGOs, private sector and academia (Rositah et al., 2022).
4. Economic business diversification through glamping-based ecotourism as an adaptive response (Dianovita et al., 2024).

This finding underscores the importance of a combination of internal (community capacity) and external (program support and networking) factors in improving the social ecological readiness of HLSW buffer communities. (section remains with the addition of sources on determinants)

"Glamping ecotourism developed in the Wain River area increases community participation while providing new economic incentives that strengthen conservation awareness" (Dianovita et al., 2024). "The decline of Anura sound indicators in the HLSW edge zone reflects the degradation of habitat quality due to anthropogenic pressures such as land clearing and fire" (Gresya et al., 2025).

Interpretation of Findings

The results show that villages with active involvement in formal programs such as ProKlim and GGC have higher social-ecological adaptive capacity. RT 38 Kelurahan Karang Joang (Sungai Wain Village) reflects readiness in various aspects such as economic, institutional, and spatial. Meanwhile, Kelurahan Lamaru shows high vulnerability, which is caused by limited access to information, low economic diversification, and weak local institutions.

Relevance to Previous Studies

This finding is consistent with the study of Sukristiyono et al. (2021) which highlighted the importance of stakeholder roles in HLSW management. Similarly, the integration of a conservative ecotourism approach raised by Dianovita et al. (2024) provides evidence that nature-based economic diversification can increase community resilience. Research by Rositah et al. (2022) emphasized the importance of legally and structurally orderly multi-stakeholder governance, which is relevant in the context of HLSW.

Policy and Practice Implications

1. Expansion of the ProKlim program and access to social forestry is urgently needed for vulnerable villages.
2. Multi-stakeholder partnerships need to be activated through the Pentahelix framework.
3. Community-based innovations such as glamping and conservation education must be supported in policy and financing.

Research Limitations

1. The study was cross-sectional and did not observe longitudinal dynamics.

2. Only two villages were studied, so generalization requires further study in other buffer villages in East Kalimantan. (permanent part with integration of Rositah's study)

IV. CONCLUSIONS

A community-based social ecological preparedness model involving regulation, multi-stakeholder partners, and increased literacy has proven effective in RT 38 of Karang Joang Village (Sungai Wain Village). This village reflects the success of a holistic approach that combines institutional interventions, social capacity building and conservation-based economic diversification such as glamping. For vulnerable villages, such as Lamaru Village, it is necessary to adopt a similar scheme in stages, starting with legal access, risk mapping and institutional assistance. There are several suggestions that can be given by the author based on the results of the above research, namely expanding access to social forestry schemes, especially for villages with unclear land legality status. Replication of ProKlim and its integration into RPJMDes to strengthen the climate change adaptation agenda. Strengthening local institutional capacity through training and community-based spatial mapping. Development of conservative ecotourism as an adaptive economic incentive. Facilitation of Pentahelix partnership network to support funding and program sustainability.

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