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Recognition of Local Communities: A Polycentric Model of Policy Management of Mangrove Ecosystems

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ABSTRACT: Mangrove forests are important resources that provide various ecosystem services ecologically, economically, socially, and culturally. However, the utilisation of mangrove ecosystems often faces management conflicts. Conflicts can occur between residents in the mangrove area or between agencies and levels of authority. The diversity of governance from various decentralised, connected and functionally different layers implies a complex system. The polycentric model is one approach to addressing the system's complexity. This study uses a qualitative approach with data collection techniques using interviews and observations. The aim is to examine the recognition of residents and the government for local community initiatives. This study found several essential things. First, the context of authority over the mangrove location by supra-village agencies, but in several decades, it has become a conservation and management area for residents. Second, recipients of ecosystem services and their utilisation involve residents from outside the administrative boundaries of the village. Third, cross-sector and level agreements for recognising mangrove ecosystem management initiatives based on local community wisdom. The model of recognition and autonomy given to local communities by higher authorities is the basis for sustainable polycentric governance of mangrove ecosystems. De facto autonomy includes four aspects, including: autonomy in decision-making, formal recognition, cross-actor collaboration, and control over access to resources.

Keywords: Recognition, Polycentric, Mangrove, Authority, Sustainable

INTRODUCTION

Mangroves are tropical plants that grow in tidal areas along the coastline called intertidal. The growth and development of mangroves form and influence the mangrove ecosystem consisting of organisms, both animals and plants, that interact with each other in one habitat (Sofian et al., 2001). The mangrove ecosystem contributes to environmental sustainability because of its ecological,

economic and socio-cultural roles. Its existence ensures the stability of the coast from abrasion, a source of fish, shrimp, shellfish and other biodiversity. In addition, it is a source of firewood and building wood, and has conservation, education, ecotourism and cultural identity functions (Setyawan & Winarno, 2006). In short, mangrove forests provide ecosystem services physically, chemically, biologically, economically and socio-culturally (Dixon, 2001). Although the function of mangroves is very large for the environment and also humans, governance that does not pay attention to its carrying capacity and capacity can damage the entire ecosystem.

Poor governance can be found in the mangrove ecosystem on the coast of Tanah Merah Village in 1987-2004. The coastal ecosystem that is overgrown with mangroves in the coastal area of Tanah Merah Village is used as a sand mining area for various development projects. Mangrove woods are cut down and used as fuel. As a result, the mangrove ecosystem is severely damaged and the coast of Tanah Merah often experiences abrasion that threatens residents' houses and land.

The damage and threat of disasters have motivated Tanah Merah residents to conserve and replant mangroves since 2004 until now. The initial planting was carried out by local residents covering an area of 5 hectares. The total number of seedlings planted at that time reached 5,000 seedlings. Planting also included replanting empty areas that were not covered by mangroves. In 2008, mangrove planting was carried out again covering an area of 10 hectares covering the coast of Tanah Merah Village to Noelbaki Village. This planting process was initiated by the Mesakh family and a mangrove lover group involving almost all of the Tanah Merah village community. The efforts of the residents, accompanied by a joint management agreement, have resulted in the restoration of mangrove forests and the benefits of coastal ecosystem services. The mangrove forest in Tanah Merah Village has succeeded in supporting the lives of around 2,389 residents and fishermen who access the economic value of shrimp commodities between IDR 250,560,000 to IDR 2,543,920,000 per year (Selan et al., 2021). This figure can contribute greatly to the national shrimp production commodity which reaches IDR 62,037,303,000,000 (BPS, 2024). Increasing the welfare of coastal residents reduces the dim portrait of poor people on the coast which has reached around 1.3 million people out of around 10.86 million poor people in Indonesia.

Awareness to manage mangrove ecosystems sustainably is based on local agreements and customs. They build unwritten agreements, such as: a ban on cutting mangroves for commercial purposes, types of mangroves that may be utilized, replacement of new plantings for those who utilize wood with a certain amount limit. Meanwhile, those who take prohibited mangroves will be subject to sanctions or fines in the form of money and goods. Although local residents' initiatives have proven effective in restoring and sustaining mangrove ecosystems, they face several challenges. First, the location of the mangrove forest on the coast of Tanah Merah is under the authority of several institutions, including: the Natural Resources Conservation Center (BBKSDA), the Kupang Regency Government, and the local village government. Second, as a common pool, the mangrove ecosystem from the coast to the sea is an arena for the utilization of ecosystem services by communities from within and outside the village which can cause conflict. Third, the absence of a good management design is a threat to the damage and sustainability of the mangrove ecosystem.

The existence of mangrove ecosystems under the authority of various levels of government and across agencies, and involving various interested actors is an interesting subject and topic to be studied from various approaches. One of them is through the perspective of polycentric institutions. The term Polycentric is the complexity of government with various decision-making centers with a certain level of autonomy (Ostrom, 2010). Polycentric governance is a governance system with many government authorities at different scales that do not have hierarchical relationships but are involved in self-organization and mutual adjustment (Carlisle & Gruby, 2019). This model is often described as an effort to answer the overlapping of regulatory units with multilevel jurisdictional levels from local to national (Mcginnis & Ostrom, 2012). The theoretical advantage of the polycentric system is that it is able to adapt to social and ecological changes due to better anticipation according to context, compared to the centralistic model (Bixler, 2014). Adaptive capacity is often called 'adaptive capacity,' the ability of a resource governance system to preemptively change processes and if necessary change structural elements in response to changes experienced or expected in society or the natural environment (Pahl-Wostl, 2009).

Research related to the polycentric management model for various resources has been conducted by (da Silveira & Richards, 2013). They evaluated the functioning of the polycentric governance system for the Pearl River Basin in China. Their findings showed that this governance was ineffective and prone to conflict due to the lack of incentives for cooperation and competition between members. Minimal coordination between authorities at various levels also shows the weakness of resource management with multilevel authority (Marshall, 2009). However, several studies in the last 5 years, such as those conducted by (Carlisle & Gruby, 2019) , show positive opportunities for the polycentric governance system. This system is more likely to show increased adaptive capacity than monocentric or centralized governance systems. Thus producing better environmental and social outcomes.

Literature study conducted by Thiel (2016) shows that the use of the polycentric concept is most in metropolitan urban planning and governance studies (Giffinger & Suitner, 2015). The following position is occupied by environmental social science research that is widely found in the works of (Ostrom, 2010). Ostrom discusses a lot about resource management at the local level that is relevant to this paper. Generally, polycentric studies are narrowed down to three different interrelated approaches, namely: descriptions of the polycentric concept, theories, and frameworks that test claims of the polycentric approach. These three approaches try to comprehensively understand the interactions between institutions, the behavior of interdependent actors and the performance of resource management. These principles are also adopted by the IAD (Institutional Analysis Development) Framework which successfully handles local collective action built by Elinor Ostrom and her colleagues and is widely applied (Oakerson & Parks, 2011).

The development of academic studies and debates related to polycentric governance of resources generally revolve around several things. First, related to coordination between actors at various levels of government. The main debate is whether the polycentric system can prevent the problem of overlapping policies, communication failures, and inevitable conflicts or vice versa (Ostrom, 2010). Second, related to the fairness of the distribution of access and benefits of resources that can be reached by all parties fairly or actually create inequality. Third, related to the flexibility and

adaptability of the polycentric model compared to centralized governance in dealing with environmental sustainability amidst climate change (Pahl-Wostl, 2009). Fourth, the debate is related to how decision makers at various levels can maintain transparency and accountability. Fifth, related to local community control over decisions across authorities and between actors at higher levels of government.

The polycentric institutional model is the adoption of a political system and adaptive natural resource governance at various complex levels without ignoring environmental sustainability (Gatto & Drago, 2020; Ostrom, 2010; van Zeben, 2019). One important aspect of polycentric management that is debated above is the quality and recognition of local community autonomy in polycentric governance. As stated by (Marshall, 2009), the most important thing is de facto autonomy compared to formal autonomy, considering that institutional analysis focuses on the rules used compared to formal government rules set. Therefore, the recognition model for mangrove management in Tanah Merah Village is an interesting and important study.

This study provides a slightly different perspective from the debate on management models that provide recognition/ acknowledgement of local community involvement. This study explores the quality and level of autonomy required by local communities to be recognized in the management of coastal resources that are the authority of village, regional and central governments.

METHOD

This study uses a descriptive method with a qualitative approach. The researcher describes in depth the multilevel institutional model of mangrove forest management in Tanah Merah Village based on recognition of local initiatives. Creswell & Creswell (2018), a qualitative approach is a research and understanding process based on a methodology that investigates a social phenomenon and human problems. The phenomenon studied is cross-authority polycentric governance, as well as efforts to recognize resource management initiatives at the community level.

Researchers conducted interviews with several key informants, including: the head and members of the Tanah Merah Village mangrove lovers group, villagers and fishermen who access coastal resources in the Tanah Merah Village mangrove area, the village head and staff of Tanah Merah Village, the Head and members of the Village Consultative Body (BPD), community leaders, PIKUL Non Governmental Organization staff, Forest Zone Stabilization Unit (BPKH) and the Natural Resources Conservation Center (BBKSDA) staff who are directly involved in work in the coastal area of Tanah Merah Village, and the Kupang Regency Development Planning Agency at Sub-National Level (Bappeda) related to the Regional Spatial Planning (RTRW) plan. The determination of informants was carried out purposively based on several criteria, including: their introduction to the research object and the problems that occur, the authority and authority of the institution represented by the informant, the direct benefits obtained from mangrove ecosystem services. The selected informants also represent elements of the local community/community groups, government from the village, district and central government levels, and NGOs. Researchers also triangulated data collection methods, namely in addition to interviews with key

informants, Focus Group Discussions were also conducted with the *Dalek Esa* group and field observations. Triangulation was also carried out through comparisons between interview data with policy documents and study reports/scientific journals related to the research topic.

The collected data and information are sorted and categorized to find patterns for analysis. Researchers map the potential of mangrove stands, related to: area size, types of mangroves. Analysis is also carried out on the benefits of the mangrove ecosystem for the community and environmental sustainability. Researchers describe the status/authority over the mangrove forest area and local wisdom-based management that has been practiced by the local community. Field findings are processed to explain the quality and level of autonomy needed by the local community to be recognized by authorities at a higher level in managing the mangrove ecosystem. Findings and analysis are strengthened by various relevant references.

RESULT AND DISCUSSION

Local Community-Based Mangrove Forest Management

The history of mangrove management in the coastal area of Tanah Merah Village cannot be separated from the efforts and initiatives of Mr Messakh's family and residents who live there. Local residents management and protection of mangroves began in 2004 based on an unwritten agreement. Initially, residents were prohibited from cutting down mangroves and could only access mangrove ecosystem services, such as catching fish, shrimp, crabs and collecting shellfish. However, as the population increased and the residents needed to build houses and plant nuts in gardens, they agreed to use the growing mangrove trees. The agreed terms are that each family can only cut down a maximum of 16 mangrove trees. Residents also must replant mangrove saplings after they are cut down. They can take old twigs for cooking purposes and make house fences and bean vines. However, residents are prohibited from selling mangrove species for commercial purposes.

Every year, coastal residents of Tanah Merah Village carry out replanting and replanting. These residents' efforts are based on experience of the benefits of mangroves for agricultural and economic needs. As a result, the condition of mangrove forest cover is very different between 2004 and now. The Mangrove forest has been proven to have saved around 2,389 lives of Tanah Merah Village residents from the tropical cyclone Seroja disaster in 2021. The village government, residents, and the *Dalek Esa* mangrove lover group have initiated the preparation of village regulations (Perdes) based on several agreements. The mangrove ecosystem area of 105 Ha is divided into a utilisation zone to the east and a protection zone to the west. Apart from utilising environmental services for fishing areas for fish, shrimp, crabs, and shellfish, the mangrove area is also planned for ecotourism and as a boat mooring area. The residents' agreement also includes the use of several types of mangroves, such as crops tagal (local term: tene), lumitsera racemose (local term: sapadi), and sonneratia alba (local term: da'dak). Every resident who cuts down one tree is required to plant five mangrove saplings. Apart from utilisation, sanctions were also discussed. Residents who damage the mangrove ecosystem will be fined Rp 1,000,000 or four-legged animals. Residents who have violated the agreement will be dealt with starting from the

Neighborhood Unit (RT), Hamlet level to the Village Government. A solution will be escalated to the authorities if it is not found. Mangrove supervision was then entrusted to the Dalek Esa group through a Decree from the Head of Tanah Merah Village.

The mangrove forest management model based on local community wisdom is a model for protecting and conserving coastal resources. Local communities have the right to manage the natural resources on which they live and depend on their local traditions and knowledge (Agrawal, 2005). The role of residents in mangrove conservation for approximately 20 years proves the effectiveness of local community management. This model turns out to be more sustainable and fair in distributing the benefits of mangrove ecosystem services compared to a management model focused on the formal tasks of the government with authority.

Collaboration Between Parties for The Sustainability of The Mangrove Ecosystem

The protection and use of mangrove forests by the coastal community of Tanah Merah Village is a challenge in itself for its sustainability. First, the coastal areas where mangroves grow are also under the authority of the supra-village government. Based on discussions with Forest Zone Stabilization Unit (BPKH) and the Natural Resources Conservation Center (BBKSDA), the area of mangrove forest that has been studied and identified is 104,352 Ha. Approximately 33.68 hectares are included in the protected block area of the Kupang Bay Marine Tourism Park (TWAL). Therefore, management must be coordinated with the central government through BBKSDA. The forest area does not include the southern part (utilisation zone). However, it is included in the coastal border area, regulated through the Regional Spatial Plan of the Kupang Regency Government. The Tanah Merah Village mangrove ecosystem also includes agricultural land and residential areas.

Management of the mangrove ecosystem by coastal residents of Tanah Merah Village has received unwritten recognition from the government and other parties. The form of recognition given by BBKSDA is through conservation activities with mangrove forests. BBKSDA even provides technical assistance and incentives for managing the environmental services of mangrove ecosystems. According to a Tanah Merah resident, last year, the local community of Dalek Esa mangrove lovers received assistance from Rp. 50,000,000 from BBKSDA. Assistance is provided through fishing and operational equipment for groups of men and women. Shrimp, crab and fish fishermen from this group were distributed fishing equipment such as trawls, ropes and equipment for producing fish floss. BBKSDA is collaborating with Artha Wacana Christian University to improve women's skills in processing shredded meat.

The local community of Tanah Merah Village is also collaborating with the Ministry of Environment and Forestry and State-Owned Enterprises (State Electricity Company/PLN and an Indonesian State-Owned Oil and Natural Gas Corporation/Pertamina) to carry out a mangrove planting movement. As a form of incentive for residents' efforts to protect mangroves, State-Owned Enterprises (BUMN) support the construction of permanent stages and revitalisation of toilets in mangrove forest areas. The village has also opened communication with the State Electricity Company (PLN) to provide business capital, equipment, training in making dodol and syrup from mangrove fruit and providing cages for crab cultivation. PLN has promised to install electricity and paving blocks from coal-burning waste material (Fly Ash and Bottom Ash) towards

the mangrove area. Collaboration with PLN will be carried out with a Cooperation Agreement for three years.

Besides working with the government and BUMN, Tanah Merah Village also builds collaboration with the NGO PIKUL and universities. The PIKUL Foundation facilitates the village government in opening a dialogue with BBKSDA and the Kupang Regency Regional Government in drafting the Mangrove Management Village Regulation. The aim is for the Village Government, residents and supra-village government to recognise the community management model. The consultation process for the draft Village Regulation has been carried out at the Kupang Regency Legal Bureau.

Collaboration in mangrove forest management between the Dalek Esa group, Tanah Merah Village Government, Regional Government, BUMN, Central Government through BBKSDA, NGO Pikul, and Universities shows the aim of sustainable management of the mangrove ecosystem. Polycentric management, which involves various actors and levels of government in decision-making, is considered more efficient and effective in overcoming complex problems that require a multisectoral approach (Ostrom, 2010).

Participation in Cross-Authority Dialogue and Coordination

Apart from collaboration, one of the main dimensions in polycentric management is dialogue and coordination. Polycentric management encourages active participation from local communities and authorities at every level of government in dialogue processes and decision-making and strengthens community commitment to resource management. Polycentric governance offers many benefits for local communities (Sabel & Zeitlin, 2010), including increased participation in decision-making processes between centres of power and authority, responsiveness to local needs, promotion of sustainable development practices and stronger relationships between levels of government.

The Pikul NGO has initiated bringing together the *Dalek Esa* group, the residents and government of Tanah Merah Village, BBKSDA, and the Regional Government. This dialogue aims to discuss several matters related to sustainable mangrove forest management in the future. First, the *Dalek Esa* group and coastal residents want the local wisdom model practised to be preserved. One form of recognition of the existence of this group is through the creation of Village Regulations (Perdes) for managing mangrove ecosystems. The village government also issued a Decree for the *Dalek Esa* Mangrove Lovers Group as part of a community institution to manage the mangrove ecosystem according to local wisdom. Second, dialogue between stakeholders was carried out to facilitate and discuss the wishes of the *Dalek Esa* group and the village government to manage the mangrove ecosystem into a village ecotourism area. The residents' wishes were communicated to the BBKSDA, which has authority over the TWAL area. The temporary answer from BBKSDA is that if the ecotourism management plan is in a protection block, it is necessary to change the status of the area used by the Ministry of Environment and Forestry.

Meanwhile, if the planned area is outside the protection block or included in the utilisation block, the Village Government can apply for a Memorondum of Agreement with the The Ministry of Environment and Forestry (KLHK)/ BBKSDA for its management. According to BBKSDA's explanation, It is possible to create ecotourism in the area, but it needs to pay attention to carrying

capacity, carrying capacity and Strategic Environmental Assessment (KLHS). The village can coordinate with the District Environmental Service. Meanwhile, KLHS will be prepared by the provincial government and will be assessed by BPKH to issue an environmental permit. Third, dialogue was also carried out with the village government, the *Dalek Esa* group and BBKSDA because some time ago, officers from BBKSDA planted pillars and measured the highest tides. This activity needs to be discussed if there are changes to regional boundaries because the Tanah Merah Village Government already has a mangrove area map made with the NGO PIKUL. Fourth, dialogue was also conducted with the Kupang Regency Regional Government regarding the RTRW and Detailed Spatial Planning (RDTR). This dialogue was carried out to determine the Regional Government's plans for developing the coastal area around Tanah Merah Village, which is under the authority of the Regency. The Kupang Regency Regional Government does not yet have an RDTR, so the utilisation opportunities planned by the Tanah Merah Village government do not conflict with the Regency's RTRW.

Recognition of Local Communities

Local community-based management of mangrove ecosystems requires informal and formal recognition. Community management practices gain legitimacy from village residents informally. These unwritten agreements give the *Dalek Esa* group and residents the power to protect and manage the mangrove ecosystem. However, it is also essential for residents to obtain formal legal recognition from the Tanah Merah Village government and the Central Government through BBKSDA, which has authority over the mangrove areas within the TWAL.

One form of Village Government recognition of the community-based mangrove management initiative is by proposing the creation of a Village Regulation on Mangrove Ecosystem Protection. It is hoped that this village regulation will provide recognition for community-based management and guarantee an agreement on the ecosystem's protection and use, which the *Dalek Esa* Mangrove Lovers Group will monitor. Meanwhile, the form of recognition from the BBKSDA is through dialogue and a willingness to partner with the *Dalek Esa* group and the Village Government. The BBKSDA allows residents to manage the mangrove ecosystem if it does not conflict with statutory regulations. BBKSDA facilitates groups and village governments if they want to utilise the mangrove ecosystem outside the protection block through an Memorandum of Agreement between the group/village government and KLHK/BBKSDA.

Recognition in polycentric management enables more sensitive decision-making to the context and needs of the community, thereby ensuring greater environmental sustainability. Local communities are recognised because they have in-depth knowledge and experience regarding ecosystems and resources that can be integrated into decision-making processe. Without recognition of management at the local level, the coordination and collaboration carried out are not necessarily characteristics of polycentricity (Marshall, 2015).

Challenges of Community Recognition in Mangrove Ecosystem Management

Although decision-making centres at various levels of authority are an important requirement in polycentric management, it often faces the challenge of regulatory diversity in each authority on the same subject. Legal recognition of specific resource management initiatives is often hampered by centralised and less flexible legislation (Agrawal, 2005). Residents and the Village Government

have taken the initiative to manage the mangrove ecosystem as ecotourism is experiencing obstacles in the face of Government Regulation Number 22 of 2021 concerning the Implementation of Environmental Protection and Management. Apart from that, the Mangrove Management Village Regulation was discussed with residents and involved elements of BBKSDA, and the NGO PIKUL still encountered obstacles due to the demand for a Village Authority Regulation to be made as its legal umbrella. Village authority has been regulated in several regulations from central to regional levels, including Law No. 6 of 2014 concerning Villages, PP Number 47 of 2015, The Ministry of Villages, Development of Disadvantaged Areas, and Transmigration of the Republic of Indonesia 2015, Ministerial of Home Affairs regulations No. 44 of 2016, and Kupang Regent's Regulation Number 61 of 2019 concerning List of Village Authorities Based on Origin Rights and Village-Scale Local Authorities. The Legal Department and the District Village Community Empowerment Service are still discussing several agreements in the village regulations regarding sanctions. Minister of Home Affairs Regulation 120 of 2018 concerning the Formation of Legal Products emphasises that legal products regulated in the Minister of Home Affairs Regulation are only at the central to district levels. Regulatory products at this level are allowed to impose sanctions. Meanwhile, legal products in the village are not regulated in terms of the imposition of sanctions. According to the residents' agreement, sanctions are an essential element that needs to be included in the Village Regulation so that it has a binding force on all residents.

Another challenge faced in this polycentric model is the conflicts and disputes between local communities if several agreements in the village regulations and management by Dalek Esa are separated from the agreement of all village residents and those outside the village who access mangrove ecosystem services. Moreover, conflict resolution mechanisms have not been further regulated at every level, from the community, RT, Village Government to the authorities. In addition, for this polycentric model to continue, effective governance mechanisms are needed to facilitate coordination, collaboration, and accountability and ensure support for local communities. Monitoring and evaluation mechanisms must be ensured to manage coastal resources using the principles of local wisdom and sustainable development.

De Facto Autonomy: The Quality and Degree of Local Community Autonomy in Polycentric Governance

De facto autonomy in the context of polycentric governance (Marshall, 2009) is based on the freedom and ability of local communities to make decisions and carry out initiatives without always being subject to formal regulations and the authority of higher authorities. The focus of de facto autonomy is on informal rules or agreements of local communities that are more relevant and in accordance with local needs. (Ostrom, 2010) supports the importance of de facto autonomy in resource management using a polycentric system.

In the study of mangrove ecosystem management in Tanah Merah Village, the Dalek Esa group and other local residents took the initiative to rehabilitate and utilize mangrove ecosystem services. They did so without any direct instructions from BBKDSA or the Kupang Regency government which has authority over the mangrove ecosystem on the coast of Tanah Merah Village. These efforts resulted in a sustainable mangrove ecosystem management model even without stronger formal regulations.

In order for polycentric governance to run effectively, the local community in Tanah Merah Village wants to strengthen the quality and level of autonomy in several aspects. The first aspect related to the need for autonomy in decision-making is needed so that local communities still have the freedom to make decisions related to management. They make agreements and joint rules in the utilization of mangrove ecosystems. They make various agreements that allow or prohibit the utilization of mangroves. Although de facto autonomy has proven effective in mangrove management for around 20 years, local communities still need aspects of formal recognition from higher authorities (Carlisle & Gruby, 2019). The initiative to create Village Regulations regarding mangrove management and dialogue with several authorized agencies are steps taken towards formal recognition. Another aspect is related to cross-actor collaboration. The Tanah Merah Village community dialogues and collaborates with various parties such as the village government, BBKSDA, Regional Government, NGOs, Universities, BUMN to implement mangrove ecosystem conservation and utilization programs. This collaboration strengthens the autonomy of local communities because they receive technical and financial support from various parties. Access to resources is the next aspect needed in de facto autonomy. Local communities have control over access to the use of mangrove ecosystem services for economic needs and ecotourism plans.

Mangrove Management in Tanah Merah Village: Contribution to a Polycentric Approach

This study contributes to the literature on polycentric governance that emphasizes the role of local communities in managing mangrove ecosystems. A polycentric management model that recognizes the autonomy of local communities provides a more sustainable alternative to centralized approaches. In addition, this study provides new perspectives on policies that support the recognition of local communities to strengthen adaptive capacity in the face of social and environmental changes.

This article strengthens a new perspective on local community recognition as an important component in polycentric governance. Formal and informal recognition of local communities as mechanisms that enable effective and adaptive governance. This is supported by evidence from the field that the management of mangrove ecosystems by local communities has been running for more than 20 years and has succeeded in maintaining environmental sustainability. This study shows that the polycentric model is more effective in dealing with dynamic environmental challenges. The role and active participation of local communities enrich the theoretical dimension of distributive justice over natural resources in the study of polycentric governance.

Schlager & Blomquist (2008) see polycentric governance as the result of overlapping arrangements. The polycentric model seeks to bridge management units whose boundaries have been technocratically determined by the government with forms that emerge from local communities to protect their values and interests. This model, as found in this study and previous studies, is stronger than centralized governance (Anderies & Janssen, 2013), resilient, and less vulnerable to high overlap and redundancy (Gupta et al., 2010).

On a practical level, this study shows how communities in Tanah Merah Village have successfully managed mangrove ecosystems through collective agreements, without relying too much on rigid formal regulations. This could be a management model that can be replicated in other areas facing

similar issues. Polycentric governance can be successfully implemented through strong dialogue and coordination between stakeholders. This article recommends that governments, both at the village and national levels, need to provide formal recognition for community-based management initiatives, while providing a more flexible legal framework. Such recognition is essential to ensure that local communities' natural resource management practices are sustainable in the long term.

CONCLUSION

This study focuses on the polycentric model of mangrove ecosystem management in Tanah Merah Village involving various actors at different levels. The main findings of this study indicate the importance of local community involvement in the sustainability of mangrove ecosystem management. Governance based on mutual agreement has proven effective in reducing environmental damage and improving the economic welfare of local residents. The initiative and role of residents are inseparable from de facto autonomy which includes aspects of autonomy in decision-making, formal recognition, cross-actor collaboration, and control over resource access.

The results of the analysis of these findings recommend several things related to the study of polycentric governance at the practical level to support the sustainability of mangrove ecosystem management. First, formal recognition of local initiatives. The government needs to provide a more flexible legal framework to recognize and support local community-based management initiatives. Rigid and non-contextual regulations can actually hinder sustainable resource management. Second, strengthening coordination between stakeholders and across agencies. More intensive dialogue and an effective communication platform are needed between the actors involved. Third, conflict resolution and enforcement of fair sanctions that are clearly regulated in regulations at the village level and supported by authorized parties. Fourth, participatory monitoring and evaluation involving local communities to measure success and detect areas that need improvement.

Overall, this study also has limitations in geographical coverage, making it difficult to generalize in different contexts. This study also has not explored in depth the dynamics between the central and regional governments in a broader context.

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