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The role and influence of stakeholders towards the Simanukmanuk village forest management using Mactor Analysis: A case in Toba Regency, North Sumatra, Indonesia

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Abstract

The village forest provides limited land access to communities and involves various stakeholders with different interests. This study explores the role and influence of stakeholders managing the Simanukmanuk village forest in Toba Regency, which holds significant ecological and cultural value. About 67 percent of the community has been living there for over 15 years, relying on the forest for their livelihoods. Data were collected through multiple instruments and then analyzed using the Mactor analysis. Based on the data analysis, the study identified twenty stakeholders involved in the village forest management. Among them, several were considered as key influencers, such as the Forest Management Unit Reg-IV, the Social Forestry and Environmental Partnership Agency (SFEPA) Sumatra, the Regional Government, and the Environment and Forestry Service (EFS). Companies relied heavily on stakeholder networks. Other most influential stakeholders were the Village Forest Management Institution (VFMI) Administrator, VFMI Members, Village Heads, Communities, the Chief of VFMI, Village Governments, Farmers and Community Leaders. They had high influence but low dependence. The VFMI Administrator, Members, and Chief demonstrated the highest competitiveness and played essential roles in planning and executing forest management activities. This research is novel for its comprehensive analysis of stakeholder roles and influences using Mactor.

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Introduction

Forest management in Indonesia has been shifted from state-based to community-based to promote community prosperity and forest sustainability. This policy is enforced by the Indonesian Ministry of Environment and Forestry (MoEF) by engaging local communities in forest management to prevent deforestation (Sylviani et al., 2020). To achieve this goal, the ministry runs the Social Forestry (SF) program, as outlined in Village Law Article 78. This program grants the community legal access to manage forests (Ministry of Environment and Forestry, 2021). The MoEF's policy includes the redistribution and reallocation of forest resources to support sustainability and community empowerment (Purnomo & Anand, 2014). The program aims to enhance community prosperity and reduce poverty by meeting basic needs, improving service and infrastructure, fostering economic growth, and using natural resources wisely, which is in line with Government Regulation No. 23 of 2021 concerning Forestry Organizing supports community well-being through sustainability forest management (Rahayu & Triwanto, 2021).

Community involvement in forest management has many benefits. For example, it increases knowledge and awareness about the importance of keeping forests and their roles in supporting a community's economic, social, cultural, and environmental well-being. This engagement fosters community interest and participation in sustainable forest management, especially in village forests (Bakrie & Luhat, 2021). Additionally, Village Forests (VFs) contribute to community welfare by providing local authorities with controlled access to forest resources, allowing them to better support local needs (Suwarti et al., 2015).

While community involvement in forest management brings many benefits, successful management also requires the collaboration of various stakeholders, including the government, local community, corporations, and environmental institutions, each holding different interests. To enhance collaboration and minimize conflicts, it is crucial to analyz these stakeholders to map their roles and influences (Firmansyah, 2019). Understanding stakeholder roles and influence is vital for achieving VF management goals. However, significant challenges persist, such as weak farmer institutions (Raharjo et al., 2020), complex land boundaries, and limited community capacity and knowledge of sustainable forest management (Pambudi, 2023).

Given the crucial roles of the community and various stakeholders, this research provides empirical data for policymakers to develop an evidence-based approach to managing VF in North Sumatra. The research questions were formulated to address the research objective. They align with Alviya et al. (2016), who emphasizes stakeholder roles for effective management and benefits from environmental, social, and economic perspectives. The key research questions are: (1) Who are the stakeholders in VF management? (2) What are the roles and influences of each stakeholder? (3) How do stakeholders interact in VF management?

The Toba Regency was chosen because it has diverse stakeholder interests, including village communities, government, NGOs, and the private sector. Saraan (2024) states that the Simanukmanuk VF has significant ecological and cultural (customary) value. About 67 percent of the community has been living in the village for over 15 years, relying on the forest as a primary source for their livelihoods. Given this context, identifying key actors and understanding their influence on forest sustainability and community welfare is a unique challenge.

Literature Review

Village Forest

Village Forest (VF) is a state forest area managed by the local village and utilized for village welfare (Ministry of Environment and Forestry, 2021). VF can be developed in production forests and protected forests. These forests have no permits and are located within the village's administrative boundaries (Qurniati et al., 2018). Communities around the forest play a role in VF implementation to improve village welfare (Asmin et al., 2019). Thus, the local community established a Village Forest Management Institution (VFMI) to manage the VF. VFMI is granted management rights for 35 years, with a possible extension. This allows communities to manage and benefit from the forest while preserving its ecological functions (Ministry of Environment and Forestry, 2021). Undri (2016) highlights that VF management is influenced by local community wisdom, valuing forests as economic assets and social hubs that strengthen kinship relations. Therefore, indigenous community management is crucial for understanding stakeholder roles, influences, and interactions (Parera et al., 2024).

Stakeholder

Stakeholders are crucial in natural resource management (Parera et al., 2024). They are individuals, organizations, or

groups that can influence or be influenced by a program or policy (Paletto et al., 2017; Reed et al., 2009). Stakeholders interact and depend on each other, influencing decisions, policies, programs, and objectives (Derak, 2017). Reed et al. (2009) categorized stakeholder into key stakeholders, subject, context and crowd. Yang et al., (2010) explain that key stakeholders are those who possess a direct interest, power of influence in forest management, whether for livelihood or direct involvement in management.

Syahputra (2018) identified twenty six stakeholders in Community-based Mangrove Management in Forest Management Unit 3 of Aceh Province based on their interest and power, divided into key stakeholder, subject, context and crowd. Meanwhile, Wakka (2014) identified six key stakeholders in KHDTK Mengkendek, South Sulawesi. Based on their power and interest, the stakeholders divided into two groups, including key players such as BPK Makassar, Dishutbun Tana Toraja, village government, and supportive stakeholder (the crowd) such as traditional institutions (Tongkonan), land-cultivating communities and local NGOs.

Reed et al. (2009) note that stakeholder influence and interests may change over time, underscoring the importance of ongoing monitoring and integration of these changes into management strategies. Effective stakeholder engagement is crucial for managing forests. It impacts decision- making and addresses the interests and influences of stakeholders (Parera et al., 2024). Stakeholder involvement in forest management reflects good governance (Siswoko, 2009). Additionally, their involvement is essential for aligning perspectives on sustainable forest management (Fibrianingtyas, 2020). Understanding stakeholders' roles enhances collaboration, gathers insightful information, and fosters sustainable decision-making (Susilo et al., 2016). Therefore, conducting a stakeholder analysis is necessary (Reed et al., 2009) and helps understand conflicts related to land resource use.

Methodology

Research Location

This study was conducted in Simanukmanuk VF, part of FMU Reg-IV, from March to September 2023. It was located in Toba Regency, North Sumatra Province, at 2.577759 E and 99.110031 N, as shown in Figure 1. This VF is one of the first licensed forests by the MoEF in North Sumatra. It is near Lake Toba and several tourism destinations, potentially integrating into tourism development. The community incorporates traditional knowledge and customary practices in VF management. Given the stakeholders' influence, it is essential to map and evaluate their roles and consider their impact on VF management.

Conceptual Framework

The research focused on analyzing the roles and influences of stakeholders in managing Simanukmanuk VF. It identified all relevant stakeholders, including the community, government, NGOs, and private sector. It analyses their interactions based on objectives, strategies, and potential alliances or conflicts. Based on these interactions, recommendations for sustainable forest management practices are provided.

Data Collection and Selection of Participant

To achieve the research objectives, a descriptive qualitative approach was employed. Data were collected through multiple



Figure 1 Map showing the research location

steps and instruments, such as observation, FGD, in-depth interviews, and document analysis. The first step was observations by systematically observing and recording relevant phenomena on the ground. The aim is to craft specific interview and FGD questions (Ariza et al., 2023). After that, the researchers conducted in-depth interviews to gain information from knowledgeable informants about the stakeholders' roles and interests (Singarimbun & Effendy, 2012; Murphy & Dingwall, 2023). The third step was FGDs. This step aims to gather detailed qualitative information from the community to explore views, opinions, beliefs, and behaviors (Fiantika et al., 2022). According to Krueger and Casey (2015), the FGD participants are usually between four and twelve participants. The FGD outcomes provided interactive data using the Mactor.

In the FGD step, respondents with relevant knowledge and experience were selected to provide extensive and detailed data. As shown in Figure 2, the FGD was conducted on July 12, 2023, at the Jangga Dolok Village office. This session involved eight participants: administrators, members of the Simanukmanuk VFMI, and the village head of Jangga Dolok.



Figure 2 FGD conducted in Jangga Dolok Village Office

Data Analysis

The data were analyzed using the Mactor tool (Tandio et al., 2023), which maps and understands stakeholder interactions, conflict, and alliance based on their objectives. Mactor is used in decision-making processes involving multiple actors with different interests. It assesses the strength of relationships, competitiveness, and attitude towards goals. Additionally, Mactor analyzes direct, indirect, and potential influences among stakeholders, facilitating a thorough exploration of inter-actor dynamics (Ress & MacDonell, 2017).

Mactor was chosen for its effectiveness in analyzing complex systems with multiple actors, competitiveness, and supportive interests (Durance & Godet, 2010). It helps researchers to deeply understand stakeholders' interests, influence, and power with systematic and easy-to-understand visual results. It also identifies potential conflicts among the stakeholders. The analysis includes: (1) Identifying actors; (2) Listing objectives; (3) Quantifying power relationships among stakeholders using a range of 0 (not influencing) to 4 (very influential); and (4) Assessing actor behavior toward the objectives (+ for favor, 0 for neutrality, - for opposition) and the importance of objectives (0 to 4 scale) (Ress & MacDonell, 2017).

In comparison with other methodologies, approaches like Social Network Analysis (SNA), the Power-Interest Matrix, and the Delphi Technique are also commonly used to analyze stakeholder roles and influences. SNA visualizes stakeholders interactions to identify key actors through network positioning, while the Power-Interest Matrix categorizes actors by power and interest, guiding engagement strategies. The Delphi Technique, meanwhile, uses expert consensus on stakeholder role and priorities. However, Mactor offers specific advantage in forest management by providing in-depth analysis of stakeholder convergence and divergence. Its ability to map influence, dependence, and both competitive and collaborative relationship makes it particularly valuable in understanding complex power dynamics, enhancing decision-making policymakers. Specifically, FGD data were analyzed using the Matrix of Direct Influence (MDI), measuring direct influence among stakeholders and the Valued Position Matrix (2MAO) to map stakeholders' positions relative to management objectives. By processing these matrices, Mactor produced maps of influence and dependence, competitiveness, and actor convergence. This framework facilitates a deeper understanding of power dynamics and strategic positioning in managing the Simanukmanuk VF.

Results and Discussion

The Simanukmanuk Village Forest

The Simanukmanuk VF is part of the social forestry scheme managed by the Village Forest Management Institution (VFMI) under the MoEF's Decree No: SK.1089/MENLHK-PSKL/PKPS/PSL.0/3/2017. This decree grants VFMI legal rights to manage over 350 hectares of forests in Jangga Dolok

Village, Toba Regency, since March 14, 2017. The Jangga Dolok village is one of several traditional Batak villages in Toba. The people are widely known to still hold traditional values and local wisdom in managing the forest, which they consider a vital water source. All forest-related activities are linked to cultural values. Figure 3 illustrates the landscape of the Simanukmanuk Village Forest framed by the Simanukmanuk Mountain.

The Actors and Their Roles

An actor is an institution, group, or individual who plays a major role in a system. (Rees & MacDonell, 2017). Actors influence systems through their capacity to mobilize resources and directly impact outcomes. Based on FGDs with 8 (eight) communities, this research discovered the actors and their roles, including strategic objectives in supporting Simanukmanuk VF development. These actors and roles are presented in Table 1.



Figure 3 A landscape of VF framed by Simanukmanuk mountain

Table 1 highlights the involvement of 20 stakeholders in the development of Simanukmanuk VF. These stakeholders had diverse characteristics. They involved cross-local and non-local authorities, including government, private sector, and communities across various strata. Sustainable VF management requires coordinated stakeholders engagement with clear strategic objectives. The Simanukmanuk VF promoted collaboration among stakeholders with complementary roles and objectives in order to reach successful management. This synergy enables the achievement of both conservation goals and community welfare.

Stakeholders in community forest management are diverse, with different roles and influence. Community members, are key stakeholders, while Government Bodies regulate the process. NGOs focus on advocacy and capacity-building. The private sector influences through investments and philanthropy, while Academics provide evidence-based practices and share knowledge. Hastanti and Raharjo (2021) identify key stakeholders in SF implementation in FMU Telawa, including Perhutani, community forestry group, VFMI, BPKH IX, BPDASHL, BDK Kadipaten and various government agencies, field facilitators, and NGOs. Sukristiyono et al. (2021) highlight key stakeholders in managing the Sungai Wain Protected Forest in East Kalimantan, including FMU Balikpapan, the Provincial Forestry Office, Pertamina UP V, NGOs, local communities, and various government agencies. Each stakeholder has its own power and interests, shaping their interactions and influencing the program's outcomes.

Table 1 Stakeholders, roles, and strategic objectives in the Simanukmanuk VF

No	Stakeholders	Roles
1	Village head	The main liaison between government and community including in forest management for community welfare
2	Village government	An element of the village apparatus that assists the Village Head in forest management for community welfare
3	Village Forest Management Institution (VFMI)	Managing the VF through field actions, including forest protection, utilization, and development of VF businesses
4	Chief of VFMI	Coordinating the efforts of communities in managing the VF
5	VFMI Administrator	Maintaining sustainable forests and improving community welfare
6	VFMI Member	The communities engaged in and around the Simanukmanuk VF actively participated in decision-making for its management
7	Farmer	Farmers who actively worked in and around VF
8	Village communities	Participating in the development of VF
9	Youth organization	Mobilizing youth participation in VF management
10	Community leaders	Leading the community in developing the VF
11	Students (internship, research, etc.)	Contributing to enhancing knowledge and science through field data collection and research

Table 1 (Continued)

No	Stakeholders	Roles
12	Village Customary Institution	Maintaining local knowledge. Facilitating customary, cultural, and religious-based decision-making. Maintaining customary values
13	Non-governmental organization (NGO)	Contributing to community empowerment, research, and development. Advocating for VF management
14	Regional government (Regency)	Providing assistance to VFMI in VF management
15	The Environment and Forestry Service (EFS) of North Sumatra	Providing community assistance, empowerment, institutional capacity building, infrastructure support, and monitoring-evaluation
16	FMU Reg-IV, Balige,	Part of the EFS that contributes to preserving forests, increasing forest benefits for ecosystems, and community welfare
17	The Social Forestry and Environment Partnership Agency Region Sumatra	Facilitating social forestry licensing, preparing social forestry development policies, and conducting mentoring, counselling, and monitoring-evaluation of SF
18	Academics	Conducting research and providing scientific guidance to increase knowledge and develop VF management
19	*Bintara Pembina Desa* (Babinsa)	Maintaining community security and order, as well as helping to develop village potential, including VF management
20	Companies	Support communities to increase the economic value of forests

** Source: research result, 2023.*

Level of Influence and Dependence Between Stakeholders

This research analyzed stakeholder influences and dependency using Mactor. In this analysis, the values in column 'Ii' indicate the influence scores, while the values in row 'Di' represent the dependency levels between stakeholders. The Direct Influence Matrix (MDI) illustrated in Figure 4 shows the level of direct influence among stakeholders. The MDI Matrix is filled by tracing the line from i to j, with the diagonal containing the value 0 (Faridz et al., 2024). Stakeholders in the first column are scored based on their influence level over the stakeholders listed in the first row. The influence levels are measured using an assessment scale: 0 (no influence), 1 (influences operational procedures), 2 (influences work), 3 (influences actor's mission), and 4 (influences actor's existence). The assessment results are presented in Figure 4.

Figure 4 shows that several stakeholders have high direct influence scores, such as FMU Reg-IV (684), Social Forestry and Environmental Partnership Agency (SFEPA) Region Sumatera (679), District Government (674), and Environment and Forestry Service (EFS) of North Sumatera (653). These stakeholders are strongly interested in achieving goals involving the community as the policy object. This finding aligns with Freeman et al. (2010), who describe stakeholder involvement in policy implementation as achieving policy objectives, assuming stakeholders are directly involved and understand policy's interests. In contrast, stakeholders with high dependency, such as Companies (676), lack direct control over decision-making processes or resource management. However, they exert influence indirectly through their networks with other stakeholders (Elmsalmi & Hachicha, 2014). It includes enhancing community product development, particularly NTFPs, ecotourism, and preparing policies through alliances. Companies can unlock collaborative initiatives where local communities and private actors collaborate on forest rehabilitation and ecotourism projects. In Simanukmanuk VF development, companies influence community products such as NTFP and environmental services. Figure 6 maps stakeholders in the influence and dependency quadrant.

On the other hand, the Valued of Position Matrix (2MAO) in Figure 5 explains the stakeholder's position towards objectives in Simanukmanuk VF development. In this research, stakeholder positions were determined by their behavior and evaluation, depending on their favourable or unfavourable behavior towards the objectives. This matrix was scored 0 (the objective had a bleak result), 1 (the objective disrupted the operational procedures), 2 (the objective disrupted work success), 3 (the objective disrupted mission achievement), and 4 (the objective disrupted existence). Positive and larger values indicate that the actor agrees with the program objectives.

The Mactor program transforms the data in Figure 4 and Figure 5 into features that interpret stakeholder connection, competitiveness, and relationships with goals (Rees & MacDonell, 2017). Mactor also generates a map of influence and dependence among stakeholders, as shown in Figure 6. This map illustrates stakeholders' ability to influence others in project planning and implementation. Stakeholder influence is determined by material resources, social status, and knowledge of the system's future. In this research, stakeholders were classified into four categories based on their power: dominant (high influence), dominated (high dependency), isolated (low

influence and dependency), and relay (high influence and dependency). This classification referred to the one expressed by Rahardjo et al. (2023).

Figure 6 shows the interests of stakeholders, distinguishing between strong influence and high-dependence stakeholders. It also identifies isolated and relay stakeholders (Rees & MacDonell, 2017). Stakeholders are categorized into four quadrants based on their influence and dependence levels. Quadrant I (top-left) consists of influential actors with high influence and low dependence. Quadrant II (top-right) comprises relay stakeholders with high influence and dependence. Meanwhile, Quadrant III (bottom-right) belongs to dependent stakeholders with low influence and high dependence. Finally, Quadrant IV (bottom-left) is filled by autonomous stakeholders with low influence and low dependence (Freeman et al., 2010).

MDII	Head-Vill	Village-Go	VFMI	Chief-VFMI	VFMI Admin	VFMI Membe	Farmer	Community	Youth Org	Comm-Lead	Student	Custom-Ins	NGO	District	EFS	FMU-IV	SFEPA	Academics	Babinsa	Companies	Ii
Head-Vill	34	33	34	30	27	29	32	30	25	31	31	35	31	43	38	42	41	30	21	38	621
Village-Go	31	31	32	30	27	29	31	29	23	29	31	32	31	41	38	40	39	30	21	36	600
VFMI	31	31	40	33	30	31	34	33	25	31	33	33	31	43	40	46	46	32	21	41	645
Chief-VFMI	30	30	39	33	30	31	34	32	24	30	33	31	30	40	40	43	43	31	21	39	631
VFMI Admin	32	33	41	33	31	33	36	35	25	33	32	34	31	42	40	45	44	32	21	39	661
VFMI Membe	34	33	39	32	31	34	36	36	25	33	32	36	32	41	41	44	42	32	21	41	661
Farmer	32	32	36	30	29	31	33	32	25	31	32	34	32	40	40	40	39	32	21	38	626
Community	32	32	36	30	29	31	33	31	25	31	32	34	32	40	40	40	39	32	21	38	627
Youth Org	23	25	26	24	25	24	26	25	20	24	24	25	25	27	27	27	27	26	21	27	478
Comm-Lead	28	29	30	28	27	27	30	28	21	27	29	32	28	35	34	34	34	29	21	35	559
Student	20	20	20	20	20	20	20	20	20	20	21	20	21	21	21	21	21	21	20	21	387
Custom-Ins	26	28	29	27	25	28	30	28	22	28	28	28	27	32	33	32	31	28	21	32	535
NGO	21	21	24	23	22	21	24	22	20	21	23	21	24	25	25	25	25	24	21	25	433
District	21	21	27	23	21	22	23	22	21	22	28	22	29	34	33	34	34	29	21	29	482
EFS	20	20	25	22	20	20	22	20	20	20	27	21	28	32	32	32	32	27	21	29	458
FMU-IV	21	23	27	26	23	24	25	24	21	23	30	24	29	35	36	37	37	29	21	33	511
SFEPA	20	22	26	24	23	23	25	23	20	22	29	23	29	34	35	35	35	29	21	32	495
Academics	20	20	25	22	21	21	23	21	20	21	27	20	29	29	30	29	29	28	21	27	455
Babinsa	20	20	22	22	20	20	22	20	20	20	25	20	25	26	27	26	26	26	21	26	433
Companies	33	33	40	33	30	31	35	33	25	32	35	36	33	48	45	49	50	34	21	46	676
Di	495	506	578	512	480	496	541	513	427	502	561	533	553	674	663	684	679	553	398	626	10974

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Figure 4 Matrix Direct Influence among stakeholders (MDI)

2MAO	Participat	income	Sustainabl	governanc	knowledge	Cooperatio	Policy	Local know	Market	Absolute sum
Head-Vill	2	3	3	2	2	2	2	3	2	21
Village-Go	2	3	3	2	2	2	2	3	2	21
VFMI	2	3	3	2	3	3	4	3	4	27
Chief-VFMI	2	3	3	3	3	3	3	3	4	27
VFMI Admin	3	3	3	2	2	3	4	3	3	26
VFMI Membe	2	3	3	2	2	2	3	3	3	23
Farmer	3	3	3	2	2	2	3	3	3	24
Community	3	3	2	3	3	3	3	3	4	27
Youth Org	1	1	2	2	3	3	2	3	3	20
Comm-Lead	3	3	3	2	3	3	3	2	3	25
Student	1	1	1	1	3	2	1	1	1	12
Custom-Ins	3	2	3	3	3	3	2	3	2	24
NGO	1	1	4	3	3	3	2	3	2	22
District	3	3	3	3	3	3	4	3	3	28
EFS	3	3	4	4	3	3	4	3	3	30
FMU-IV	3	3	4	4	3	3	4	3	4	31
SFEPA	4	3	4	4	3	3	4	3	4	32
Academics	2	2	3	2	3	3	4	4	2	25
Babinsa	2	2	2	1	2	3	2	3	2	19
Companies	3	4	3	3	4	4	2	3	4	30
Number of agreements	48	52	59	50	55	56	58	58	58	
Number of disagreements	0	0	0	0	0	0	0	0	0	
Number of positions	48	52	59	50	55	56	58	58	58	

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Figure 5 Valued of Position Matrix (2MAO)

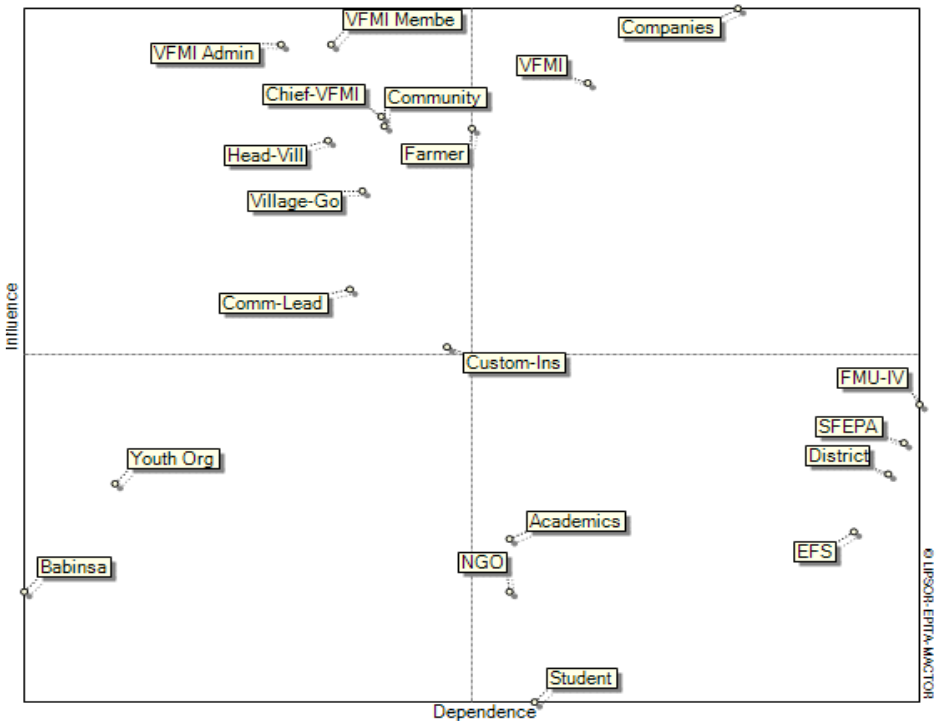


Figure 6 Map of influence and dependence among actors

The mobilization process reveals stakeholders' power and willingness to use it to control issues. The diagram shows the total mobilization of stakeholders for each issue. The strength of influence and dependency can be described based on its position in the quadrant above. Stakeholders' position in the influence and dependency map helps understand interactions in achieving and mobilizing to achieve goals (Rees & MacDonell, 2017). Figure 6 explains that the VFMI Administrator, VFMI members, Head of Village, Community, Chief of VFMI, Village Government, Farmers, and Community Leaders are dominant stakeholders because they have the authority to affect others with low dependence. For this reason, their roles are very important in managing Simanukmanuk VF. The dominant position of these stakeholders shows their ability to determine policies for VF development.

Companies and VFMI are relay stakeholders with strong influence and dependency on others (Freeman et al., 2010; Rees & MacDonell, 2017). They act as intermediaries, maintaining the flow of resources information. Their role is particularly essential in complex governance structures like VF management, where effective synchronization of interests and strategic actions across multiple actors is required for successful outcomes.

Meanwhile, the Regional Government, FMU Reg-IV, SFEFA, EFS, Students, NGO's, and Academics have a high influence and dependency on others. They are expected to serve as the operators of Simanukmanuk VF development and need to understand group mechanisms' work and technical aspects related to VF management. The Village Customary Institution, Youth Organization, and Babinsa are isolated stakeholders with low influence and dependency. Rahardjo et al. (2023) stated that isolated stakeholders have low influence and dependence in a particular context. They may not be significantly involved in project interactions and do not have a strong connection with the main stakeholders in Simanukmanuk VF development.

The Stakeholders and Their Objectives

Another result of Mactor is the Map of Competitiveness as shown in Figure 7 that illustrates the effects of a stakeholder's influence on others, depending on direct dependence, direct influence, indirect dependence, and indirect influence (Rahardjo et al., 2023). The competitiveness map explains whether stakeholders can use their power to reach objectives.

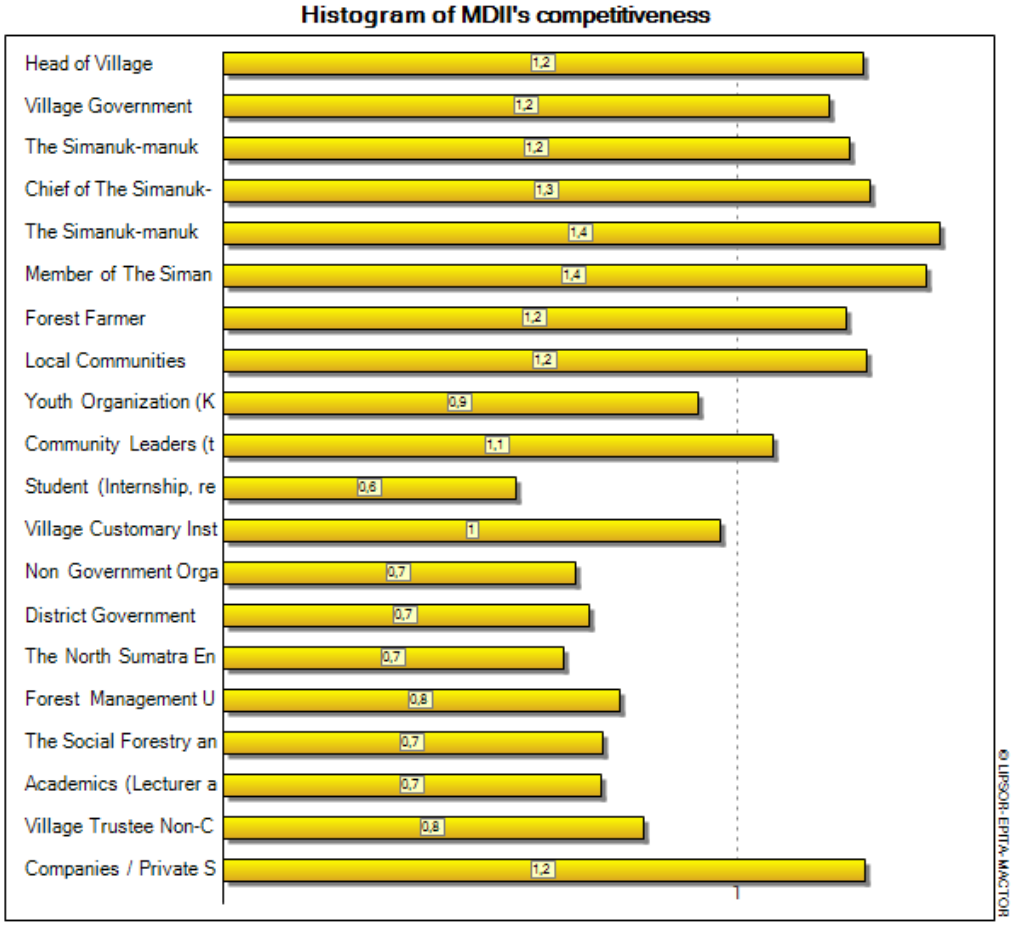


Figure 7 Map of Competitiveness in village forest management

Figure 7 shows that the VFMI Administrator (1.4), VFMI Members (1.4), and Chief of VFMI (1.3) are the most competitive stakeholders in Simanukmanuk VF development. They are crucial for planning and conducting activities and will benefit directly from VF activities. The Head of the Village and Local Communities follow closely behind. With high competitiveness, these stakeholders significantly influence the direction of Simanukmanuk VF management, while students have low competitiveness. These findings highlight the important roles of VFMI Administrator, VFMI Members, and Chief of VFMI as key actors in VF.

Stakeholder Interaction with The Simanukmanuk Village Forest Development Objectives

Stakeholders' interaction with objectives is important for identifying what motivates them to exert influence (Ariyani and Umar, 2020). Further analysis involves mapping the management objectives of the Simanukmanuk forest. Elmsalmi and Hachicha (2014) mentioned that the key factor in deciding the stakeholders' support or opposition is the compatibility of the development objectives with their commitments. Mactor produces a map of stakeholder support for these objectives. The more important an objective is, the stronger the support from stakeholders toward achieving that goal.

Figure 8 below shows no blue color on the bar graph of objectives, meaning that all stakeholders support all established VF management objectives. The highest levels of support are for providing markets, maintaining forest sustainability, and promoting policies that support VF development. This high level of support reflects the real conditions, where the community expects markets that can accommodate forest products and policies that safeguard their rights. They increase community involvement and ensure a fair benefit distribution.

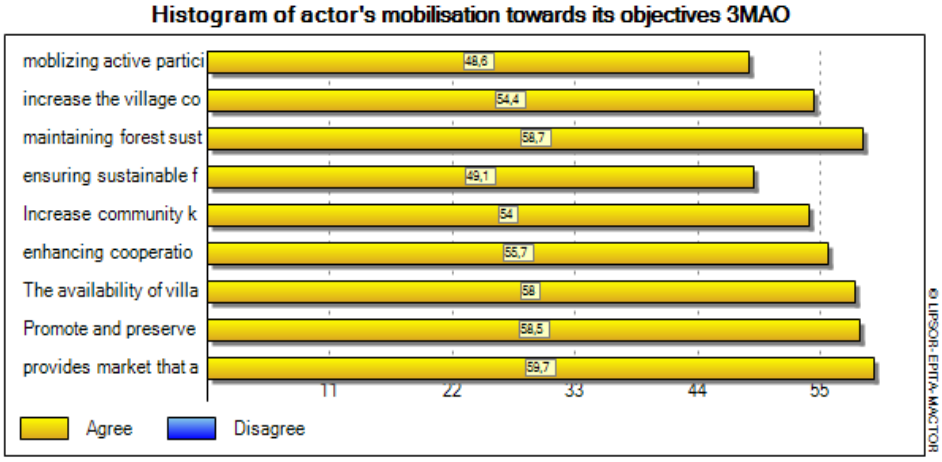


Figure 8 Map of the strength of management objectives

Another strongly supported objective is to increase cooperation and community income, which is particularly important given the existing limitations in support networks and income diversification. Since most community members are farmers, the potential to increase cooperation and community income is through non-timber forest products and environmental services. By fostering collaboration and optimizing these resources, stakeholders enhance economic resilience while promoting sustainable practices in VF management.

On the other hand, the least supported objectives are ensuring forest governance and mobilizing community participation. The lack of support for ensuring governance is because it is a long-term endeavor that does not provide immediate benefits. Additionally, the community has limited knowledge and managerial skills in forest governance, including understanding forest policies, licensing, and regulations. Limited community participation is caused by low roles and involvement, lack of transparency and accountability in management, limited resources and finances, or the influence of other socio-economic conditions.

Tandio et al. (2023) stated that some actors did not support certain sustainable tourism objectives. The rejection is due to several reasons, for example, land use change for tourism, impacts on environmental damage, conflicts of interest, and private involvement. In contrast, this study found that all stakeholders agreed with the objectives of Simanukmanuk VF management. The nine objectives above align with the main objectives of social forestry, which aim to achieve an equal distribution of rights, responsibilities, and benefits for communities in forest resource management. This achieves a balance between forest conservation and fulfilling the community's economic and social needs.

The Interaction Schemes Among Stakeholders

The pattern of interaction among stakeholders is outlined in convergence mapping. The convergence map shows that the closer one stakeholder is to another, the more intensive the convergence. This result aligns with Rahardjo et al. (2023), which explains that stakeholder interactions are reflected in a convergence map for each stakeholder. The convergence mapping shows that the closer the position between stakeholders, the stronger the level of convergence realized. The convergence mapping refers to a graphical visualization of how stakeholders' views, interests, or positions can come close to an agreement. It involves understanding how stakeholders are engaged in a project, program, or policy.

The following figure shows the alignment or convergence of stakeholders' strategic objectives. This graph visualizes level of stakeholders consensus on shared objective. The stakeholders with high convergence indicates a common vision, despite differing interests. This graph is useful for identifying possible alliances or potential cooperation among stakeholders, which help resolve conflicts and align efforts to achieve common objectives. The convergence among stakeholders is categorized as weakest, weak, moderate, strong, and strongest.

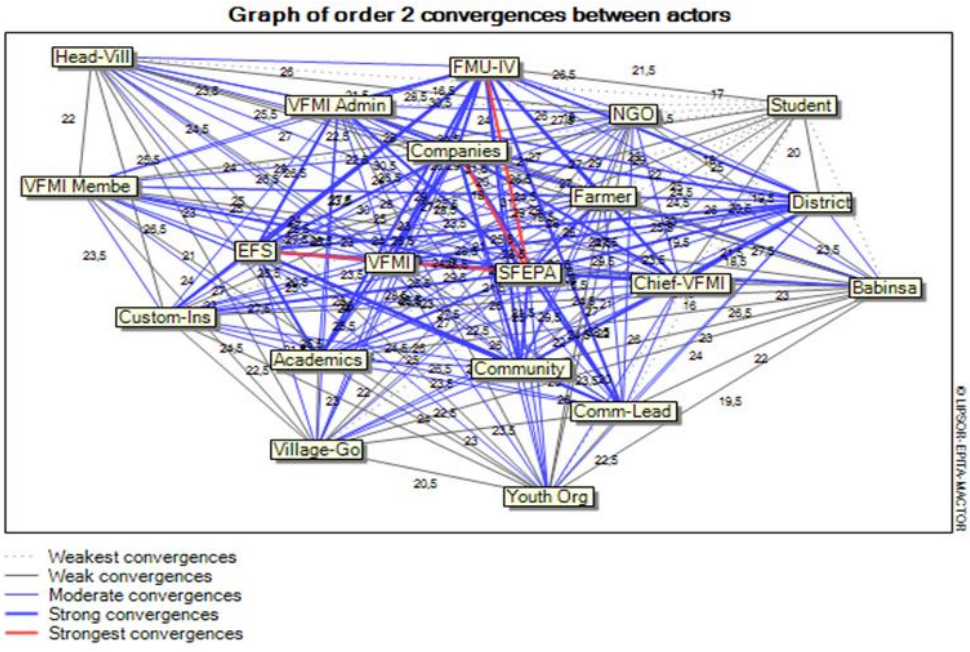


Figure 9 Graph of order 2 convergence between stakeholders

In Figure 9, the red line indicates very strong relationships among some stakeholders, including SFEPA, EFS, FMU Reg-IV, and Companies. These stakeholders can work together in achieving VF objectives. The stakeholders with a very strong influence are key stakeholders who can collaborate as they have the same goal. SFEPA should be encouraged to become the main stakeholder that facilitates the achievement of VF management objectives. The EFS is a stakeholder that bridges various efforts to ensure VF sustainability, while FMU Reg-IV contributes by educating, increasing capacity, and connecting parties. In addition, the companies have strong relationships with other government stakeholders (SFEPA, EFS, FMU) who are in close contact with VFMI. Therefore, in addition to playing a role in capacity building, these stakeholders can cooperate to develop forest products produced by VFMI.

Conclusion and Recommendation

Simanukmanuk VF management involved 20 diverse stakeholders, including local, non-local authorities, and the private sector. Key stakeholders with high direct influence included FMU Reg-IV Balige, SFEPA Sumatera Region, Regional Government, and EFS North Sumatera, while companies tended to be highly dependent. VFMI Administrators, Members, the Village Head, Local Communities, Chief of VFMI, Village Governments, Farmers, and Community Leaders were influential due to their roles in forest management and community relationships.

Furthermore, SFEPA, EFS, FMU Reg-IV, and companies shared strong relationships, contributing to VF management objectives. Their collaboration suggests potential to achieve shared objectives. SFEPA should act as the main facilitator, while EFS should ensure VF sustainability and FMU Reg-IV should strengthen stakeholder capacity and foster connections. Companies have significant influence through their close government relationships. Future research should consider alternative methods, such as network analysis, to gain deeper insights into stakeholder relationships and VF management strategies.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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