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Central Sulawesi Grand Forest Park: "Participatory Mapping Model for Conflict Resolution on Forest Resource Utilization"

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Abstract: Land claims and forest resource utilization activities are one of the causes of conflict in forest management in the Grand Forest Park (Tahura) area of Central Sulawesi. The existence of communities around and within the Central Sulawesi Grand Forest Park is an inseparable part of forest ecosystem management. The success of management planning for it will be more achieved if the manager has reliable instruments and strategies in dealing with problems and conflicts between forest managers and the community. The aim of the research is to classify the roles of the parties in the utilization of forest resources in Tahura and to design a participatory mapping model for conflict resolution over the use of forest resources in Tahura. The research method used in this research is a matrix of interrelationships between stakeholder issues to determine conflict issues on a priority scale, stakeholder analysis to map the influence and interests of stakeholders and to determine a participatory conflict resolution mapping model using a soft system method. Focusing on conflict issues that are on the priority scale, namely land (tenurial) conflicts and conflicts over the value of the benefits of the existence of Tahura. The results of stakeholder mapping related to land conflict resolution consist of: key actors (key players) including: Central Sulawesi Forestry Service, UPTD Tahura, Village Communities, and Forest Farmer Groups. Meanwhile, the resolution model formulated is "Joint control" based on the role of each stakeholder, namely the Management body or Advisor Body.

Keywords: Central Sulawesi; Conflict resolution model; Participatory Mapping

Introduction

Tompu Hamlet was established by the indigenous Kaili tribe, which is located in the Central Sulawesi Province Forest Park (Tahura) area. The local community has claimed its existence before the establishment of Tahura. They generally live in mountainous areas, and still often carry out illegal logging activities and clearing forest land for other land by burning. This tends to have an impact on environmental damage (Jovanović & Milanović, 2017; Tola, 2023). Conversion of forest land to agricultural land by communities causes significant changes in forest function (Batunacun et al., 2019; Golar et al., 2023). The results of the interpretation of land cover coverage in the Tahura area in Ngatabaru Village, with a time span of 10 years (2010 to 2020), identified land cover in the form of shrubs which experienced an increase in area of 20%. This increase is partly due to the activity of taking forest products in the form of wood for charcoal raw materials. The less wood is available, the further they go into the forest area to look for wood (Greenslade et al., 2020; Konstantinavičienė, 2023).

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Land use in the Tahura area has been going on for quite a long time, one of which is in Ngatabaru Village. The urgency of the community towards forest use is triggered by limited sources of livelihood and community life, as well as the poverty they experience. In conditions like this, encroachment and forest damage will occur, including in conservation areas (Almanza-Alcalde et al., 2022; Bos et al., 2020). One of the impacts occurred in Ngatabaru Village, where there was forest damage and a decline in the quality and quantity of water in the Ngia Reservoir in Ngatabaru Village which was starting to be felt (Kurnijanto et al., 2023). This encroachment activity is actually nothing more than a manifestation of tenure practices (Hak et al., 2018; Hjort, 2020). In the context of tenure practices, land control becomes a determining factor because it is related to land as the main basis for cultivation in order to realize the hopes of utilizing it (Tanjung, 2019; Cai et al., 2020).

Legal ambiguity over land and natural resources has resulted in land feeling unsafe, and has had an impact on community livelihoods, and has resulted in potential conflict (Gritten et al., 2013). There are several priority issues related to Tahura management, namely the problem of tenure and the value of forest benefits that are not felt by the community and local village government; the problem of boundaries around the forest area, and the activities of Tompu Hamlet (part of Ngatabaru Village) in the Tahura Area. This dynamic will result in prolonged conflict with Tahura managers and the local government. This condition needs to be a concern for all stakeholders for the sake of the sustainability and preservation of Tahura management in the future (Maccioni et al., 2024). One of them is through the preparation of a policy direction in harmonizing the interests of the community (Syahlan, 2021), management and management of conservation areas in the Central Sulawesi Grand Forest Park.

However, the collective agreements that are built will often clash with the applicable regulations. This must be responded to immediately by policy makers, as an effort to improve governance and forest management in the future (Golar et al., 2021). The success of the Tahura management planning will be more achieved if mapping is carried out from the beginning in the utilization of forest resources by the community and the interests of stakeholders in management are accommodated. The interest mapping model is carried out in a participatory manner, so that interventions in decisions on forest management can be implemented with a collaborative model of the roles of the parties/stakeholders (Arifah et al., 2023).

Based on this, the purpose of this study is to classify the roles of the parties in the management and utilization of forest resources and to produce a design model for conflict resolution in the utilization of forest resources in Tahura Central Sulawesi. The design of the conflict resolution model as a strategic step to help resolve conflicts in Tahura Central Sulawesi effectively.

Method

The research location is in Ngatabaru Village, which is the only village that has a hamlet that borders directly and there is also a hamlet in the Tahura Central Sulawesi forest area. In addition, in this village there is a large potential for tenurial conflict.

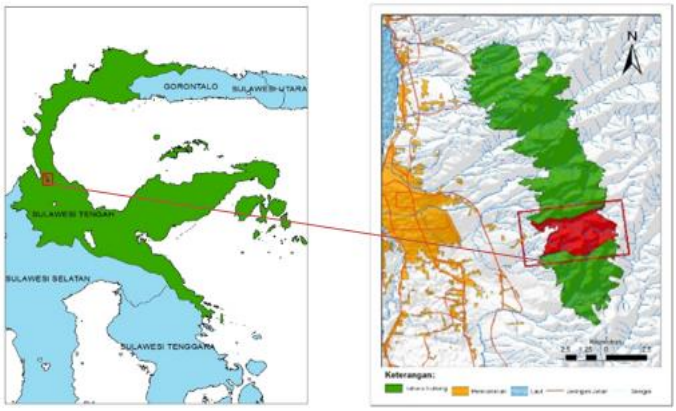

Figure 1. Research location

This study uses mixed methods between qualitative and quantitative methods. The qualitative approach is used to understand the perspectives, experiences, and local knowledge of stakeholders related to forest resource utilization and the participatory mapping process. The quantitative approach is used to measure the level of participation, effectiveness of the mapping model, and changes in forest resource utilization. In addition, this study adopts the principles of Participatory Action Research - PAR, where stakeholders will be actively involved in the entire research process, including problem formulation, data collection, analysis, and development of the mapping model.

Data collection consists of: participatory mapping workshops, Semi-Structured interviews, in-depth interviews will be conducted with key informants from various stakeholder groups, FGDs with stakeholder groups, document analysis and field observations. The data obtained will be analyzed using thematic analysis or content analysis methods, consisting of: Data transcription; Coding; Categorization; and Interpretation of emerging themes related to forest resource utilization, conflict, and the potential of participatory mapping models. Quantitative data collected through a questionnaire on the level of participation will be analyzed using descriptive statistics. Meanwhile, spatial data generated from the

participatory mapping workshop will be analyzed using Geographic Information Systems (GIS) to visualize information, identify spatial patterns, and analyze potential conflicts or agreements related to forest resource utilization.

The model development process will be iterative and participatory, involving stakeholders in formulating key elements of the model, including the roles and responsibilities of each stakeholder, validation and verification mechanisms for mapping results, implementation and sustainability strategies for the model, validation and testing of the model. The participatory mapping model that has been developed will be validated through discussions with stakeholders and tested on a small scale in the field to see its effectiveness in facilitating the resolution of forest resource use conflicts. The results of the testing will be used to improve and refine the model.

Result and Discussion

Stakeholder Classification in Tenurial Conflicts

Tenurial Conflict is a common conflict that occurs in forest areas, including in the Tahura area. The Tahura conflict is closely related to the lives of communities that depend on agricultural products and non-timber forest products around the forest area (Sagali et al., 2023). In general, conflicts occur due to the absence of clear boundaries, community claims, limited community access and overlapping stakeholder interests in conservation and other sectors within forest areas (Fienitz & Siebert, 2022). Classification of stakeholders in land conflicts in Tahura using a matrix of influence and interests using five variables including condition strength, feasibility strength, compensation strength, individual strength and organizational strength (Reed et al., 2009).

Measurement of stakeholder interest levels in land conflicts is measured using five variables including stakeholder involvement, benefits obtained by stakeholders, forms of stakeholder authority, stakeholder work programs and stakeholder dependency levels. Each stakeholder has a different level of influence and interest in efforts to resolve the Tenurial conflict that occurs. UPTD Tahura is a stakeholder that has the highest number of influences and also the highest interests. In addition to UPTD Tahura, there are 3 (three) key stakeholders, 2 (two) stakeholders who are included in the Subject group, 2 (two) stakeholders who are included in the Context setter group and 2 (two) stakeholders who are included in the Crowd group (Figure 2). Stakeholder groups that are included in the key player category include the Central Sulawesi Forestry Service, UPTD Tahura, the Forest Area Improvement Center and the local government. Key players are a classification of stakeholders who have high influence and interests in resolving tenurial conflicts in Tahura. This high influence and interest is due to the role of the Central Sulawesi Forestry Service in accordance with the Regional Regulation of Central Sulawesi Province Number 2 of 2015 which has the authority to carry out coaching, supervision and control in the management of Tahura.

UPTD Tahura is an actor who has the highest interests and influence of all identified stakeholders. In the Regional Regulation (PERDA) No. 2 of 2015, UPTD Tahura has the rights and obligations to carry out planning, protection, preservation and utilization of the Tahura area.

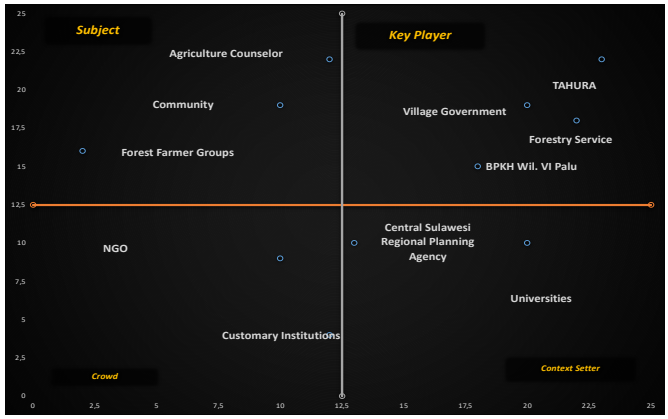

Figure 2. Matrix of Influence and Stakeholder Interests in Tenurial Conflicts in Tahura Central Sulawesi

The Forest Area Stabilization Center (BPKH) is included in the key stakeholders because this stakeholder is responsible for the outer boundaries of the forest area, in line with this, one of the factors causing the conflict in Tahura Central Sulawesi is the lack of clarity in the area boundaries. So the role of this stakeholder is very important in resolving the conflict over the boundaries of the Tahura Central Sulawesi area. Stakeholders who are included in the subject group are Extension Workers, communities living around the Tahura Area and forest farmer groups in Ngatabaru Village. This group has a high interest classification but low influence. High interests are caused by the community and farmer groups who live around the Tahura area depending on the Tahura area for their livelihoods.

In addition, based on PERDA No. 2 of 2015, the community around the Tahura area and forest farmer groups are given space to utilize the Tahura area, so that the community feels that they have and need to be involved and given full access to the management of the Tahura area. Forestry extension workers also have high

interests because one of the rights and obligations of extension workers in the regulations of the Director General of PSKL is to provide assistance and resolve conflicts in forest areas. Context Setter is a stakeholder group that has low interests but high influence on other stakeholders. Stakeholders included in this group are universities and the BAPEDDA of Central Sulawesi Province. Universities are one of the stakeholders that have high influence because universities in their role can influence other stakeholders in resolving tenurial conflicts that occur. In addition to universities, BAPEDDA Central Sulawesi also has high influence because this stakeholder has a role in efforts to provide good accessibility in Tahura management.

Both stakeholders play a role in helping the community or parties related to the management of Tahura Central Sulawesi, both directly and indirectly. The role of stakeholders is in the form of assistance or delivery of information to the entire community or parties related to the management of Tahura in order to resolve conflicts that occur. Crowd is a group of stakeholders who have low influence and interests in the Management of Tahura Central Sulawesi, but these stakeholders still have a role that is quite helpful in solving problems and also have the roles needed in management. The role is in the delivery of information, and also supervision, which includes this group are Non-Governmental Organizations and Traditional Institutions.

Stakeholder Classification in the Utilization of Joint Management Space

Tahura according to the mandate of Law Number 5 of 1990 concerning Conservation of Natural Resources and Ecosystems, is a natural conservation area for the purpose of collecting natural or artificial plants and/or animals, native and/or non-native species that are utilized for research, science, education, supporting cultivation, culture, tourism and recreation. This law provides opportunities for all stakeholders to utilize Tahura according to the function of the Tahura utilization block. In Governor Regulation No. 69 of 2015 concerning Procedures for Traditional Utilization in the Central Sulawesi Grand Forest Park, it provides access to the community and other stakeholders to utilize Tahura through traditional utilization. Traditional Utilization is an activity that can be in the form of collecting non-timber forest products, traditional cultivation, and limited traditional hunting for protected species in traditional blocks. In this traditional block, stakeholders are given access to carry out traditional utilization which is carried out to fulfill the traditional interests of the community around Tahura.

In the utilization of Tahura, related stakeholders are classified based on aspects of influence and interests. Similar to the aspect of Tahura conflict resolution, measuring the level of stakeholder influence uses five variables including condition strength, feasibility strength, compensation strength, individual strength and organizational strength. The dependence of the Ngatabaru Village community on the Tahura area has a fairly high intensity of relations. The high intensity is due to the easy access to the Tahura area for the community, in addition, the potential value of the ecosystem or economic value in the Tahura area is quite high and easy to utilize and market by the Ngatabaru Village community. In addition to the community, several stakeholders also have influence and interests in the utilization of the Tahura area (seen in Figure 3). Based on the figure, it can be seen that there are 4 (four) key stakeholders who have influence and interests in the utilization of Tahura. These stakeholders include; Forestry Service, Tahura, Ngatabaru Village Community, and Forest Farmer Group.

Regional Regulation of Central Sulawesi Province Number 2 of 2015 states that the Forestry Service as an extension of the Governor of Central Sulawesi has the task of supervising, fostering and controlling. From the Regional Regulation, it is identified that the Forestry Service has a high influence and interest in the policy of utilizing Tahura resources. In addition to the Forestry Service, Tahura is also a stakeholder that has a high influence and interest in the utilization of Tahura. The high influence and interest are described in Regional Regulation 2 of 2015 which states that Tahura has the task and function of planning, protecting, preserving and utilizing.

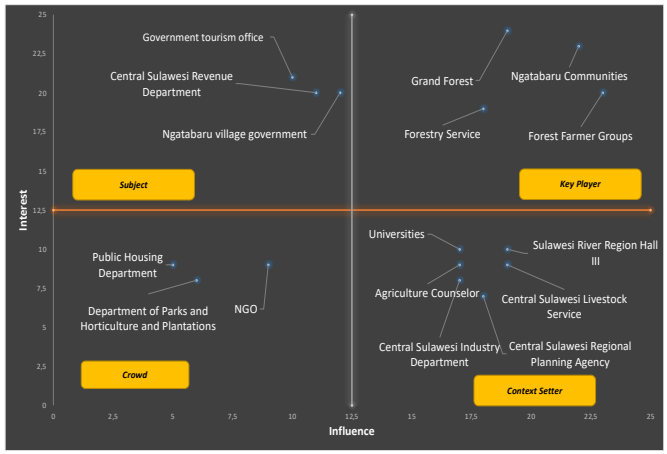

Figure 3. Matrix of influence and stakeholder interests in space utilization in Tahura

The community is one of the stakeholders who has a high influence and interest in the utilization of Tahura. This is because the Ngatabaru Village community has long utilized the Tahura area, even since the Tahura area has not been established, the community has utilized it,

both in the form of utilizing wood or utilizing non-timber forest products. In addition to the community, forest farmer groups are also key stakeholders in the utilization of the Tahura area. Almost all stakeholder activities are in the Tahura area. Meanwhile, the Regional Revenue Service of Central Sulawesi Province is the only stakeholder included in the Subject group category. The Regional Revenue Service has a high interest because the source of regional income comes from the Ecotourism services of this area, namely Kapopo which is in Tahura. Every person or group who enters this area is required to pay a levy. The results go to the regional treasury through the Regional Revenue Service. However, this service does not have the influence to change or make policies related to the utilization of the Tahura Area.

There are several stakeholders in the Context Setter group, namely Agricultural Extension Workers, Universities, River Basin Office Region III, Animal Husbandry and Animal Health Service, and the Industry and Cooperatives Service. In addition to the context setter group, in the utilization of Tahura, several stakeholders have also been identified who have low interests and influence, namely: the PU Service, Bapedda, the Food Crops and Horticulture Service and Non-Governmental Organizations. Although they have low interests and influence, these stakeholders can help solve problems that occur in the utilization of Tahura.

Institutional Governance for Sustainable Management of Tahura

Based on the description, the concept of conflict resolution in Tahura management is a collaborative management approach. The collaboration model developed is "joint control" which starts from the negotiation and agreement development processes, then directed at the formal division of power and responsibility, as presented in Figures 4 and 5. The joint control mechanism plays a very important role in the implementation of the participatory mapping model, especially in determining the success and sustainability of the solutions achieved (Clark, 2021; Doucet et al., 2024). Without a control system that is agreed upon and implemented jointly by the conflicting parties, the mapping results and agreements that are developed are at high risk of being ineffective or even triggering new conflicts (Ghorbani & Azadi, 2021).

In the context of this research, the joint control mechanism can guarantee legitimacy and ownership, ensure the sustainability of the agreement, increase transparency and accountability, balance power relations, build trust, and prevent future conflicts. The application of the joint control mechanism can transform maps and agreements from static products into a dynamic process that is managed collaboratively (Simorangkir et al., 2024).

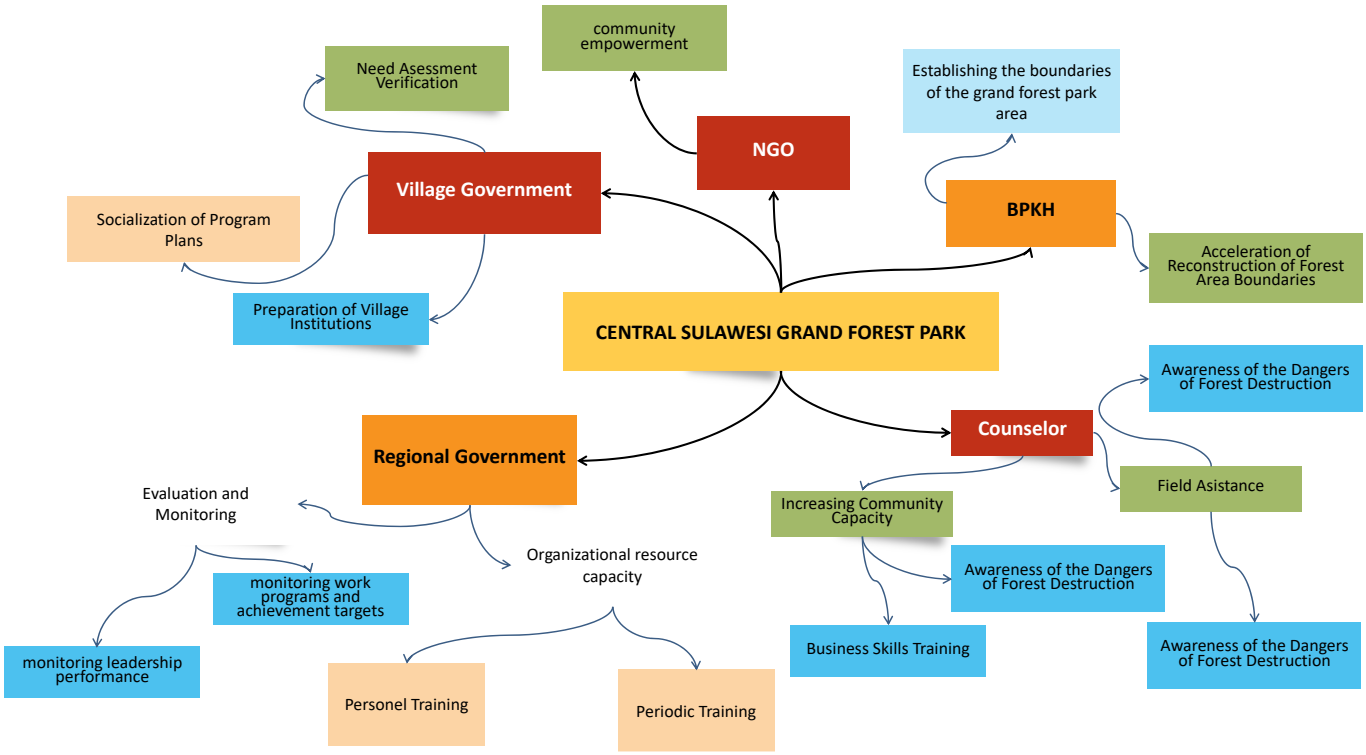

Figure 4. Mind mapping of the resolution model in tenurial conflicts in Tahura (Description: Management Body: Tahura; Advisor Body: Forestry Service, Village Government, BPKH, Counselor)

Participatory mapping activities are aimed at improving participatory planning by helping communities identify and prioritize their demands, while other tools can be used to help local governments monitor or evaluate conflict resolution efforts in the management of Tahura Central Sulawesi. Many conservation initiatives fail because they do not pay attention to the interests and characteristics of stakeholders (Prayitno, 2020). Stakeholder analysis has received increasing attention and many natural resource management initiatives are conducted in a participatory manner.

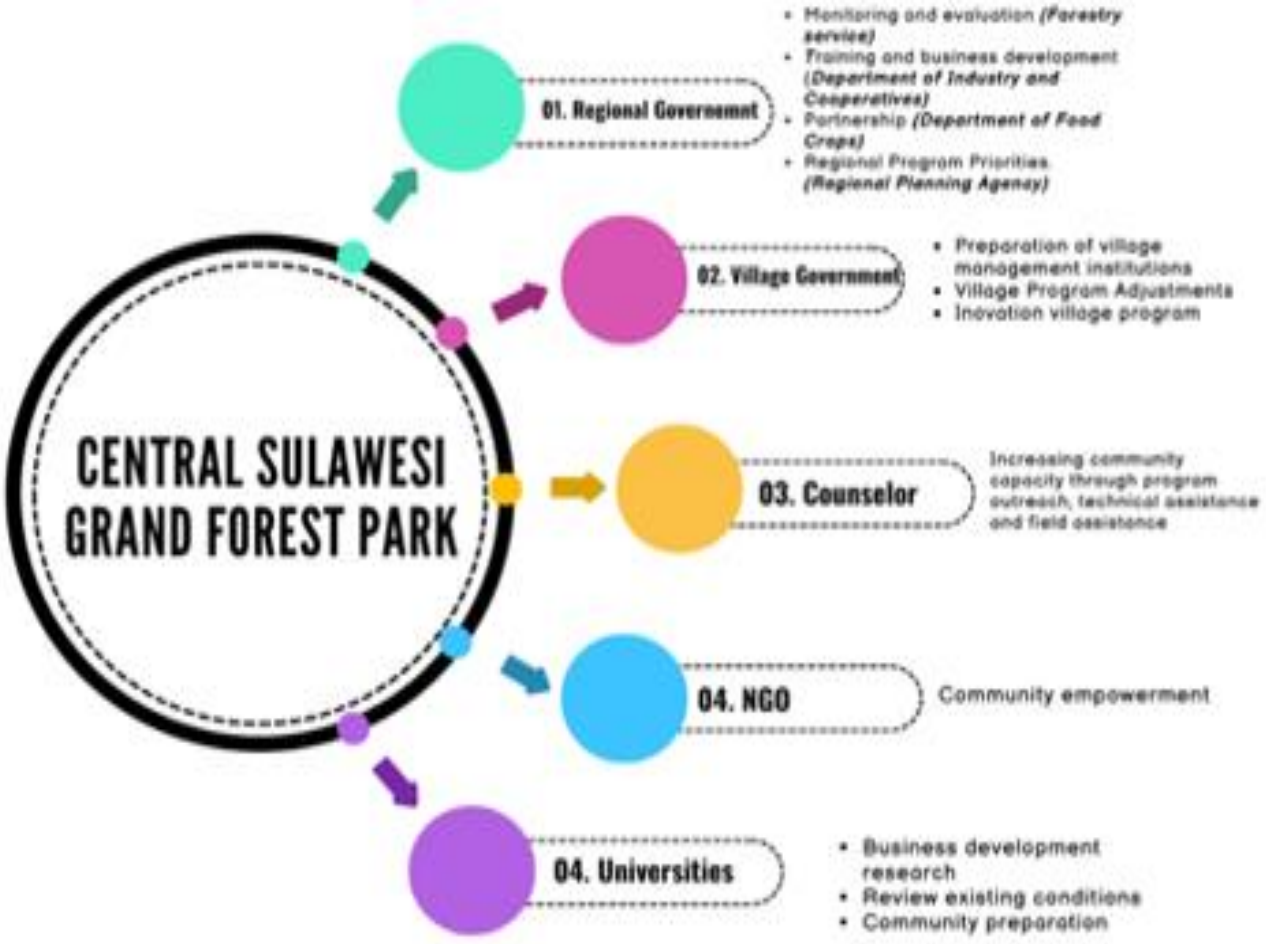

Figure 5. Tahura Utilization Model (Description: Management Body: Tahura; Advisor Body: Forestry Service, Village Government, BPKH, Counselor)

The collaboration institution is run by the collaboration forum secretariat which is tasked with connecting the management body and advisory body. The stages of the process towards collaboration start from strengthening the Tahura institution, consolidating Tahura with non-governmental organizations (NGOs) and local governments (Palu City Government), and then building collaboration together with local communities and other stakeholders, such as Universities and Research Institutions, according to the main focus of the conflict resolution that will be attempted (tenure conflict and benefit value).

Participating in forest governance is strongly associated with better outcomes for forest management (Tiki et al., 2025), Public participation, transparency, accountability, effectiveness and consistency are the main pillars for good governance (Roengtam et al., 2023; Maryudi et al., 2022), strengthening the trust necessary for effective governance processes (Ninan et al., 2024; Alessandro et al., 2021), create social learning opportunities (Silva-Jean & Kneipp, 2024; Ishikawa & Itakura, 2024) and enhance shared understanding and joint action (Heesen et al., 2017; Van Der Wel et al., 2021; Mogan et al., 2019).

According to Sahide et al. (2023), that so far, joint learning between various stakeholders in forest management in Indonesia has been very lacking. This situation does not encourage collaboration, nor does it trigger groups with interests in forests to jointly and responsibly utilize and manage forests (Golar et al., 2020; Alusiola et al., 2025; Zafra-Calvo et al., 2024).

Conclusion

Focusing on conflict issues that are on the priority scale, namely land (tenure) conflicts and conflicts over the value of the benefits of the existence of Tahura, Central Sulawesi. The classification of stakeholders who have high influence and interest in resolving tenurial conflicts in Tahura includes: key actors (key players), consisting of: Palu Region XVI Forest Area Stabilization Center, Provincial Forestry Service, UPTD Tahura, Central Sulawesi Village Government; the subject group consists of: Extension workers, communities living around the Tahura area and forest farmer groups in Ngatabaru Village; Context Setters consist of: Universities and the Regional Planning Agency of Suteng Province; The crowd consists of: Non-Governmental Organizations and Traditional Institutions. Meanwhile, key actors related to the value of benefits in Tahura management include: Central Sulawesi Provincial Forest Service, UPTD Tahura, Village Communities, and Forest Farmer Groups; subjects, consisting of: Central Sulawesi Regional Revenue Service; context setters consist of: Agricultural Extension Officers, Universities, Region III River Basin Centers, Livestock and Animal Health Services, Perindakop Services; Crowd, consisting of: Department of Public Works, Suteng Province Regional Planning, Department of Food Crops and Horticulture and NGOs. The conflict resolution model offered is "Joint control" based on the role of each stakeholder, namely the Management body or Advisor Body.

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Author Contributions
Conceptualization, M. H.; methodology, M. H., G. G; validation, M. H., G. G.; formal analysis, R. A.; investigation, H. H., M. A.; resources, M.H; data curation, S.S.W: writing—original draft preparation, M. M. H. and S.S.W.; writing—review and editing, H.M., G.G., S.S.W.; visualization, H.H, R.A. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest.

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