



Power relations in the management of the Sisik Naga Hills forest from a political ecology perspective

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ABSTRACT

Background: Forest governance in Indonesia faces a fundamental paradox. 95.5 million hectares of forest are claimed as critical conservation assets, yet 70% of the area is managed through centralized institutions. This situation tends to marginalize local communities. This study examines power relations in state forest management in the Sisik Naga Hills, Purbalingga, Central Java. Forest management in this area is formally participatory, but upon closer examination, it harbors structural inequalities. This study aims to analyze the power mechanisms operating through the Forest Village Community Institution (LMDH) and explore the ecological consequences of exclusionary management practices. **Methods:** This qualitative research uses a desk study method. Political ecology is used as the research framework. Data include policy documents, academic publications, and institutional reports related to social forestry and state forest governance. Thematic analysis was conducted to map forest ownership structures, local institutional dynamics, and exclusionary mechanisms in decision-making. **Findings:** The results found that the conversion of protected forests into cardamom plantations in Karangmoncol resulted in an escalation of disasters and material losses. The ambiguity of zoning boundaries and the dominance of local elites create blind spots that exclude community ecological knowledge. **Conclusion:** This study concludes that the absence of explicit conflict is not an indicator of balance, but rather a product of power relations that have been naturalized through formal procedures. **Novelty/Originality of this article:** This study extends the political ecology literature by showing that power does not always operate through open conflict, but rather through bureaucratic mechanisms that appear neutral but systematically benefit dominant actors in areas that have been marginalized in national forestry discourse.

KEYWORDS: forestry bureaucracy; political ecology; Forest Village Community Institutions; social forestry; power relations.

1. Introduction

The value of forests lies not only in their economic function, but also in their important ecological functions such as carbon sequestration, flood prevention, water flow maintenance, and providing space for humans to breathe and think (Dewi, 2021). Recent studies show that the economic value of forests is actually highest in their ecological functions, such as carbon sequestration and watershed protection, which can contribute 10-55% of the total value of forests. However, the economic assessment of these ecological functions is not objective. It is highly dependent on location, forest type, and population

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density in the surrounding area. What is considered “valuable” about forests is a product of the relationship between the ecological system and the economic interests that surround it.

Theoretically, an ideal forest is an ecological system capable of performing these functions sustainably, with biodiversity as its main foundation. Weiskopf et al. (2022) emphasise that biodiversity is not only an indicator but also a determinant of the stability and effectiveness of ecosystem services. Fisher et al. (2019) even show that forests with high integrity that maintain ecological structure and involve local communities have greater capacity to withstand anthropogenic pressures. In this framework, forest functions cannot be separated from the social and spatial contexts that surround them. The relationship between economic value and ecological function does not occur naturally. A system comprising policies, institutions, and relationships between actors regulates how these values are defined, accessed, and distributed. This system becomes an arena where various interests meet, negotiate, and often conflict in determining environmental harmony.

Forest governance in Indonesia faces a fundamental paradox in which 95.5 million hectares of forest are claimed to be critical conservation assets for climate change mitigation and biodiversity conservation (François, 2024). However, around 70% of this area is categorised as state forest, managed through centralised institutions that systematically marginalise local communities. This paradox is intensifying with the pressures of urbanisation, which is not only changing the physical landscape of cities but also expanding its ecological footprint into rural areas through increased resource consumption and forest exploitation (Adams et al., 2024). In this context, forests formally dedicated to conservation are experiencing ecological degradation, while communities with cross-generational ecological knowledge are marginalised from decision-making processes. This paradox demands urgent attention, as failure to address structural inequalities in forest governance not only threatens ecological sustainability but also exacerbates social injustice at the local level.

Recent literature points to a critical gap between environmental policy frameworks and the socio-ecological realities they are supposed to regulate. Herrmann-Pillath et al. (2023) identify a persistent failure in environmental governance, namely the inability to integrate ecological externalities into natural resource management frameworks. This gap is clearly manifested in Indonesia's forestry sector, where forest cultivation programmes face obstacles in dismantling entrenched power structures. Despite policy reforms following Constitutional Court Decision No. 35/PUU-X/2012, which recognises customary forests as part of forest rights (Arauf, 2021), implementation in the field is still far from transformative.

Previous studies have shown that state forest management controlled by institutions such as Perhutani or the Forest Management Unit/*Kesatuan Pengelolaan Hutan* (KPH) tends to place local communities in a subordinate position (Maryudi et al., 2022; Moeliono et al., 2023). Conservation narratives are often used to legitimise economically oriented production practices, while community participation is limited to symbolic roles without substantive authority in decision-making. Robbins (2019) argues that environmental management is never neutral. It is always shaped by institutions and narratives that conceal power relations. However, most political ecology literature still focuses on regions with explicit and massive tenure conflicts, such as Kalimantan, Papua, or Sumatra. Meanwhile, the power dynamics in regions that appear ‘peaceful’ but harbour deep structural inequalities remain underexplored. This bias reflects the assumption that ecological-economic conflicts are only relevant when they manifest in the form of open violence, collective resistance, or land disputes that enter the legal realm. In fact, in regions that appear stable, the pattern of prioritising economic interests over ecology is more subtle, but no less systematic. Local communities may not resist, not because they agree, but because governance structures do not provide space for them to articulate their interests. The absence of open conflict is actually an indicator that economic-ecological domination has been successfully naturalised. Political ecology needs to read this ‘peace’ critically, as a product of unequal power relations, not as evidence of balance.

In response to criticism of this centralised and exclusive forest management model, social forestry schemes promise to redistribute access to and control over forest resources to local communities. Although the literature on social forestry in Indonesia has grown rapidly, there is a significant knowledge gap. First, most studies focus on areas with explicit tenure conflicts and visible structural violence. Meanwhile, the power dynamics in areas that have formally adopted participatory mechanisms such as the Village Forest Community Institutions/*Lembaga Masyarakat Desa Hutan (LMDH)* have not received adequate attention. Research in the context of Java, particularly Malang, shows that even though LMDH has been formalised, farmers' level of trust in social forestry programmes is only around 28.9% and their level of understanding is only 26.7%, with low levels of farmer participation, external support and availability of facilities. Second, political ecology analyses tend to emphasise resistance and confrontation, but fail to explore how power relations operate through subtle mechanisms such as bureaucratic procedures, unequal access to information, and the formation of local elites. Third, the connection between global urbanisation pressures (Adams et al., 2024) and forest management transformations in relatively marginalised rural areas such as small districts in Java has not been systematically analysed. To fill these gaps, this study takes Purbalingga, a district in Central Java that offers an ideal case, as its locus. Geographically, Purbalingga is located in the North Serayu Hills and is managed by PT Perhutani (Persero) KPH Banyumas Timur. Unlike areas that are the focus of national forestry studies, Purbalingga does not experience massive tenure conflicts or explicit violence. Interestingly, the dynamics of state forest management in Purbalingga also have significant ecological consequences. The Upper Serayu Watershed, particularly in Karangmoncol Subdistrict, located in the upper Serayu North Mountains within Purbalingga Regency, has experienced repeated landslides and flooding.

Data from the Purbalingga Regency Disaster Management Agency/*Badan Penanggulangan Bencana Daerah (BPBD)* in 2024 shows that in the last five years, this region has experienced a significant intensification of natural disasters, particularly floods and landslides. In 2020, there were 6 flood incidents with losses amounting to IDR 564.55 billion and 55 landslide incidents causing losses of up to IDR 29.148 trillion. The following years showed non-linear fluctuations but still indicated consistent vulnerability. In 2021, there were 7 floods and 19 landslides (losses of IDR 162 million), in 2022 it increased to 10 floods and 38 landslides (losses of IDR 1.65 billion), 2023 recorded 5 floods and 31 landslides (losses of IDR 1.26 billion), and a drastic increase occurred in 2024 with 7 floods and 43 landslides, causing total losses of more than IDR 4.15 billion.

The escalation of floods and landslides in Purbalingga, especially the surge in losses in 2024, cannot be separated from deteriorating biophysical conditions, namely the reduction of water catchment areas and forest cover in the upstream area. The degradation of vegetation cover reduces the ability of the soil to absorb rainwater, increases surface runoff, and triggers slope instability, leading to repeated disasters of increasing intensity. However, the reduction in catchment area and forest cover is not a natural phenomenon; it is a product of power relations operating in forest and land management. The crucial question is how do power relations operate in this process of environmental destruction? What subtle mechanisms perpetuate structural inequality in a space that appears non-conflictual? Power relations in forestry politics do not always manifest themselves in the form of open conflict or blatant land grabbing. Instead, they operate through formal mechanisms such as licensing, spatial zoning and land use policies that systematically benefit certain actors. Decisions about who has the right to access and exploit forest resources, how forest areas are classified and converted, and the extent to which conservation principles are upheld, are all arenas in which power is exercised. Often, this occurs without meaningful participation from the communities most vulnerable to the ecological impacts.

A review of the literature conducted by the author on forest management practices in Indonesia reveals a variety of analytical approaches, ranging from policy perspectives and socio-economic dynamics to the ecological aspects of forest management. However, there is still a gap in understanding how power relations and bureaucratic mechanisms operate in the context of implementing forest management practices at the local level. To fill this gap,

this study makes three main contributions. Theoretically, it expands the political ecology literature by showing that power relations do not always operate through explicit conflict, but also through bureaucratic mechanisms, the formation of local elites, and the normalisation of limited participation. Empirically, this study provides in-depth data and analysis on the dynamics of social forestry in areas that have been marginalised in the national forestry discourse, enriching our understanding of the diversity of forest management contexts in Indonesia. In practical terms, the findings of this study can inform the design of social forestry policies that are more sensitive to local contexts and more effective in dismantling power structures that perpetuate inequality. Although Minister of Environment and Forestry Regulation No. 9/2021 on Social Forestry Management normatively emphasises sustainable forest management, improving community welfare, and environmental protection (Article 1), the literature shows a significant implementation gap in that Indonesia's social forestry programmes have not resulted in an aggregate reduction in deforestation; in fact, forest loss has increased in village forests and community forests. This article is organised into three sections. Following this introduction, the second section explains the research methodology, including the qualitative approach and data collection methods. The third section presents the results and discussion, analysing the forest control structure, Village Forest Community Institutions/*Lembaga Masyarakat Desa Hutan (LMDH)* dynamics, and power mechanisms operating in Purbalingga.

2. Methods

2.1 Research design and data sources

This study uses a qualitative approach with secondary data analysis as the main strategy to examine power relations in state forest management in Purbalingga Regency, Central Java. Creswell & Poth (2018) define qualitative research as an approach to explore and understand the meanings attached by individuals or groups to social or humanitarian issues. This approach was chosen because it allows for in-depth exploration of institutional dynamics and exclusion mechanisms in a context that is formally participatory but substantively exclusive. The researcher's position in secondary data analysis is as a critical analyst of documents produced by various parties. This study does not aim to produce statistical generalisations, but rather to generate a reflective contextual understanding of forest governance practices in areas that do not experience explicit tenure conflicts.

The data analysed includes policy documents, academic publications, and institutional reports relevant to issues of social forestry, state forest governance, and the dynamics of Village Forest Community Institutions/*Lembaga Masyarakat Desa Hutan (LMDH)*. Data sources include public documents (government reports, policy documents) and private documents (internal reports, academic studies). The documentary data included academic literature (journals, books, proceedings) and government policy documents (forestry regulations, Community-Based Forest Management/*Pengelolaan Hutan Bersama Masyarakat (PHBM)* guidelines). The data selection process was carried out systematically based on thematic relevance to the political ecology framework and the depth of analysis of the local context in Purbalingga. The documents selected were those directly relevant to the research questions on power relations, access to resources, and the dynamics of participation in forest management. The unit of analysis in this study was the practice of state forest management through LMDH under the management of the East Banyumas Forest Management Unit, with a focus on power relations in decision-making, benefit distribution, and access to forest resources.

2.2 Data analysis framework

The data analysis strategy was carried out thematically and interpretively following a qualitative data analysis framework. Creswell and Poth explain that qualitative data analysis involves organising data, conducting an initial reading of the database, coding and

organising themes, representing data, and forming interpretations of its meaning. The analysis began with the identification of main themes such as forest control structures, exclusion mechanisms, normalisation of participation, and bureaucratic politics.

These themes were coded to construct analytical categories relevant to the research questions. The coding process involved repeatedly reading documents to identify patterns, regularities, and anomalies in the data. The analysis was conducted in three stages. First, mapping the formal structure and substantive access to forest resources by identifying regulations, policies, and institutional mechanisms that govern state forest management. Second, exploring the dynamics of local institutions in LMDH, including the formation of elites and the distribution of authority, by analysing how different actors have unequal access to information, networks, and resources. Third, reading the mechanisms of power that work through the production of knowledge. The analysis also considers the context of document production, who produces the documents, for what purpose, with what epistemological assumptions, and what audience is targeted. Awareness of this context of production is important in the political ecology perspective, because documents are not seen as objective representations of reality, but rather as products of certain power relations that need to be read critically. Document analysis in this study does not merely extract information, but also reads the discourse and power relations embedded in the way knowledge about forests is produced, legitimised, and circulated.

3. Results and Discussion

3.1 Political ecology framework

Political ecology as an analytical framework has developed into an approach that analyses power relations shaping access, control, and distribution of benefits from natural resources. Robbins (2019) asserts that political ecology is an empirical study of questions related to environmental conflict and change. It emphasises specifically the influence of economic-political variables on ecological degradation and social marginalisation. This perspective rejects the depoliticised narrative that treats environmental issues as purely technical problems. Instead, political ecology emphasises that every environmental management decision is the result of power negotiations between actors with often conflicting interests.

The political ecology framework is increasingly important in understanding Indonesia's complex forest governance, where various actors are involved with intersecting interests. A study by Sahide et al. (2023) shows that political ecology is becoming increasingly relevant for analysing the political dynamics of bureaucracy in environmental governance, where various actors use diverse access mechanisms to secure their interests. This approach allows for a comprehensive analysis of how various interests are intertwined in the process of environmental policy-making, including how conservation narratives are often used to legitimise practices that actually perpetuate structural inequalities. This political ecology framework provides a basis for understanding the dynamics of state forest management in Purbalingga. It is particularly useful in analysing how power relations operate. The following sections will explore how the structure of state forest control, the fragmentation of the social forestry bureaucracy, unequal access mechanisms, and the dynamics of Village Forest Community Institutions/*Lembaga Masyarakat Desa Hutan (LMDH)* as a participatory institution shape a complex and contested forest management landscape.

According to the latest data cited by ANTARA News (2025), Indonesia's forest area covers 95.5 million hectares, most of which is state forest. Its status as a public asset gives the state full authority to determine its function, allocation and utilisation scheme. The North Serayu Mountains, which stretch across several districts in Central Java, namely Brebes, Tegal, Pemalang, Banyumas, Purbalingga, Wonosobo and Semarang, are a forest area with protected biodiversity. Purbalingga, one of the districts crossed by these mountains, is home to the Sisik Naga Hills. Stretching across the northern part of

Purbalingga Regency, from Rembang to Karangreja Subdistricts, it covers subdistricts such as Karangmoncol, Karanganyar and Karangjambu.

The Sisik Naga Hills area is managed by PT Perhutani (Persero) KPH Banyumas Timur. As an area with high biodiversity, including protected flora and fauna, the Sisik Naga Hills should be a model for sustainable forest management. In reality, land degradation practices still occur, highlighting the gap between protection regulations and implementation in the field. This gap is not merely a technical issue but reflects structural problems within the forest management bureaucracy.

A critical study by Maryudi et al. (2022) found that the implementation of state forest management faces what they call contested bureaucracy mandates. This is a situation where conflicting bureaucratic mandates create structural deadlocks that hinder more inclusive governance. This study uses a bureaucratic politics lens to explain why social forestry policy objectives are not being achieved, as non-social forestry bureaucracies increasingly channel their interests through social forestry policies and 'hijack' the intrinsic objectives of the programme. The fragmentation of the social forestry bureaucracy, with its different mandates and policy priorities, makes it difficult to take synchronised action. Maryudi's findings are confirmed by (Rodd et al., 2022), who analysed the coordination of forest tenure reforms in Indonesia, Kenya, Nepal, Peru, and Uganda, showing that despite formal commitments to reform, implementation in the field faces structural obstacles from various institutions with different interests in forest areas. This bureaucratic fragmentation in Purbalingga is manifested in the lack of clarity regarding the authority of PT Perhutani (Persero) KPH Banyumas Timur, which often creates confusion at the community level regarding the procedures and mechanisms for forest cultivation practices.

3.2 Unequal access mechanisms

The concept of access in natural resource management is often used extensively but has not been fully examined theoretically. Peluso & Ribot (2020) propose that access is not merely a legal right to property, but rather the actual ability to derive benefits from various things. These can be material objects, institutions, social relations, or symbols. By emphasizing the 'ability to obtain benefits rather than 'rights to ownership', this approach opens space for analysis of the social relations that enable or hinder communities in utilising resources. Access is understood as the result of complex interactions between various social mechanisms and forces, which form "bundles" and 'webs of powers' in the configuration of power relations.

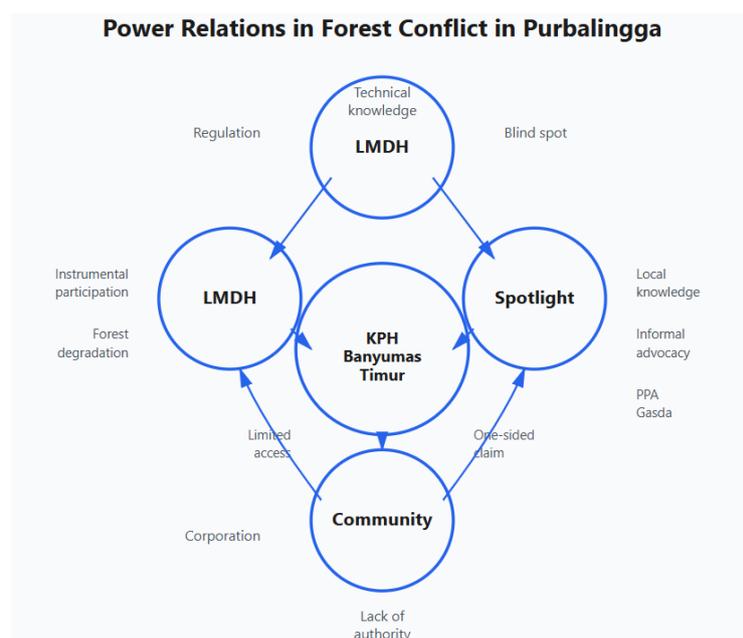


Fig. 1. Power relations between actors in state forest management

Within this framework, property is only one form of access relations among many others. Forest management cannot be separated from the issues of who decides, who regulates, and who must comply. These inequalities are not always visible in policy documents but are clearly felt in the daily experiences of communities who must deal with bureaucracy and dominant actors. Social forestry policy was confirmed through Minister of Environment and Forestry Regulation No. P.83/2016 and was later reinforced through the Omnibus Law on Job Creation, which sets a target of granting management access to communities covering 12.7 million hectares through five schemes: Village Forests, Community Forests, People's Plantation Forests, Customary Forests, and Forestry Partnerships. However, the latest data shows that the programme's realisation is still far from the target. Moeliono et al. (2023) identify four intertwined discourses in the implementation of social forestry in Indonesia, namely community-first (prioritising community rights and welfare), legal-first (prioritising procedural compliance and legality), conservation-first (prioritising ecosystem preservation), and development-first (prioritising economic growth). The fragmentation of these values creates contradictions in practice, where programmes that formally aim to empower communities often create new bureaucratic burdens and dependence on external facilitators.

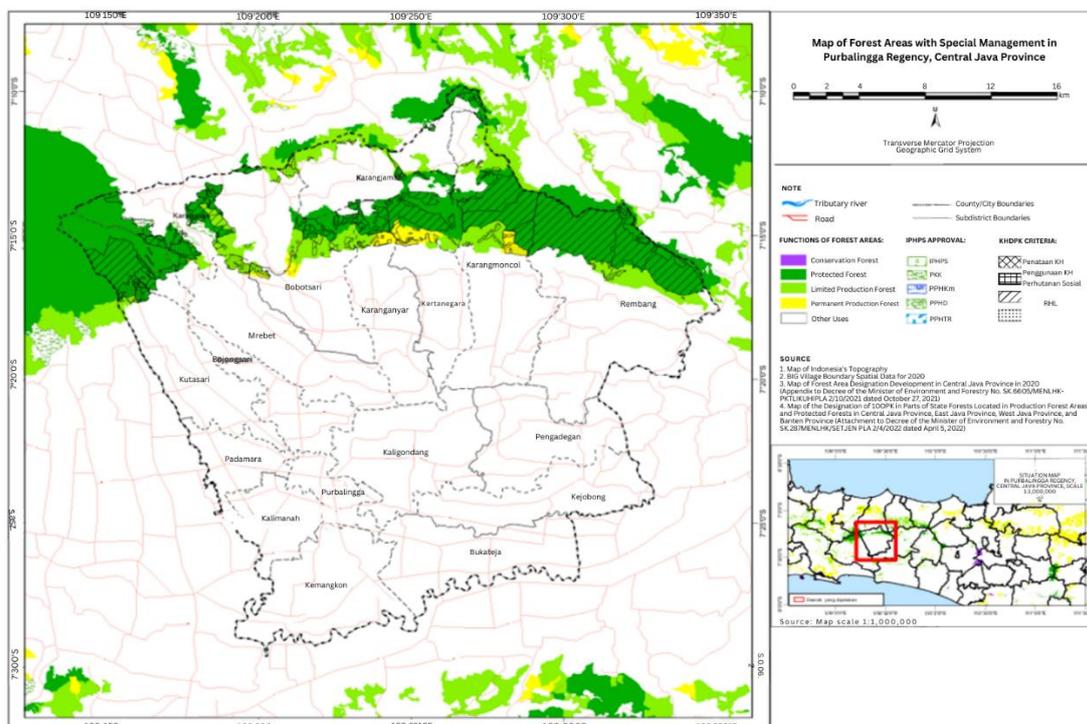


Fig. 2. Special management forest area

One important finding in the analysis of state forest management is the gap between the legal rights and the substantive ability of communities to access and benefit from forest resources. Budi et al. (2021) analysed the implementation of social forestry policies in various locations in Indonesia and found that although communities had obtained legal permits, their substantive access to forest benefits was still limited. Various factors underlie this, including complex licensing procedures, high transaction costs, a lack of technical assistance, limited market access, and the dominance of local elites in decision-making. These findings confirm that the granting of formal permits does not automatically democratise forest management if the underlying power structures are not changed. This gap between legal rights and substantive access manifests itself in various forms in the Sisik Naga Hills, Purbalingga.

According to data from the Forest Use Agreement issued in 2024, based on the administrative area, the total area of protected forest in Purbalingga Regency is 9,236.10 hectares, 4,726.80 hectares of Limited Production Forest and 629.10 hectares of Production

Forest. This area was obtained through terrestrial measurements in the field, which are technically more accurate than image-based estimates. However, the figures produced are still approximate because they are influenced by geographical conditions and technical limitations of measurement. This uncertainty creates structural ambiguity that allows for flexible interpretation of the function of the area. When zoning boundaries are inaccessible and incomprehensible to local communities, the category of 'Protected Forest' becomes informally negotiable by actors who have access to the East Banyumas KPH bureaucracy. This is manifested in the conversion of areas that should be protected into cardamom plantations without a process of transparency and public accountability.

Healthy forests should function as stable water regulators, not as a source of threat in every season. When forests become 'vulnerable' throughout the year, this is empirical evidence that vegetation cover degradation has destroyed the hydrological capacity of the area, transforming forests from protectors into sources of vulnerability. Although formally, communities affiliated with Village Forest Community Institutions/*Lembaga Masyarakat Desa Hutan (LMDH)* have the right to practice intercropping on state forest land. However, in practice, this access is severely limited by various technical and procedural regulations. The types of crops that may be planted, the locations of accessible land, and the duration of utilisation are all determined unilaterally by PT Perhutani (Persero) KPH Banyumas Timur, without adequate consultation with the community. A comparative study by Khan et al. (2024) on the power networks of multilevel actors in mangrove forest governance in the Sundarbans, Bangladesh, shows that the power dynamics in forest management involve complex interactions between state, non-state and local community actors. These findings are relevant to the Indonesian context, where hierarchical power structures and bureaucratic fragmentation create structural barriers to the substantive participation of local communities in forest management. Nurprabowo et al. (2021) further show that forests with high conservation value in Indonesia have undergone significant land use changes due to the convergence of poor science and political neglect. Forest land allocation and use in Indonesia has long been an arena of political contestation characterised by poor data and competing interests from various institutions. This shows that forest management is not only a technical matter, but also a political arena where scientific knowledge is often ignored in favour of certain economic and political interests.

3.3 Elite domination in forest governance

The LMDH (*Lembaga Masyarakat Desa Hutan* or Village Forest Community Institution) is a formal institution that connects village communities with state forest managers. It is an important arena for analysing the dynamics of participation and power in forest management practices in the Sisik Naga Hills of Purbalingga. Formally, LMDH was established as a vehicle to increase community participation in forest management through the Community-Based Forest Management/*Pengelolaan Hutan Bersama Masyarakat (PHBM)* programme, which has been running since the early 2000s. However, recent studies show that the function of LMDH in practice is often far from ideal in terms of participation. Maring (2022) found that the transformation of conflict and collaboration in the development of social forestry in Flores faces various institutional challenges, including the dominance of local elites and the lack of community institutional capacity. This study shows that community participation in LMDH is often instrumental in nature. The community is involved to the extent that their involvement benefits the interests of the managing institution.

Maring's findings on elite domination and instrumental participation in LMDH raise important questions about the factors that determine the success or failure of community-state collaboration models in forest management. The limitations of a top-down approach that prioritises institutional interests indicate the need for an alternative perspective that places community internal capacity as the starting point for institutional transformation. In this context, analysis of how communities build social resources and strategic networks becomes relevant to understanding the more complex dynamics of LMDH. Research on

social innovation and network mobility shows that the success of LMDH is highly dependent on the capacity to build strong social capital and networks, not only with state institutions but also with non-state actors such as NGOs and the private sector. This social capital and networks are crucial because they can offset the power asymmetries inherent in formal institutional structures.

Power asymmetries in LMDH stem not only from the dominance of local elites, but also from the way knowledge is produced and formalized in governance processes. Sahide et al. (2023) analyse blind spots and spotlights in bureaucratic politics, particularly in the context of policy co-production in environmental governance dynamics in Indonesia. They find that bureaucratic politics frames the dynamics of knowledge co-production in environmental policymaking, where there are blind spots in the policy-making process and spotlights that are deliberately formalized for specific purposes. An important finding from this study is that knowledge produced 'from below' can also be used in the co-production of knowledge policies produced by non-expert actors, or from dialogues between them and sympathetic experts that occur under the radar of the bureaucracy.

In the context of Purbalingga, the concepts of blind spots and spotlights are particularly relevant for understanding why local community knowledge about forest ecology is often ignored in planning and decision-making processes. Scientific knowledge produced by PT Perhutani (Persero) KPH Banyumas Timur or other stakeholders becomes the spotlight, considered the only valid knowledge and the basis for policy legitimacy. Meanwhile, the community's practical knowledge about seasonal patterns, the characteristics of local plant species, and socio-economic dynamics at the village level become blind spots that are invisible or considered unimportant by policymakers. This pattern creates a situation where community participation in LMDH is reduced to mere procedural legitimacy. The community is 'heard' but their knowledge is not taken into account in substantive decisions.

Muttaqin et al. (2023) reinforce this argument by analysing asymmetrical power relations in multi-stakeholder initiatives, focusing on the Indonesian National Forestry Council established by the government. This study shows that although multi-stakeholder initiatives are formally designed to increase participation and inclusiveness, in practice there are still significant power imbalances between state and non-state actors. These findings are relevant to understanding the dynamics of LMDH, which, although formally participatory institutions, are in practice still dominated by actors with better access to information, networks, and resources. This inequality is not merely a matter of technical capacity, but also a product of a governance structure that systematically privileges certain forms of knowledge while formalizing others. It is a mechanism that allows economic-ecological domination to proceed without meaningful resistance, precisely because it has been formalized within formal procedures that appear participatory.

3.4 Power relations in non-conflictual spaces

An analysis of the dynamics of state forest management in Purbalingga reveals that power relations do not always operate through explicit conflict and visible structural violence. Instead, power operates through subtle mechanisms that appear neutral. These include complex licensing procedures, high technical requirements, the normalisation of limited participation, and the formation of a legitimate local elite with better access to information and bureaucratic networks. Purbalingga, a region that has not experienced massive tenure conflicts but is still under centralised control through PT Perhutani (Persero) KPH Banyumas Timur, shows that the absence of explicit conflict does not mean that there is no structural inequality. In fact, in this seemingly peaceful and participatory context, mechanisms of exclusion and subordination operate more subtly and are difficult to detect. The community does not openly oppose the forest management institution because they have internalised the norms and rules set by the state, and because they depend on the limited access provided through the LMDH scheme.

The findings of this study confirm the argument of Maryudi et al. (2022) that social forestry in Indonesia is being held hostage by conflicting bureaucratic mandates. The

implication of this finding is that substantive transformation in forest governance requires more than just formal policy reform or administrative decentralisation. The dynamics of forest management described in the previous section have real ecological consequences and threaten the safety of communities in Purbalingga, particularly in the Upper Serayu River Basin/*Daerah Aliran Sungai* (DAS). Floods frequently hit the Serayu watershed, located in the southwestern part of Central Java Province at coordinates 07°05'–07°04' South Latitude and 108°56'–110°05' East Longitude. The Serayu River is approximately 181 km long, covering an area of 5,760 km², and flows through five districts: Wonosobo, Banjarnegara, Purbalingga, Banyumas, and Cilacap. The Serayu watershed is one of the critical watersheds in Central Java, particularly in Purbalingga District, which often experiences flooding during the rainy season. The condition of the watershed is greatly influenced by the condition of the upstream area, which is vulnerable to human disturbance. The Upper Serayu Watershed is located in the Sisik Naga Hills, which administratively falls under the Karangmoncol Subdistrict, Purbalingga Regency. This location is an example of watershed degradation that has attracted national attention due to recurring flooding. The altitude in the Serayu Upper Watershed in Purbalingga Regency ranges from 213 to 3,238 metres above sea level, with slopes that mostly have a gradient of 0-8%. The vulnerability of the Serayu watershed to flooding cannot be separated from the issue of forest management in its upper reaches. Recurring floods are not merely a natural phenomenon, but the result of complex interactions between ecological conditions and resource management decisions made by actors with different interests. Seddon et al. (2020) argue that a vulnerability framework for socio-ecological systems helps explain the role of nature in supporting human adaptation to climate change. This means that forest degradation in the upstream area is not only an environmental issue, but also a socio-political issue related to how access to and control over forest resources are distributed.

3.5 National deforestation in the context of legal concessions

The dynamics of deforestation in Indonesia show a pattern that is highly relevant to the situation in Purbalingga. Recent data shows that Indonesia's deforestation rate over the past five years remains alarming despite fluctuations. In 2024, 261,575 hectares of forest cover were lost, an increase of 1.6 per cent compared to the previous year. Most worrying is the fact that 97 per cent of this loss occurred within legal concession areas, indicating serious problems in corporate-level supervision and law enforcement (Parker, 2024). Official data from the Ministry of Environment and Forestry shows that the 2021-2022 period saw deforestation of 104,000 hectares, which, although an 8.4 per cent decrease from the previous period (113,500 hectares in 2020-2021), is still significant and far from the national conservation target. Even more concerning is the critical ecological impact of this forest loss. In 2024 alone, more than 160,925 hectares, or 61.5 per cent of total deforestation, occurred in the habitats of critically endangered wildlife such as orangutans, Sumatran tigers, elephants and rhinos. Habitat loss on this scale threatens the survival of these iconic species and disrupts the overall balance of the ecosystem. The pattern of deforestation in these legal concessions reflects a structural failure in forest governance, where state and corporate actors, who should be the guardians of the forest, have instead become the main actors in its degradation. Meanwhile, local communities that have historically managed forests sustainably been excluded from legal access and stigmatized as a 'threat' to conservation. This paradox shows that the problem of forest degradation is not only a technical management issue, but fundamentally a problem of unequal distribution of power and access among various actors.

Changes in forest area function have significant and often long-term hydrological consequences. Research shows that tree species and forest density, climate, rainfall, aquifer type, and topography are important factors influencing the relationship between tree cover and water availability (Aljunied, 2025; Ramadhan et al., 2022). The study confirms that groundwater availability and recharge are higher in areas covered by native forest species than in areas planted with commercial forest species for production. Furthermore, research

using the Soil and Water Assessment Tool (SWAT) model to test the relationship between upstream forest cover and downstream water quality, showing that forest conversion to settlements results in substantial increases in sediment and nitrogen concentrations, with extreme occurrences of nitrogen and sediment concentrations potentially becoming 3.6 to 6.6 times more frequent in the future (Gay et al., 2025). These findings confirm that the hydrological function of forests is not merely an administrative attribute, but has a real material impact on ecosystem resilience and community welfare, especially in downstream areas that are prone to flooding, such as the Serayu watershed.

The ecological impacts of forest function conversion on biodiversity have been systematically documented in recent literature. Studies on land conversion from natural ecosystems to agricultural land use show that such conversion reduces tree species diversity, abundance, and occupancy, and decreases the capacity of ecosystems to provide various ecosystem services (Noulèkoun et al., 2025). The study reveals that land use change can affect various ecosystem functions directly or indirectly through its impact on various attributes of biodiversity. In the context of Southeast Asia and Indonesia in particular, recent data shows that more than 160,925 hectares or 61.5 per cent of total deforestation in 2024 occurred in the habitats of critically endangered wildlife such as orangutans, Sumatran tigers, elephants and rhinos. Habitat loss on this scale not only threatens the survival of these iconic species, but also disrupts the overall balance of the ecosystem, creating cascading effects that exacerbate environmental degradation.

The process of reclassifying the function of forest areas is not merely a technical decision, but rather an arena of political contestation involving complex power negotiations and the systematic exclusion of local communities. Research on the formation of forests as administrative entities shows that forest management operates as a technology of state power, whereby the state divides land, allocates rights, forms collectives and subjects, and legitimises some practices of knowledge while ignoring others (Gabrys et al., 2022). In the context of Purbalingga, the ambiguity regarding the boundaries between protected forests and production forests mentioned earlier is not only a technical issue, but also a strategy to maintain flexibility for dominant actors in changing the function of the area according to their economic and political interests, without having to be accountable for these decisions to the affected communities.

The structural failure in the Sisik Naga Hills, specifically in Karangmoncol Subdistrict, is manifested in a very concrete form, namely the unclear boundaries between protected forest areas and production forest areas. State actors (East Banyumas Forest Management Unit) have not provided clear zoning maps that are accessible to the public, so that residents do not know for sure which areas must be strictly protected and which areas can be used on a limited basis. This ambiguity is not merely a technical cartographic issue, but reflects deliberate ambiguity that gives dominant actors the flexibility to interpret the rules according to their interests. The change in forest function from natural vegetation to agricultural monoculture has direct consequences for slope stability and susceptibility to landslides. A concrete case in Karangmoncol District, Purbalingga, shows a clear manifestation of forest management failure. In April 2022, a landslide occurred on the Siregol road connecting the villages of Kramat and Sirau as a result of the massive conversion of protected forest into cardamom plantations.

A field survey conducted by the Gasda Nature Activists Association/*Perhimpunan Pegiat Alam* (PPA) in March 2022 found that an area that was supposed to be a protected forest with tree cover had been turned into the “Taman Kapulaga Indah” (Beautiful Cardamom Garden), a cynical term criticizing the change in the forest's function. The Karangmoncol Regional Forestry Extension Officer explained that kapulaga is actually a intercropped plant that should be grown under the shade of large trees, but because the timber trees have disappeared, the soil has lost its grip, causing repeated landslides. This finding is confirmed by recent literature showing that the architecture of tree root systems plays a crucial role in slope stability and uprooting resistance. Research on the effects of root architecture on six woody plant species with different growth habits (deciduous shrubs, deciduous trees, and evergreen trees) in the black soil region of northeastern China

found that total root length had the greatest influence on maximum pull-out force; the longer the total root length, the greater the plant's ability to hold the soil (Pang et al., 2024). The study also showed that the number of inclined roots (roots growing at an angle of 30°-60° to the soil surface) had a significant effect on uprooting force and activation displacement.

This extreme pattern of fluctuation, from water surpluses that cause flooding and landslides to severe deficits that trigger droughts, is not merely a weather anomaly, but a manifestation of ecological failure due to the loss of forest cover. When forests are intact, the complex root systems of trees, with sufficient total root length and an inclined root structure (30°-60°), function as a “natural sponge” that gradually absorbs rainwater and slowly releases it into the soil aquifer. The conversion of forests into nutmeg plantations with shallow root systems eliminates the soil's infiltration capacity, causing rainwater to flow directly to the surface during the rainy season (triggering floods and landslides with losses reaching IDR 2.3 billion in 2024), while during the dry season there is no adequate groundwater reserve to maintain river flow and residents' wells (requiring 4,292 emergency water tanks at the peak of the 2019 crisis). Regional Disaster Management Agency/*Badan Penanggulangan Bencana Daerah (BPBD)* data showing a drastic decline in water assistance in 2020-2021 followed by a surge in 2023 indicates that progressive forest degradation has created an increasingly unstable hydrological system that is vulnerable to climate variability. The paradox of “too much water” and “too little water” in the same geographical area within a short period of time is the most concrete empirical evidence that forests are not just a collection of trees, but a critical ecological infrastructure that regulates water availability. When this infrastructure is destroyed by conversion driven by short-term economic interests, while ignoring the warnings of local communities and environmental activists, the consequence is a double vulnerability that threatens the lives of thousands of residents in the form of both hydrological disasters and food and health crises due to clean water scarcity.

The process of converting forest areas from protected to cultivated areas is not merely a technical decision, but rather a political contest involving the systematic exclusion of local community knowledge and participation. Analysis of land cover change and landslide vulnerability shows that forest cover transition and urban expansion are the main drivers of landslide vulnerability, with various impacts of land cover change depending on the specific context and trajectory of land conversion. Recent studies emphasize the importance of understanding the complex interactions between socio-environmental transformations and geodynamic processes in reducing landslide risk, where affected areas in hilly regions with steep to moderate slopes experience high vulnerability due to intense rainfall that saturates the soil and reduces slope stability (Zhu et al., 2025).

In the case of Karangmoncol, local communities and environmental activists have long warned about the dangers of converting forests into nutmeg plantations, but their warnings have been ignored by policymakers who prioritize short-term economic interests. The head of the Sirau Village Tourism Working Group and PPA Gasda activists who conducted field surveys are non-state actors who do not have the formal authority to stop illegal conversion practices. Meanwhile, PT Perhutani KPH Banyumas Timur, as a state institution with a management mandate, has failed to carry out effective supervision, reflecting what are known as blind spots in governance, where the community's practical knowledge of local ecology becomes invisible while extractive economic interests gain bureaucratic legitimacy. This case confirms that forest conversion is a political instrument that facilitates exploitation while excluding local communities who best understand the ecological consequences of such changes. This paradox shows that the problem of forest degradation is not merely a technical management issue, but fundamentally a problem of unequal distribution of power and access among various actors, where procedural ambiguity becomes a tool for dominant actors to maintain control while excluding local communities from meaningful participation. As long as this structure remains intact, social forestry programmes will continue to fail to create effective and equitable conservation.

4. Conclusions

An analysis of power relations in the management of the Sisik Naga Hills Forest reveals three main mechanisms that perpetuate structural inequality. First, bureaucratic fragmentation between PT Perhutani KPH Banyumas Timur and related agencies creates deliberate ambiguity in the zoning of the area. The unclear boundaries between protected and production forests become a strategy that provides flexibility for dominant actors to change the function of the area without accountability to the community. Second, LMDH operates as a procedural legitimation mechanism that excludes local ecological knowledge. Substantive decisions about plant types, access locations, and duration of use are still determined unilaterally by KPH. Institutional scientific knowledge becomes the spotlight that legitimises policy, while the practical knowledge of the community becomes a blind spot that is ignored. Third, the conversion of protected forest into cardamom plantations in Karangmoncol Subdistrict demonstrates the material consequences of unequal power relations. The loss of complex tree root systems destroyed the forest's hydrological function, triggering an escalation of disasters with losses of IDR 610.17 billion in 2024 and a drought crisis that required 4,292 emergency water tanks in 2019. The paradox of flooding and landslides during the rainy season and severe drought during the dry season is not a climate anomaly, but rather the product of management decisions that prioritise economic extraction while ignoring the warnings of local communities.

The Purbalingga case proves that power relations do not always operate through explicit conflict. In areas that appear 'peaceful', exclusion mechanisms operate more subtly through complex bureaucratic procedures and the normalisation of limited participation. The absence of open conflict is not an indicator of balance, but rather evidence that domination has been naturalised. This finding expands the political ecology literature by showing that power operates in spaces that appear stable but harbour deep inequalities, requiring the dismantling of subtle mechanisms that perpetuate the subordination of local communities.

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Author Contribution

I.H.P., was at the forefront of the research and manuscript development process. She formulated the research concept, developed the research framework, and established the overall objectives that aimed in the context of political ecology. I.H.P., also wrote the initial draft meticulously, explaining the background, methodology, findings, and implications clearly and systematically. Methodologically and in data analysis, she designed a qualitative-descriptive methodology and conducted a critical review of available policy documents and academic literature.

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Conflicts of Interest

The author declares no conflict of interest.

Declaration of Generative AI Use

During the preparation of this work, the author used Grammarly to help improve the grammar, clarity, and academic tone of the manuscript. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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