



The social moderation model: Meta-ethnographic synthesis of local realities in watershed rehabilitation sustainability

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ABSTRACT

Background: Watershed rehabilitation in South Sumatra is a national priority program to address ecological degradation, yet its implementation on the ground has shown highly variable results. This study aims to analyze the determinants that differentiate the success and failure of watershed rehabilitation programs, focusing on the interaction between external interventions and local socio-ecological realities. **Methods:** Using a Meta-Synthesis (Meta-Ethnography) methodology on qualitative secondary data from studies published between 2020 and 2025, this study translates fragmented findings to build a more comprehensive understanding. **Findings:** Key findings suggest that the key to success lies not in the technical aspects of planting, but rather in its socio-economic foundations. Failures are generally caused by top-down, project-centric approaches from external stakeholders, which create negative spillover effects, such as rigid targets and tenure conflicts. On the contrary, the success of the program is determined by the existence of a moderation process, where three vital local contexts are tenure security and a sense of ownership, program integration with the subsistence economy through agroforestry, and the involvement of local institutions that are trusted to actively mitigate these negative impacts. **Conclusion:** This study concludes that the sustainability of watershed rehabilitation requires a paradigm shift from procedural involvement to substantive participation that integrates local knowledge and realities as the main foundation of the program. **Novelty/Originality of this article:** The novelty of this research lies in its Meta-Ethnographic synthesis of fragmented studies from 2020–2025, proposing a 'Social Moderation Model' that identifies local tenure security and subsistence integration as the definitive core of watershed sustainability, rather than mere technical or procedural participation.

KEYWORDS: watershed rehabilitation; meta-synthesis; socio-ecological context.

1. Introduction

River Basin Rehabilitation in Indonesia has now become one of the most prominent national priority programs. This is not just an ordinary environmental program, but a comprehensive strategy that touches on various aspects of life. Healthy watersheds are the backbone of civilization, functioning as providers of clean water, regulators of water management, supporters of food security, and guardians of biodiversity. Recognizing the vital importance of these functions, every relevant institution, both within the government and outside it, is strongly promoting this program to uphold and develop the socio-economic pillars of the communities living around watersheds. Many watersheds in Indonesia are currently facing critical conditions due to various pressures. Deforestation for

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land conversion, unsustainable agricultural practices in upstream areas, erosion, and river sedimentation have caused significant degradation. The direct impact of this damage is felt by the community itself. Hydrometeorological disasters such as flash floods in the rainy season and extreme droughts in the dry season are becoming more frequent. Water quality has declined drastically due to pollution and sedimentation, while agricultural productivity has declined due to the loss of fertile soil. This ecological damage has direct implications for the economic and social decline of communities (Jannah et al., 2024). Watershed rehabilitation is a long-term investment. It is a collaborative effort to restore the balance of nature, while building a stronger and more sustainable economic foundation for the communities that live and depend on it. The success of this program will ensure that watersheds not only function as providers of resources, but also as sources of life and prosperity for current and future generations. The watershed rehabilitation program in South Sumatra has become a crucial agenda, given that this province is home to large watersheds such as the Musi Watershed, which plays a vital ecological and economic role. This analysis will present a comparison of data from several watershed development projects in South Sumatra.

This analysis highlights an important phenomenon in several areas of South Sumatra, where rehabilitation programs have shown significant success, while in other areas, similar programs have not been able to achieve maximum results. This paper aims to identify the key factors that differentiate these two outcomes, focusing on social, institutional, and technical aspects in the field. Before making comparisons, it is important to establish the context of the problem. Watersheds in South Sumatra have unique and complex characteristics. Many upstream areas are directly affected by plantation activities, such as rubber and oil palm, as well as mining, which contribute to increased erosion and sedimentation rates. Meanwhile, in the downstream areas, the dominant issues are peatland degradation and coastal abrasion. Therefore, rehabilitation projects in this region not only aim to restore hydrological or water management functions, but also carry out a major socio-economic mission for communities that depend on river resources. To fairly compare projects that are considered successful with those that have not yet reached their full potential, we must establish clear indicators. Success in this context cannot be measured solely by the percentage of plants that grow, which is a purely technical aspect. Significant success should ideally encompass several dimensions. Ecologically, this is marked by a decrease in the rate of erosion, improved water quality, and increased permanent vegetation cover. Socio-economically, success is reflected in increased community income through agroforestry schemes, the formation of active community institutions such as Forest Farmers Groups (KTH), and a decrease in land use conflicts. Finally, sustainability indicators are evident when programs continue to run and are maintained by the community even after the formal project or funding has ended. Conversely, suboptimal results usually stop at achieving technical indicators, such as completion of planting, but fail in socio-economic aspects and long-term sustainability.

Areas that show significant success generally have several common patterns. The first determining factor is active bottom-up participation, where the highest success is achieved when local communities are involved from the early stages of planning. They are not treated as objects, but as subjects who help determine the type of plants, location, and maintenance scheme. Second, the application of agroforestry or intercropping models, which not only plant trees for conservation but also combine them with high-value crops such as coffee, durian, or other Multi-Purpose Tree Species (MPTS). This provides short- and medium-term economic incentives for residents to care for their conservation trees. Third, the existence of strong local institutions through intensive assistance to form KTH or community groups concerned with watersheds (Talif et al., 2024). This group acts as the “guardian” of the post-project program. Finally, success is greatly supported by a clear land status, ensuring that the project is carried out on land that does not overlap with other concession permits, thus providing legal certainty for the farming community. Conversely, areas where watershed rehabilitation projects have not achieved maximum results often face similar challenges. One of the main factors is a top-down, project-centric approach, where programs tend to be

“drop seeds” and “plant-and-leave” in nature. The community is only involved as planting laborers and has no sense of ownership of the program. Another crucial factor is conflicts of interest and land status. Rehabilitation programs that overlap with concession areas or are located in areas prone to tenure conflicts are almost certain to fail because communities are reluctant to maintain crops on land with unclear status. In addition, the imposition of monoculture planting with crop types that do not meet the economic needs of the community or are not suitable for the local agroclimate also becomes an obstacle. Often, uncontrollable external factors, such as rampant illegal logging or mining around the site, contribute to the destruction of rehabilitated areas. A comparison of data from South Sumatra clearly shows that the main difference between success and failure is not solely technical aspects of planting. Technical factors, such as the selection of superior seedlings or planting techniques, are indeed important, but they are meaningless without a strong socio-economic foundation. Successful areas are those where watershed rehabilitation is integrated with Village Development Plans and is seen as a solution to their economic problems. Meanwhile, in unsuccessful areas, watershed rehabilitation is often considered an “outsider's project” that is irrelevant to the urgent needs of the community. Many government and ministry responses to watershed rehabilitation issues recognize that local context is crucial. However, the reality on the ground shows that this context is still a common generalization and has not yet become something detailed and operational. Often, “local participation” is only interpreted as involving the community as planting labor, not as subjects with the knowledge to design programs. In this article, researchers attempt to analyze several local contexts that are actually vital to the success of watershed rehabilitation, by examining how external interventions interact with pre-existing socio-ecological realities.

This analysis identifies spillover effects originating from stakeholders outside the village level, which are often the main cause of program failure. The first cause is the top-down and target-centric approach of government agencies (ministry/agency stakeholders). These agencies work with rigid budget absorption and planting area targets. The resulting causal effects are rushed programs, non-participatory location decisions, and the imposition of seed types that are not suited to local economic or agroclimatic needs, as long as planting targets are met. The second cause comes from private sector stakeholders. The existence of large-scale concessions such as plantation HGU (Right to Cultivate) or HTI (Industrial Forest Plantations) upstream or in watershed areas creates spillover effects in the form of tenure (land) conflicts and ecological fragmentation. As a result, communities lose legal certainty over the land to be rehabilitated, thereby eliminating their incentive to maintain long-term crops. This is where the process of moderation by local realities should come into play.

The moderation process is a vital adjustment mechanism so that the negative spillover effects from external factors can be mitigated or even turned into positive ones by local knowledge and realities. For example, to moderate the top-down effects of the government, local knowledge about predator-prey relationships and MPTS (Multi-Purpose Tree Species) such as avocado, durian, or petai can be used. When the program is forced to run, this knowledge moderates its implementation: the community does not reject the program, but adjusts the types of plants and planting times. Government-provided seedlings are planted alongside seedlings of economic plants chosen by the community. Without this moderation process, government-provided seedlings would be left to die because they are not economically relevant. Similarly, to moderate the effects of land conflicts involving corporations, local realities such as customary boundaries or traditional farming patterns must be recognized. The moderation process here involves advocating for a Social Forestry scheme, which provides legal recognition of these local realities, thereby giving communities certainty about protecting their land. Based on this analysis, researchers identified several specific local contexts that are vital to success. The first is the tenure context. This is not just a matter of legal certificates, but local perceptions of ownership. The second vital context is the subsistence economy. Rehabilitation programs that focus only on ecological functions without being integrated with short-term economic needs are almost

certain to fail. The third context is trusted local institutions. Often, government programs are channeled through formal village institutions, even though in matters of land and forests, communities may be more obedient to customary institutions or informal leaders. This institutional channeling error has fatal consequences for the legitimacy of the program.

2. Methods

This study adopts the Meta-Synthesis methodology, also often referred to as Meta-Ethnography, as its main reference. This approach is one of the most powerful methods for analyzing qualitative secondary data and has great potential to produce theoretical contributions. This method was chosen based on the research objective, which is not merely to review or accumulate existing literature, but to synthesize findings from various previous qualitative studies in order to create a higher and more comprehensive interpretation. The focus of this research is on the dynamics of watershed rehabilitation in South Sumatra province. The data corpus for this meta-synthesis consists of published qualitative research articles. Data collection was carried out systematically with strict inclusion criteria: articles must be qualitative in nature (e.g., ethnographic studies, case studies, in-depth interview research); articles published between 2020 and 2025 to ensure data relevance; and articles must have a geographical focus on South Sumatra or related areas and discuss the successes and failures of rehabilitation. Thematically, this secondary data material focuses sharply on articles that discuss three main pillars, namely local knowledge, community adaptation strategies, and forms of resistance, all of which originate from the knowledge and social reality of local communities in responding to watershed rehabilitation programs. Fundamentally different from traditional literature reviews, this study treats each selected article as raw data. The analysis process follows the principles of meta-ethnography, as formulated by Noblit & Hare, which focuses on the “translation” of concepts. This process begins with identifying themes, key concepts, and metaphors used in each study individually. After that, a process of “translation” or reciprocal translation is carried out, in which concepts from one study are compared, contrasted, and synthesized with concepts from other studies. For example, how the concept of local ecological knowledge (from one article) is translated into the concept of agroforestry adaptation strategies (from another article), or how passive resistance (from study A) has a meaning analogous to “pseudo-compliance” (from study B).

This study also uses previous recordings as basic data, which contain information on the technical aspects of river basin rehabilitation in South Sumatra. The author will analyze three records obtained from a staff member of the Ministry of Forestry in Lahat Regency. The author will conduct the analysis by combining two important data sets, which are derived from relevant articles and records from the Ministry of Forestry.

Table 1. Data usage system

Relevant articles	Data useful for basic analysis of technical policies and community empowerment processes
Ministry of Forestry records	Supporting data that is crucial for activists working directly with communities

The author relies heavily on data from these records, given the paucity of national and international articles available that discuss watershed rehabilitation in depth. Even when such topics are addressed, these articles are not particularly useful or applicable to the analysis process. The ultimate goal of this synthesis process is to construct a new theoretical model or a more comprehensive interpretive framework. By integrating previously fragmented insights from various case studies that touch on watershed rehabilitation in South Sumatra, this study attempts to analyze which local knowledge and realities have a significant impact or are crucial to the success or failure of watershed rehabilitation programs. This impact analysis will be reviewed from two aspects reported in these studies, namely the ecological impact, which shows the success of plant growth and the restoration

of hydrological functions, and the social impact, which shows improved welfare, conflict resolution, and program sustainability (Jain et al., 2020). Thus, this study not only maps what is already known, but also builds a new, higher level of understanding from existing qualitative data.

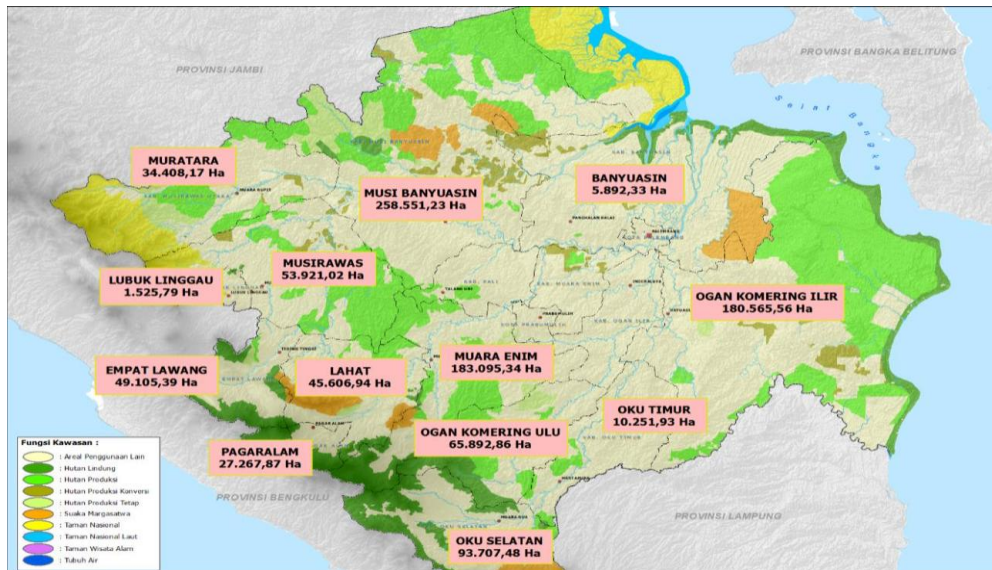


Fig. 1. Geographical and demographic conditions of South Sumatra province

The image above illustrates the geography of South Sumatra. The author used this data as basic data in the local reality analysis stage. From these records and articles, the author imagined and searched for data relevant to the details of the South Sumatra Province, both in terms of geography and demography. This effort focused on obtaining a detailed picture of the specific conditions of South Sumatra Province, both from a geographical aspect—covering topography, hydrography, and distribution of natural resources—and from a demographic aspect—covering population composition, population distribution, and socio-economic characteristics of the local community. The integration of geographic and demographic data is a crucial starting point for identifying the unique context and specific challenges faced by the region.

3. Results and Discussion

3.1 Tenure security and sense of ownership

Areas surrounding forests are often synonymous with pockets of structural poverty, where poorly educated local communities face limited arable land, which in turn drives them to encroach on forest areas due to economic necessity. The extent of this land occupation clearly shows the state's weakness in implementing a repressive and security-based forest management paradigm, leaving no other way to save the forest except by involving the community as partners (Tusznio et al., 2020). In response to and in an effort to legalize access, the government rolled out the Social Forestry policy as a national priority program designed to carry out a dual mandate: reducing poverty, unemployment, and management inequality, while ensuring the sustainability of forest resources. In the context of Economic Equity Policy, Social Forestry is believed to be able to address inequality through the provision of legal access to management, which enables communities to develop schemes such as agroforestry to obtain multiple incomes from forest products, intercropping, and plantations. However, policy instruments and acceleration strategies should not stop at merely accelerating the provision of access to management (Nugrahapsari, 2023). The key to its success lies in post-licensing facilitation and empowerment activities, which aim to ensure that forest management follows the principles

of good forest governance. Only through this process of capacity building and independence can the Social Forestry program truly lead to improved community welfare and sustainable forest conservation (Aina, 2024).

In the context of watershed rehabilitation in South Sumatra, the answer is not monolithic, but rather divided between appreciation and frustration. In general, the community sees that the watershed rehabilitation program has been quite helpful to their development, both economically and socially, as well as in terms of ecological improvement. However, this positive view has not led to complete satisfaction due to rigid technical regulations, which are rooted in two crucial issues: land ownership status and crop type regulations. This complexity is evident in the land control scheme in South Sumatra, which is divided between land that has been granted ownership rights to the community (although legally it formally belongs to the government) and land that is purely owned by the government or large companies under concession. In both scenarios, the community cultivating the land must follow the watershed rehabilitation procedures (Wang et al., 2022). This is where the main conflict lies: rehabilitation regulations require the planting of large trees. This requirement directly conflicts with the reality of local agriculture, where the majority of farmers' income comes from coffee plantations, which are ecologically productive but do not meet the technical criteria of the program (Piégay et al., 2019). Ironically, this regulatory conflict occurs in a community that already has a high level of understanding of natural resource conservation, a social capital that should be maintained and utilized. Community participation, measured from the planning stage to the utilization of results, does exist in the form of environmental maintenance, information exchange, and involvement in extension services. However, the regulatory conflict over crops reveals a paradox: procedural participation has not been able to influence the core technical design of the program. This indicates a top-down model of participation, in which local knowledge (such as coffee-based agroforestry) has not been integrated. Ultimately, the community perceives watershed rehabilitation as a beneficial but inconsistent intervention—assistance that comes at the “cost” of compromising their main livelihoods, highlighting the gap between the ecological goals of regulators and the socio-economic realities on the ground.

Social capital is crucial in the management of the South Sumatra Watershed (DAS), as it is based on the high level of collective awareness among the community regarding the preservation of natural resources. This established awareness is a fundamental asset that should not only be passively maintained, but must also be actively integrated as the main foundation of the program (Chen et al., 2022). To ensure that this awareness is translated into concrete action, community participation needs to be measured comprehensively throughout the program cycle, covering their involvement from the planning stage, technical implementation in the field, monitoring and evaluation processes, to the sustainable utilization of activity results. More specifically, this participation can be elaborated into several vital roles. First, the role of stewardship, in which the community is not only an object but also an active subject that maintains, preserves, and in turn enjoys the improved quality of life obtained from a healthy watershed ecosystem. Second, the consultative and communicative role, which ensures a two-way flow of information, whereby the community has the right to obtain transparent information and is encouraged to provide advice and critical considerations in watershed management decision-making. Third, the role of capacity building, which is facilitated through training and outreach programs relevant to local needs (Hendraswari & Helda, 2023). Thus, maintaining the ecological awareness of the community means activating their knowledge through functional channels of participation at every stage of the program (Dewi et al., 2023).

When the author connects the findings and the image, a deep analysis of the data emerges, as referenced, highlighting various complex obstacles in the field. One significant challenge identified is the lack of clear regulations regarding harvest time in the Forest and Land Rehabilitation (RHL) scheme. This shows that some watershed rehabilitation locations have not fully involved the community in its development.

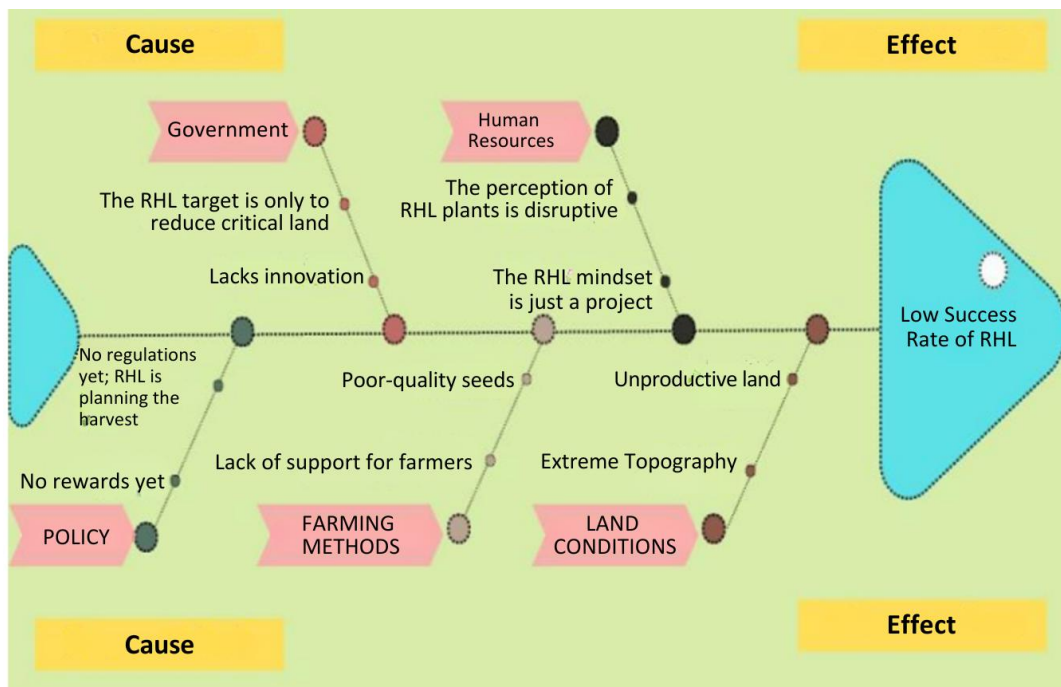


Fig. 2. Basic conditions and situations for community participation (Aina, 2024)

This lack of formal regulations creates a gray area that has the potential to threaten the sustainability of the program. In this case, the community does not only play a passive role, but also acts as an active agent that fills this void by utilizing a wealth of local knowledge and traditional ecological knowledge that has been accumulated from empirical experiences across generations. This knowledge is often more adaptive and relevant to the specific conditions of the location, enabling them to determine the appropriate harvest cycle while maintaining environmental sustainability (Loire et al., 2021). Furthermore, community initiatives are not limited to harvest issues. They also independently strive to overcome other serious challenges, such as managing and revitalizing critical or unproductive land, which is often the main target of rehabilitation. This is where the importance of a collaborative model lies. To ensure long-term success, interventions from external parties such as the government and academics must move beyond a top-down approach. Their role is to contribute synergistically, bringing “new knowledge” in the form of technological innovations, precise research data, and more systematic managerial frameworks. The key to success is the process of collaborating modern scientific insights with proven local wisdom. Thus, a watershed rehabilitation model is created that is not only scientifically valid but also deeply rooted in social reality and acceptable to the community, which ultimately encourages better, fairer, and more sustainable watershed management.

The condition of a watershed depends heavily on the success of the Forest and Land Rehabilitation/*Rehabilitasi Hutan dan Lahan (RHL)* program. This intervention is a vital determining factor for the health of watersheds and sub-watersheds as a whole, as it directly affects the three main pillars of water availability flowing from upstream to downstream: quality, quantity, and continuity. Ironically, however, observations and analyses in various locations, as reported in a case study in Lampung, show that RHL activities to date cannot be said to have been optimally successful. This failure is particularly striking when measured in terms of economic improvement for the communities living around the forests. The root of the problem, as identified through fishbone analysis, lies in the perceptions of the communities themselves. Local communities still think of and view RHL as merely a temporary, top-down “project,” rather than a sustainable system that benefits them in their capacity as farmers. Unfortunately, this “project” perception is often reinforced by the characteristics and employment structure offered by the rehabilitation program itself. For example, an analysis of worker characteristics in watershed

rehabilitation projects in several regions, such as Kalimantan, shows that the dominant employment status is divided into two types, both of which are temporary in nature (Satriawan & Umami, 2024). The first is Daily Casual Workers (PHL), a highly flexible and uncertain employment status, where their involvement depends on the circumstances of time or volume of work, which can vary. The second is the Contract Work System, which, although binding workers to written rules, is explicitly limited by a certain period of time. When community engagement models are dominated by PHL and short-term contract schemes, this systematically fails to build a sense of ownership and instead legitimizes the community's perception that RHL is only a temporary side job, not a long-term investment for their economic and ecological future.

3.2 Integration of programs with subsistence economies through agroforestry

Many countries in Europe focus on geomorphology before embarking on agroforestry development projects. The process and focus of forest development that takes geomorphology into account will lay a solid foundation for future agroforestry developments in river basin rehabilitation systems (Arnaud et al., 2023). An approach that thoroughly considers geomorphology in forest development and integrated land systems provides a solid foundation for agroforestry development, especially in a broader context, such as future watershed rehabilitation systems. European countries view geomorphology not only as a descriptive science, but also as a predictive and normative tool that ensures that nature-based solutions such as agroforestry are placed in the most appropriate locations, using the most suitable planting patterns, and providing maximum ecological and economic benefits for the community and the watershed environment.

Table 2. Description of land in terms of geomorphology

No	Slope	Description
1.	0-8	Flat
2.	8-15	Gentle
3.	15-25	Slightly steep
4.	25-45	Steep
5.	> 45	Very steep

Each region in South Sumatra has its own characteristics and specific soil types, and these characteristics and specifications ensure that differences in soil specifications greatly influence the local realities of each resident in that area. In the eastern part of South Sumatra, such as Ogan Komering Ilir (OKI) and Musi Banyuasin (Muba) districts, the dominance of peat soil creates a very specific local reality. Peat soil, which is composed of partially decomposed organic material, is acidic, has low bearing capacity, and is highly susceptible to fire when dry (Janssen et al., 2020). The resulting local reality is a community with highly developed water adaptation skills. Economic activities are heavily dependent on water-based commodities, such as freshwater fisheries (especially in the lebak lebung system) and the cultivation of flood-tolerant crops, such as tidal rice and sago. Culturally, river transportation and stilted house architecture are the norm, reflecting the need to live in harmony with the perpetually wet and vulnerable soil conditions. Red-Yellow Podzolic Soil/*Podzolic Merah Kuning (PMK)* in the Highlands and Hills.

Moving to the central and western regions, such as Lahat, Muara Enim, and Pagar Alam districts, the soil specifications are dominated by Red-Yellow Podzolic (PMK) and volcanic soil types around Mount Dempo. PMK soil, formed from igneous and sedimentary rocks, generally has a relatively low level of natural fertility, but has good drainage and is stable for hardy plants. The local reality here is characterized by dryland farming and annual plantations. The community is highly dependent on commodities such as coffee, tea, and rubber, which require sloping land. Pagar Alam coffee, for example, has become a local economic and cultural icon, creating a unique plantation management system and a tradition of harvesting that has been passed down from generation to generation. Limited

irrigation water has forced the community to develop more intensive soil and water conservation systems than in peatland areas. Alluvial Soil Along Major Rivers. Along the Musi River and its tributaries, the soil is dominated by relatively young alluvial soil rich in sediments carried by water. This soil is known for its high fertility and fine texture. The local reality that has developed in this region (including the city of Palembang and its surroundings) is a center of fertile food agriculture. The community utilizes alluvial soil for intensive rice cultivation and horticulture. The availability of water and adequate fertility encourage the formation of a denser community structure focused on trading agricultural products. The economic value of alluvial soil is much higher than that of peat or PMK, which also affects property prices and the level of urbanization in the region. The Influence of Soil Specifications on Economic Choices and Migration.

These differences in soil specifications fundamentally dictate people's choice of livelihood and even migration patterns. For example, areas with fertile PMK soil for rubber often attract people from other areas (transmigration) who are looking for plantation land. Conversely, peatland areas with abundant fishery resources encourage economic specialization in fishing or trading in fish products. When environmental degradation occurs, such as the loss of fertility in PMK soil or excessive drainage in peatland, the impact is immediately felt on local economic resilience, forcing residents to seek alternative livelihoods, such as working in the mining sector or urbanizing to the city of Palembang. Implications of Land Specification-Based Development Policy. Therefore, the success of development and implementation of agroforestry or watershed rehabilitation programs in South Sumatra must be based on detailed land suitability analysis (García et al., 2021). Effective programs on peatlands (e.g., hydrological restoration and pineapple/sago cultivation) will fail completely if implemented on dry PMK land, and vice versa. Local realities demand differentiated policies and site-specific solutions. Recognition of this geological and edaphic diversity is key to designing interventions that not only increase productivity but also preserve local wisdom that has long adapted to the unique soil conditions in every corner of South Sumatra.

3.3 Active involvement of trusted local institutions

Contrary to the common perception that often places communities as passive objects, some local communities in South Sumatra have shown active agency by conducting critical assessments and proactive adaptations to implement watershed rehabilitation projects. They take these steps not merely out of compliance, but based on a holistic understanding that the program has real potential to simultaneously develop the three pillars of their lives: economic, social, and ecological (Hossain et al., 2020). The projects in this region have strong prospects for developing beyond the short-term project cycle and transforming into a sustainable system. The main catalyst for this optimism is the fact that communities are no longer isolated; they have been exposed to and supported by various inputs, knowledge transfers, and technical innovations (Boothroyd et al., 2021). This support comes from multi-stakeholder collaboration, where external parties such as corporations contribute resources, the government facilitates policy, and academics provide guidance and research. It is this collaborative intervention that enriches the adaptive capacity of communities, enabling them to integrate local wisdom with new innovations to build rehabilitation models that are not only ecologically effective but also socio-economically relevant (Ibrahim et al., 2020). This collaborative intervention enriches the adaptive capacity of communities, enabling them to integrate local wisdom with new innovations to build rehabilitation models that are not only ecologically effective but also socio-economically relevant.

The concrete form of this adaptive capacity is clearly evident in modified agroforestry practices. Instead of outright rejecting conservation tree seedlings from programs that are often considered to have no direct economic value, proactive communities, often accompanied by academics or NGOs, actually “translate” these programs. They use local knowledge about planting arrangements and agroclimatic suitability to integrate these aid

seedlings with their main cash crops, such as coffee, rubber, durian, or other high-value Multi-Purpose Tree Species (MPTS). In this scheme, technical innovations from external parties (e.g., terrace construction techniques, irrigation, or the introduction of superior seedlings) are not imposed top-down, but rather offered as a “menu” that can be selected and adapted by the community. The facilitating role of the government, particularly through the acceleration of the Social Forestry scheme, then comes into play to provide a “legal umbrella” for the land adapted by the community.

This hybrid model, which combines local wisdom with external innovation, ultimately creates a win-win scenario. Ecologically, the land cover and hydrological function restoration targets of the rehabilitation program are still achieved because conservation trees grow alongside other crops. Economically, communities receive clear incentives to care for these trees, as intercropped plants (such as coffee or secondary crops) provide short- and medium-term income that ensures post-project sustainability (Along et al., 2022). Socially, this collaborative process builds strong social capital and a high sense of ownership, transforming the community's position from passive objects to active subjects and guardians of watershed sustainability. This hybrid model, which combines local wisdom with external innovation, ultimately creates a mutually reinforcing win-win scenario that goes beyond simply achieving project targets. Ecologically, the benefits go far beyond simply meeting land cover targets. Diverse agroforestry cropping patterns, which mimic the structure of natural forests, actively restore hydrological functions in ways that monoculture planting cannot achieve (Danraka et al., 2024). The combination of cover crops and conservation trees (with deep roots) drastically reduces the rate of surface erosion, increases water infiltration into the soil, and contributes to a more stable water cycle. Furthermore, this model creates a more resilient ecosystem—more resistant to climate shocks such as drought or pest attacks while increasing local biodiversity. Economically, the incentives created are fundamental and sustainable. Communities no longer depend on daily wages from temporary “projects,” but instead become “investors” in their own land. Cover crops such as coffee, secondary crops, or chili peppers provide crucial short- and medium-term income to cover daily living expenses. This provides economic “breathing room” for communities to care for long-term conservation crops (such as timber or durian) until they are ready for harvest. This model creates income diversification, reduces the risk of total crop failure, and most importantly, builds productive assets. Post-project sustainability is ensured because the rehabilitation program has transformed into a collective business model that benefits the community.

Socially, the transformation that has taken place is the most fundamental. The process of collaboration and negotiation in designing this hybrid model (selecting crop types, determining planting patterns) builds strong social capital in the form of trust, shared norms, and functional working networks. A strong sense of ownership is created because the community feels that this program is “theirs,” not a “government project” that is imposed on them. Their role has shifted structurally from passive objects who only receive seed assistance to active subjects who have agency, knowledge, and bargaining power. Local institutions (such as Forest Farmer Groups) have become stronger because they manage real and valuable resources, making them active guardians of true watershed sustainability.

3.4 The role of local realities

The analysis table presents a comprehensive and highly structured multi-stakeholder partnership model, designed to execute a project by clearly dividing responsibilities among four key entities. This model describes a logical and interdependent workflow. The process begins with the Company, which plays a fundamental role as the initial resource provider by supplying the main asset in the form of land, thereby laying the physical foundation for all activities to take place (Darko et al., 2021). Following this, the Government takes on the role of mobilizer and facilitator. Using its authority and legitimacy, the government officially calls, organizes, and involves the community to participate in the project.

Table 3. Multi-stakeholder collaboration

Company	Land provision
Government	Determining community participation
Community	Processing, maintenance, contributing to problem solving with government and academics
Academics	Quality control

The core of this project's operations lies in the hands of the community, which plays a dual and very important role. They not only act as the main implementers responsible for physical tasks such as processing and maintenance on the land provided, but are also positioned as equal strategic partners. In this capacity, they actively contribute to the problem-solving process, collaborating directly with the government and academics to find solutions to emerging challenges. To complete this cycle and ensure sustainability, academics serve as quality assurance or independent supervisors. Their role is to perform quality control, bringing objectivity, expertise, and scientific standards to monitor the process and evaluate the results, ensuring that the entire series of activities meets the established standards (Zhaoxia et al., 2020). This capacity as a 'strategic partner' fundamentally changes the power dynamics within the project. The community is no longer merely a passive recipient of instructions, but has become the main 'navigator' that validates or even corrects technical plans in the field (ground-truthing). Their local knowledge—about the pranata mangsa (traditional planting calendar), specific soil types, or internal social dynamics—is treated as a data set that is equal in value to scientific data. The problem-solving process is no longer top-down, but rather a forum for 'knowledge negotiation'. This is where they actively collaborate with the government and academics to overcome unexpected socio-ecological challenges, ranging from conflicts over resource use between residents to technical adaptations to micro-agroclimates that were not captured in the initial planning (Bento et al., 2021).

To complete this cycle and ensure sustainability, academics serve as quality assurance or independent supervisors. Their role is to perform quality control, bring objectivity, expertise, and scientific standards to monitor processes and evaluate results, ensuring that the entire series of activities meets the established standards (Li et al., 2022). This independence is crucial to avoid the 'success bias' often reported by implementing agencies tied to administrative targets. The role of academics is not only to evaluate the physical output at the end of the project (such as crop growth percentage), but also to monitor the process periodically and the long-term outcomes. The results of this objective monitoring then serve as vital feedback loops for all stakeholders, including the government and the community itself. This enables adaptive management, where project strategies can be corrected and adjusted in real time based on scientific evidence and field realities, ensuring true sustainability rather than merely achieving targets on paper.

In this capacity, their participation goes beyond mere labor involvement; it is formal recognition of their local knowledge and ecological wisdom. They actively contribute to adaptive problem-solving processes in the field. For example, when faced with unexpected technical challenges such as location-specific pest attacks, unique soil conditions, or the failure of certain seedlings, their insights and empirical experiences become the initial data for finding solutions. Direct collaboration with the government and academics becomes a dynamic feedback cycle, not just top-down reporting. The community identifies real problems, while academics and the government help provide the technical expertise or resources to overcome them, creating a process of co-creation of solutions. To complete this cycle and ensure sustainability and accountability, academics serve as quality assurance or independent supervisors. Their role is to conduct comprehensive quality control, not only on physical outputs (e.g., crop growth rates or erosion reduction rates), but also on the quality of processes, such as the actual level of community participation, transparency, and fairness in benefit sharing. By bringing objectivity, expertise, and scientific standards, they act as neutral 'referees' who ensure that project methodologies remain on track. They monitor processes and evaluate results periodically, not just at the end of the project

(Bungabong et al., 2023). This evaluation data—both quantitative and qualitative—provides critical input that enables adaptive management, whereby project strategies can be flexibly adjusted based on findings in the field. In this way, academics ensure that the entire series of activities not only meets established scientific standards, but also remains relevant, effective, and accountable in responding to dynamic socio-ecological realities.

3.5 In-depth analysis

The failure to optimize the Forest and Land Rehabilitation (RHL) program in the South Sumatra Watershed (DAS) stems from a policy design gap that fails to integrate ecological objectives with local socio-economic realities. Although communities have demonstrated high levels of social capital and ecological awareness, their participation has been merely procedural and top-down, hampered by rigid RHL technical regulations (e.g., plant species) and a lack of post-permit tenure security, reinforcing the perception of RHL as a “temporary project” rather than a long-term investment. The solution to achieving sustainability lies in the implementation of an adaptive hybrid agroforestry model—integrating RHL conservation seedlings with subsistence crops such as coffee—which must be based on site-specific soil analysis and a predictive geomorphological framework (Sharma, 2021). The implementation of this model requires structural multi-stakeholder collaboration, in which the role of academics ensures quality control and adaptive management, while the role of the community transforms into active subjects and problem solvers (navigators), thereby building a strong sense of ownership and creating a win-win scenario for the welfare and sustainability of watersheds.

Table 4. The role of local realities

Party	Traditional Role	Transformative Role (Key to Sustainability)
Community	Passive beneficiaries (project objects)	Active Subjects and Navigators: Take initiative, make decisions, and become problem solvers (manage pests, design planting patterns according to local wisdom)
Academics/ Researchers	Providers of general policy recommendations	Quality Control and Adaptive Management: Ensuring site-specific design and providing knowledge transfer and adaptive ecological monitoring
Government (Regulator)	Enforces strict technical standards	Facilitator and Tenure Security Guarantor: Simplifies RHL regulations and ensures the legality/tenure security of community management rights over RHL land.

Transforming the role of communities from passive objects to active subjects and policy makers at the grassroots level is a crucial step in fostering a strong sense of ownership, which must be supported by tenure security and involvement in program design. When RHL is integrated as an integral part of the food production system and local economy through a hybrid agroforestry model, community motivation will shift from extrinsic project incentives to intrinsic motivation driven by the direct economic value generated by the land. With the assurance that they manage and harvest the products of conservation land, communities will be naturally motivated to protect and maintain the sustainability of watersheds, because ecological sustainability now serves as a logical and profitable prerequisite for long-term welfare improvement, creating a sustainable win-win scenario (Diansyah et al., 2022).

4. Conclusions

This study confirms that the main distinguishing factor between the success and failure of watershed rehabilitation programs in South Sumatra does not lie solely in the technical aspects of planting, but rather in socio-economic and institutional aspects. Failed programs were proven to be top-down and “project-centric,” where programs were driven by rigid budget absorption and planting area targets, and treated the community only as objects or

planting laborers. This approach systematically failed to build a sense of ownership and instead fostered a perception at the grassroots level that rehabilitation was a temporary and unsustainable project by outsiders. Conversely, the success of the program was largely determined by the extent to which external interventions were able to adapt through a process of moderation. This process acted as a vital mechanism in which local knowledge and realities were actively used to translate and mitigate the negative spillover effects of external stakeholders, such as the government's technocratic targets or land conflicts resulting from corporate concessions. This success specifically depends on the integration of three vital local contexts, first, the existence of tenure security, both legal and perceptual, which provides a sense of land ownership, second, integration of the program with short-term subsistence economic needs through locally relevant agroforestry models, and third involvement of trusted local institutions (both customary and formal) as strategic partners, not merely administrative channels. The integration of these three contexts proves that sustainable rehabilitation is not just a matter of planting trees on critical land, but also a matter of building trust and the economy within the community. Thus, the sustainability of watershed rehabilitation can only be achieved through a paradigm shift: from procedural involvement (the community as labor) to substantive participation. Substantive participation means that communities are not only involved in implementation, but also have the authority to participate in designing, adapting, and monitoring programs so that they are in line with their social and economic needs and realities, which ultimately makes them the true guardians of the ecological success of the program itself (Absori et al., 2023).

The implications of these findings are clear for policymakers, donor agencies, and program implementers in the field. Approaches that have focused on technical outputs such as the number of seedlings planted, growth rates, or budget absorption have proven inadequate to ensure long-term ecological and social outcomes. Failure to integrate local realities will only repeat the cycle of costly but ineffective projects. Therefore, the framework for future rehabilitation programs must fundamentally shift from planting contracts to socio-ecological contracts. This shift requires significant resource allocation not only for seedling procurement and planting, but also for social facilitation, mediation and tenure advocacy (such as accelerating Social Forestry schemes), as well as intensive post-project assistance. As a practical recommendation, this study suggests that every watershed rehabilitation program design must include participatory socio-ecological analysis at an early stage to map these three vital contexts (tenure, economy, institutions) before technical interventions are carried out. Program flexibility must be increased, allowing for adaptation of crop types and schemes at the site level. Innovation should not only be technical (bringing new knowledge), but also institutional, that is, by seriously recognizing, respecting, and strengthening existing local wisdom and institutions. Without being rooted in local realities, watershed rehabilitation programs will only be temporary interventions that fail to restore watershed functions and fail to improve the welfare of the surrounding communities.

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Author Contribution

M.A.K.I., designed and conceptualized this study. The researcher was fully responsible for the meta-synthesis methodology design, as well as data curation, formal analysis, and interpretation of all secondary data. The researcher wrote the initial draft of the manuscript and performed critical revisions and final editing of all sections of the article, including the

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Conflicts of Interest

Not available.

Declaration of Generative AI Use

During the preparation of this work, the author used Gemini to help organize the data for analysis. After using this tool, the author reviewed and edited the content as necessary and takes full responsibility for the content of the publication. After using this tool, the author reviewed and edited the content as necessary and takes full responsibility for the content of the publication.

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