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Legal Outreach on the Impacts of Mangrove Forest Conversion through a Forestry Law Approach in Sugian Village, East Lombok

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Abstract
Part of the mangrove fringe on the coast of Sugian Village, Sambelia District, East Lombok Regency, adjacent to the Gili Sulat–Gili Lawang Marine Tourism Park, has been converted into aquaculture ponds, several of which are now inactive. Mangrove protection is governed by forestry, coastal, and environmental legislation, yet these rules are rarely known at the village level. This article reports a community service activity consisting of a single legal outreach session held on 3 July 2026 with 25 invited participants: pond farmers, fishers, village officials, youth, and members of women's groups. The session combined two short lectures with two-way discussion. Participants' initial understanding and their responses to the material were documented qualitatively in facilitator field notes, organized around three indicators: activeness in discussion, the content of questions, and the ability to relate the material to village conditions. No pre-test or post-test was administered; the findings therefore describe group-level responses observed during one session rather than measured individual learning gains. Participants' opening remarks referred mainly to the direct benefits of mangroves, and most indicated no awareness that mangrove clearing is restricted by law. During the discussion, participants asked about the legal status of inactive ponds and about how their ecological functions could be restored, and some expressed interest in forming a mangrove care group. The activity thus touched, at most, the levels of legal knowledge and legal understanding among those present. Follow-up assistance is needed, beginning with clarification of land status and of the responsible authorities, before a community oversight group and the rehabilitation of inactive ponds can be pursued.

Keywords: mangrove conversion, forestry law, legal awareness, legal counseling, community participation

Introduction

Mangrove forests are coastal ecosystems that sustain both environmental balance and the livelihoods of coastal communities. Mangroves protect shorelines from abrasion and storms, provide habitat for fish, shrimp, and crabs, and store carbon (Aswim et al., 2023). Global studies show that mangroves are among the most carbon-rich tropical forests, chiefly because of the carbon stored in their sediments (Donato et al., 2011). Indonesia occupies a central position because it holds the largest mangrove area in the world (Giri et al., 2011).

Despite this value, Indonesia's mangroves continue to decline. Conversion to shrimp and fish ponds has been identified as one of the principal drivers of mangrove loss in Southeast Asia and Indonesia (Richards & Friess, 2016). Ponds promise short-term income, but their productivity often declines within a few years, after which many are abandoned and the former mangrove land is left degraded (Ilman et al., 2016). In Sugian Village this regional pattern appears at a small scale. Residents combine fishing and crab gathering with smallholder pond farming, and several ponds opened on former mangrove land near the river mouth are no longer in use. The coastal economy of the village therefore depends on the same mangrove fringe that pond construction has reduced.

Sugian Village lies in Sambelia District, East Lombok Regency, on the coast adjacent to the Gili Sulat–Gili Lawang Marine Tourism Park (Taman Wisata Perairan, TWP), a marine conservation area of approximately 10,000 ha (Hilyana et al., 2020). Rahmani et al. (2023) recorded eight true mangrove species and two associate species on Gili Sulat. On the basis of field research conducted in 2019, Hilyana et al. (2020) reported mangrove ecosystems of approximately 641.63 ha on Gili Sulat and 369.02 ha on Gili Lawang, and Gili Sulat has been described as holding the largest mangrove stand on Lombok Island (Rosalina et al., 2025). These figures refer to the two small islands, not to the mainland coast of Sugian Village. No published figure for mangrove cover on the village coast was found, so the description of local conditions below relies on the team's own observation.

The two settings fall under different legal regimes, and the difference matters for legal responsibility. The TWP is a marine conservation area. It was designated in the provincial coastal zoning plan (Hilyana et al., 2020), and the management of sea space up to 12 nautical miles is a provincial matter under Law Number 23 of 2014 on Regional Government (Republic of Indonesia, 2014b). The ponds discussed in this article, by contrast, lie on land at the village coast. Who governs them depends on the status of each plot. If a plot lies within a designated forest area, it falls under the forestry authorities, including the provincial forest management unit (KPH). If it lies outside the forest area, it is governed by land rights, the regency spatial plan, and fisheries business licensing. The TWP management authority therefore does not automatically hold responsibility for the ponds, and any future rehabilitation must begin by establishing which regime applies to each plot.

The coast of Sugian Village includes the Keramat Suci area, a river mouth fringed by several mangrove species, with a lower river reach that remains under tidal influence (an estuary). During a preliminary visit on 12 Desember 2025, the team walked the shoreline around Keramat Suci and the lower river reach, recorded what it saw in field notes and photographs, and held informal conversations with 7 residents and village officials. The visit identified several smallholder ponds on former mangrove land that were no longer in use. Residents also reported that some ponds still in operation produced lower yields than their owners expected for their size. These observations were descriptive. The team did not measure pond productivity, soil or water quality, or mangrove cover, and it did not establish why each pond had become inactive.

The protection of mangroves is governed by several statutes that were in force when the activity took place in July 2026. The principal instruments are Law Number 41 of 1999 on Forestry and Law Number 18 of 2013 on the Prevention and Eradication of Forest Destruction;

Law Number 27 of 2007 on the Management of Coastal Areas and Small Islands, as amended by Law Number 1 of 2014; and Law Number 32 of 2009 on Environmental Protection and Management. Each of these laws was further amended by Law Number 6 of 2023 on the Stipulation of Government Regulation in Lieu of Law Number 2 of 2022 on Job Creation (Republic of Indonesia, 2023). Most specifically, Government Regulation Number 27 of 2025 on the Protection and Management of Mangrove Ecosystems now applies to mangroves both within and outside the forest area (Republic of Indonesia, 2025). The problem is that these provisions have not reached the community level. A study in Muara Pantuan Village, Kutai Kartanegara, found that 15% of respondents did not know the regulations on mangrove forests, 30% did not understand them at all, and 43% did not know the sanctions applicable to mangrove utilization (Darmansyah & Erwiantono, 2018). Closer to the present site, a survey of fishers in the Gili Sulat–Gili Lawang area found broad support for mangrove conservation. It also found very low awareness and education about mangrove use, together with weak enforcement and competing economic interests (Rizal, 2019).

Earlier mangrove programmes in the Gili Sulat area and elsewhere in Indonesia concentrated on the ecological roles of mangroves, species recognition, and planting (Al Idrus et al., 2018; Aswim et al., 2023; Azizah & Adibah, 2025). The present activity adds a forestry-law component to that work in three ways. First, it explains to residents which legal regime applies to mangrove land depending on its location and status. Second, it presents the community's statutory rights to information, participation, and reporting alongside its obligations. Third, it addresses the legal steps available after conversion has already occurred, including clarification of land status and lawful restoration. The aim is not merely to ask residents to protect mangroves but to help them understand the legal basis of their rights and obligations.

Based on this background, the activity addresses two questions:

1. What did participants' initial remarks indicate about their knowledge of the functions of mangroves, the impacts of converting mangroves into aquaculture ponds, and the legal rules that protect mangroves?
2. How did participants respond to legal outreach using a forestry law approach, and what interests in participation in mangrove conservation emerged during the discussion?

In line with these questions, the activity had two objectives: first, to identify participants' initial understanding of mangrove functions, the impacts of conversion, and the relevant legal rules; and second, to deliver legal outreach using a forestry law approach and to document participants' responses and any emerging interest in participation.

Method

Setting, permission, and consent

The activity was held in Sugian Village, Sambelia District, East Lombok Regency, on 3 July 2026 at the Sugian Village Office, from 9:00 a.m to 11:00 a.m, with a total duration of approximately two hours. The activity was carried out with the permission of the Sugian Village Government, granted through verbal approval by the Village Head. At the opening, participants were told that the team would take written notes of the discussion without recording names, and

that photographs would be taken for reporting and publication. Participants gave oral consent, and the photograph reproduced as Figure 1 is published with the permission of both the Village Government and the participants involved.

Participants

A total of 25 participants were invited through the Sugian Village Government, with the Village Head responsible for inviting participant representatives. The inclusion criteria were adult residents of Sugian Village whose livelihoods or responsibilities were directly related to the coastal area, including pond farmers, fishers, village officials, youth representatives, and members of women's groups. The inclusion criteria were adult residents of Sugian Village whose livelihoods or responsibilities relate directly to the coastal area, namely pond farmers, fishers, village officials, youth representatives, and members of women's groups. The number of participants was set at 25 based on the venue's capacity and the consideration that a relatively small group would allow each participant an opportunity to express their views. Table 1 presents the composition of the participants.

Table 1. Composition of participants

Stakeholder category	**Number of participants**
Pond farmers	4
Fishers	3
Village officials	6
Youth	7
Women's groups	5
Total	**25**

Outreach procedure

The session was run by 2 facilitators: facilitator 1, role speaker on mangrove ecology and facilitator 2, moderator and note-taker. Material was delivered in Indonesian using presentation slides. The session followed five steps:

1. Opening and introduction by Head of Sugian Village and the team (15 minutes).
2. Opening exchange to identify initial understanding. Before any material was presented, the moderator asked participants open questions: what mangroves are used for, what happens when mangroves are cleared, and whether clearing mangroves requires permission (5 minutes).
3. Session 1 on the functions of mangroves and the impacts of conversion, followed by discussion (55 minutes).
4. Closing discussion on possible follow-up actions (45 minutes).

Session 1 explained the ecological functions of mangroves and how clearing can contribute to pond failure. The material was linked to the inactive ponds around Keramat Suci and the lower river reach, so that participants could relate it to their own surroundings.

Session 2 introduced the legal framework in plain language. Law Number 41 of 1999 on Forestry protects mangroves within the forest area and recognizes the community's right to take part in forest management. Article 12(c) in conjunction with Article 13(1)(f) of Law

Number 18 of 2013 classifies as illegal the felling of trees within a forest area up to a distance of 130 times the difference between the highest and the lowest tide, measured from the shoreline (Republic of Indonesia, 2013). The same distance criterion was originally set out in Article 50(3)(c) of Law Number 41 of 1999 (Republic of Indonesia, 1999). Article 35(e)–(g) of Law Number 27 of 2007 prohibits the use of methods that damage mangrove ecosystems and the conversion of mangrove ecosystems in cultivation zones without regard to the sustainability of coastal ecological functions. It also prohibits the felling of mangroves in conservation areas for industry, settlement, or other activities, and Article 73 attaches imprisonment and fines to these prohibitions (Republic of Indonesia, 2007, 2014a). Law Number 32 of 2009 obliges every person to preserve environmental functions and guarantees the community's role in social oversight, in submitting suggestions and opinions, and in providing information and reports (Republic of Indonesia, 2009). Finally, Government Regulation Number 27 of 2025 applies to mangroves both within and outside the forest area. It requires that every utilization maintain the function of the mangrove ecosystem and that damaged mangroves be restored, and Article 36 provides for community involvement through reports, opinions, objections, and complaints (Republic of Indonesia, 2025). Presidential Regulation Number 73 of 2012 on the National Strategy for Mangrove Ecosystem Management was also introduced as the policy background (Republic of Indonesia, 2012). The team stressed that these rules do not only prohibit. They also open room for participation, for example through community management groups and social forestry schemes.

Documentation and analysis

Because participants' educational backgrounds varied, the team did not use written tests. Understanding was elicited orally, a practice also used in earlier mangrove outreach activities (Al Idrus et al., 2018; Azizah & Adibah, 2025). During the session, the note-taker wrote down each question and response in sequence, recording the speaker's stakeholder category but not the speaker's name. On the same day, the notes were typed up and coded against three observation indicators: (1) activeness, meaning who asked questions or responded; (2) the content of the questions, grouped into themes; and (3) whether a contribution referred to specific places or conditions in Sugian Village. Remarks made during the opening exchange were coded separately as indications of initial understanding. Two team members read the coded notes independently and resolved differences by discussion. The analysis is descriptive. It reports themes, anonymized examples, and simple counts where the notes allow, and it does not test statistical significance.

Result

The results are reported for each objective. Section 1 reports the initial understanding expressed during the opening exchange, and Section 2 reports participants' responses to the outreach. Figure 1 shows the format of the session: three facilitators at the front table presented the material while participants faced the presentation screen. The photograph documents how the activity was implemented. It is not evidence of learning outcomes.

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Figure 1. Implementation of the legal outreach session in Sugian Village, Sambelia District, East Lombok Regency

1. Initial understanding (Objective 1)

Direct benefits dominated participants' view of mangroves. When asked what mangroves are used for, participants who spoke mentioned direct uses, chiefly firewood and a place to gather crabs. Indirect functions, such as reducing coastal erosion, trapping sediment, and storing carbon, were rarely mentioned.

The ecological consequences of conversion were not recognized. Participants' remarks did not indicate awareness that converting mangroves to ponds may threaten the ecological condition of the surrounding area, such as through declining pond productivity or greater coastal vulnerability.

Legal restrictions were not known. When asked whether clearing mangroves requires permission, most of the participants who responded indicated that they did not know that mangrove clearing and utilization are regulated and restricted by law. They were unfamiliar with the rules on the use of coastal areas, the requirements to be met before an area is altered, and the consequences of violating those rules. These remarks come from participants who chose to speak and may not represent the views of every participant.

2. Responses to the outreach (Objective 2)

Table 2 summarizes the observations under the three indicators.

Table 2. Summary of observations by indicator

Indicator	What was recorded	Anonymized example (paraphrased from field notes)
Activeness	7 of 25 participants asked at least one question or responded; 5 questions in total. Questions came mainly from describe participation by women's groups and youth.	—
Content of questions	Two dominant themes: (a) the legal status of former mangrove land now used for ponds (3 questions); (b) how to restore inactive ponds (2 questions).	(a) A pond farmer asked whether land that has become a pond is still treated as mangrove area, and whether residents who use it may continue to do so. (b) A participant asked what residents may lawfully do with ponds that no longer produce.
Relating material to village conditions	Participants referred to specific sites, especially the inactive ponds around Keramat Suci and the lower river reach.	A participant asked whether the inactive ponds near Keramat Suci could be planted again with mangroves.

Source: field notes of the community service team, 3 July 2026.

Questions on the legal status of converted land. The questions raised most often concerned land that had been mangrove and had become shrimp ponds, especially ponds that were no longer productive. Participants asked whether such land remains bound by its previously designated function and status, and what the legal position is of residents who have been using it. These questions show that participants saw conversion as raising issues of status, tenure, and the obligation to restore, and not only as a physical change.

Questions on restoring inactive ponds. Participants generally agreed that inactive ponds no longer yield economic benefit, but they did not know the legal and technical steps for returning them to mangrove. The team explained that restoration involves more than replanting. It must take account of hydrology, tides, soil and water quality, and suitable species, and it must be preceded by clarity about land status and about the competent authority.

Relating the material to local sites. Participants repeatedly referred to the inactive ponds around Keramat Suci and the lower river reach. The discussion therefore moved from general information to concrete problems in the village.

Expressed interest in participation. Toward the end of the session, some participants proposed forming a mangrove care group and planting mangroves on former ponds. These proposals were recorded as expressions of interest. No responsible party or timeline was formally established during the session

Discussion

Initial understanding and legal awareness

The initial understanding recorded in Sugian Village is consistent with the Gili Sulat survey, which found that coastal residents support conservation in principle but that low awareness and limited education about mangroves keep that support from turning into practice (Rizal, 2019). It is also in line with the low knowledge of regulations and sanctions reported in Muara Pantuan (Darmansyah & Erwiantono, 2018).

Soekanto (1982) distinguishes four graduated indicators of legal awareness: legal knowledge, legal understanding, legal attitude, and patterns of legal behaviour. Legal knowledge is the most basic level, at which a person knows that an act is regulated by law. Legal understanding requires comprehension of the content and purpose of the rule. Among the participants who spoke in the opening exchange, even the first level had largely not been reached for mangrove rules, since most did not know that mangrove clearing is regulated by law. Limited legal knowledge is, however, only one of several conditions that shape decisions about mangrove land. Livelihood pressure and the short-term income from ponds, unclear or contested land tenure, and weak institutional enforcement have all been identified as drivers of mangrove conversion in Indonesia (Ilman et al., 2016; Rizal, 2019). The present data cannot show which of these conditions explains past conversion in Sugian Village. What they do show is that participants lacked the legal knowledge needed to recognize where lawful utilization ends.

Legal substance, structure, and culture

Friedman (1975) holds that the operation of law depends on legal substance, legal structure, and legal culture. For mangrove protection in Sugian Village, the legal substance is largely in place in the statutes and regulations described above. The legal structure consists of the institutions expected to apply those rules and to support compliance at village level. These are the village government and the Village Consultative Body, which can adopt village regulations or customary agreements (awig-awig) on the use of the coastal fringe; the provincial forestry service and its forest management unit, for mangroves within the forest area; the provincial marine and fisheries service as manager of the TWP and its waters; the regency government, responsible for spatial planning and fisheries business licensing; the land office, for clarifying land rights; and forest police or civil-servant investigators for enforcement. In the legal culture, mangroves are valued mainly as an economic resource. The rules will not operate if the community closest to the mangroves does not know them and the institutions responsible for applying them are not present at village level. Legal outreach can connect substance with culture, but compliance also requires a functioning structure.

Impacts of conversion and the limits of alternatives

Clearing mangroves removes a natural buffer. Over time this can contribute to poorer water exchange, acidification of pond soils, and more frequent shrimp disease, which reduce pond productivity (Ilman et al., 2016). Pond failure is nevertheless site-specific. Soil type, water supply, stocking practices, disease outbreaks, and the capital available to the farmer all play a part, so not every inactive pond near Keramat Suci can be attributed directly to mangrove

clearing. Mangroves also attenuate wave energy, although the degree of protection depends on the width and density of the forest and on local coastal conditions (Alongi, 2008). The loss of mangrove cover thus shifts costs onto residents in the form of erosion, lower catches of fish and crabs, and possible damage to land and infrastructure.

Silvofishery and mangrove-friendly ponds were presented as options that combine income with mangrove cover. Their feasibility for Sugian pond farmers should not be assumed. A pond within the forest area can only be managed lawfully through an approval such as a social forestry scheme, whereas a pond outside it requires clear land rights and compliance with fisheries registration or licensing. Converting a pond requires up-front spending on dike modification, seedlings, and lower stocking during establishment, and it brings little or no income while the trees grow. Pond farmers also need technical assistance and access to buyers. Smallholders who rent or share-crop their ponds may have no authority to change them at all. These options should therefore be assessed plot by plot, after land status has been clarified, and not presented as ready-made solutions.

Restoring inactive ponds: a sequence of responsibilities

Studies on mangrove rehabilitation support the sequencing explained to participants. Lewis (2005) shows that many rehabilitation projects fail because they proceed directly to planting without examining hydrology. The depth, duration, and frequency of tidal inundation determine whether mangroves survive, so the first step is to restore tidal flow and allow natural regeneration, with planting undertaken only where regeneration does not occur. In the Philippines, planting at unsuitable sites such as seafront mudflats resulted in low survival, whereas abandoned ponds were the most suitable sites but were often blocked by tenure problems (Primavera & Esteban, 2008). In Indonesia, community-based ecological rehabilitation, including on Tanakeke Island in South Sulawesi, restored mangrove cover and prompted village-level management rules (Brown et al., 2014). Combining these findings with the legal framework, restoration of the inactive ponds in Sugian Village could follow this sequence:

1. Clarify land status (village government with the land office and the forestry authority). Determine for each inactive pond whether it lies within the forest area and who holds rights to it.
2. Secure the agreement of land users (pond owners and users). Confirm tenure, obtain consent to rehabilitation, and agree whether each plot will be fully restored or managed as silvofishery.
3. Obtain the approval of the competent authority. For plots in the forest area, this is the forestry authority through the KPH. For plots outside it, this is the regency or provincial agency responsible for the environment and fisheries, in coordination with the TWP manager where the coastal waters are affected. This step includes approval of a rehabilitation design based on a hydrological assessment, beginning with the opening of dikes to restore tidal flow.
4. Formalize village arrangements (village government and Village Consultative Body). Record the agreed use and protection rules in a village regulation or awig-awig, and recognize a community group to carry them out.

5. Implement, monitor, and report (community group). Carry out the rehabilitation, monitor regeneration, and report damage or violations to the competent authority, using the participation channels provided by Government Regulation Number 27 of 2025.

The discussion format and follow-up

The two-way discussion appeared to be the component that engaged participants most, because they tested the material against their own experience instead of only receiving information. This is consistent with Reed (2008), who argues that high-quality participation in environmental management rests on empowerment, trust, and mutual learning rather than one-way delivery of information. Community mangrove activities elsewhere, such as the planting programme in Darat Pantai Village, were likewise designed to build residents' concern through direct involvement (Aswim et al., 2023).

The follow-up ideas must be read in two categories. The participants themselves proposed a mangrove care group and planting on former ponds; these remain expressions of interest. The team recommended three further measures: forming a community mangrove oversight group, using inactive ponds for rehabilitation once their status is clear, and coordinating with the village government, the forestry authority, and the TWP manager. Experience from four coastal villages in Central Java shows that community-based management can support sustainable resource use and livelihoods, but that outcomes depend on the management arrangements in each village (Damastuti & de Groot, 2017). A group therefore needs agreed rules, a clear division of roles, and the support of the village government. In Soekanto's (1982) framework, this is the stage that moves legal awareness from knowledge and understanding toward attitude and behaviour, which this activity did not reach.

Limitations

This report has several limitations. It is based on a single session with 25 invited participants, who are not a representative sample of the village. No pre-test or post-test was used, so individual learning gains cannot be measured. The field notes capture mainly the views of participants who spoke, and they were recorded by members of the team that delivered the outreach. Attitudes and conservation behaviour after the session were not assessed. The findings should therefore be read as short-term, group-level indications from one activity.

Conclusion

This activity yields two conclusions, which correspond to the two questions and apply to the 25 participants of the session.

First, at the start of the session, the participants who spoke described mangroves mainly in terms of direct benefits. They rarely mentioned the indirect ecological functions of mangroves, did not link conversion to its ecological consequences, and showed little knowledge of the legal rules that restrict mangrove clearing and provide room for community participation.

Second, during the legal outreach, participants engaged with the material. They asked about the legal status of inactive ponds and about how to restore their ecological functions, related the material to sites in their village, and expressed interest in forming a mangrove care

group. These are short-term, group-level indications of legal knowledge and understanding expressed during discussion. They do not demonstrate individual learning gains or sustained conservation behaviour, neither of which was assessed. Follow-up assistance should begin with clarifying the land status of inactive ponds and the responsible authorities, followed by village-level arrangements and support for a community group.

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