Claiming the swamp: How territorialization produces hidden populations in South Sumatra's peatlands

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Abstract

Successive interventions in South Sumatra's peat swamps including logging, transmigration, plantations, conservation, and restoration have led to changing land use permits, boundaries, canal systems, different land use classifications, and prohibitions. This article examines how those overlapping territorial regimes reshaped access to wetland resources in Perigi and Riding, Ogan Komering Ilir, and how their effects were differentiated within the local population. It uses 'hidden population' as an analytical concept for politically-produced invisibility rather than as an official or self-ascribed identity. The analysis draws primarily on fieldwork conducted in 2018, supplemented by relevant contextual observations from research undertaken in the same area in 2019 and 2021 and other more recent data sources. Territorialization made earlier histories of use and resource claims progressively less legible within formal governance. Accounts of livelihood loss were particularly pronounced among people dependent on interior swamp resources and poorly connected to village institutions. Legal, institutional, ecological, and economic ambiguities further constrained decisions about fishing, cultivation, canal maintenance, and intergenerational livelihood transfer. Accounts distinguish household adaptations from collective efforts to defend land, including canal construction and negotiation during a plantation dispute. The case contributes to political ecology and feminist political ecology by explaining produced invisibility as an uneven, relational, and negotiated outcome of territorial governance.

Keywords: differentiated access, feminist political ecology, hidden populations, peatlands, South Sumatra, territorialization

Résumé

Les interventions successives menées dans les zones marécageuses tourbeuses du sud de Sumatra – notamment l'exploitation forestière, la transmigration, les plantations, la conservation et la restauration – ont entraîné des modifications des permis d'occupation des sols, des limites territoriales, des réseaux de canaux, ainsi que des classifications d'utilisation des sols et des interdictions. Cet article examine comment ces régimes territoriaux qui se chevauchent ont redéfini l'accès aux ressources des zones humides à Perigi et Riding, dans le district d'Ogan Komering Ilir, et comment leurs effets se sont différenciés au sein de la population locale. Il utilise la notion de « population cachée » comme concept analytique pour désigner une invisibilité induite par la politique, plutôt que comme une identité officielle ou auto-attribuée. L'analyse s'appuie principalement sur un travail de terrain mené en 2018, complété par des observations contextuelles pertinentes issues de recherches menées dans la même région en 2019 et 2021, ainsi que par d'autres sources de données. La territorialisation a rendu les antécédents d'utilisation et les revendications de ressources de plus en plus difficilement lisibles au sein de la gouvernance formelle. Les témoignages relatifs à la perte des moyens de subsistance étaient particulièrement marqués chez les personnes dépendantes des ressources des marécages intérieurs et peu intégrées aux institutions villageoises. Des ambiguïtés juridiques, institutionnelles, écologiques et économiques ont encore davantage entravé les décisions concernant la pêche, la culture, l'entretien des canaux et la transmission intergénérationnelle des moyens de subsistance. Les témoignages distinguent les adaptations des ménages des efforts collectifs visant à défendre les terres, notamment la construction de canaux et les négociations menées lors d'un conflit concernant une plantation. Cette étude contribue à l'écologie politique et à l'écologie politique féministe en expliquant l'invisibilité produite comme un résultat inégal, relationnel et négocié de la gouvernance territoriale.

Mots-clés: accès différencié, écologie politique féministe, populations invisibles, tourbières, Sumatra du Sud, territorialisation

1. Introduction

Indonesia's peatlands have been reorganized through successive extraction projects, settlement, production, protection, and ecological repair. Logging concessions opened forests and waterways; transmigration schemes cut canals and recast wetlands as agricultural land; industrial plantations consolidated licensed control; conservation boundaries restricted established uses; and restoration programs introduced new hydrological and administrative interventions. These regimes did not simply replace one another. Their infrastructures, maps, permits, and institutional mandates accumulated in the same landscapes, creating overlapping claims over land and water. Political ecology has long shown that such environmental change is inseparable from struggles over authority, access, and the power to define legitimate resource use (Forsyth, 2003; Robbins, 2012). In peatlands, the consequences are particularly acute because canals, seasonal water, fishing grounds, forest products, and cultivation sites form an interconnected livelihood geography that administrative zoning often separates into discrete technical objects.

National concern with peat fires and greenhouse gas emissions has made peatland restoration a prominent contemporary intervention in Indonesia. Scholarship has documented insecure tenure, institutional misfit, and contested rights in Indonesian forests and peatlands (Resosudarmo *et al*., 2014; Uda *et al*., 2020). In South Sumatra, logging, transmigration, commercial agriculture, and protected area formation had already redistributed access and altered peat hydrology before restoration agencies began blocking canals or supporting alternative livelihoods. We argue that overlapping territorial regimes made earlier wetland uses and claims progressively less visible within formal governance, while distributing the costs of restricting access unevenly across residents. This directs attention to the cumulative effects of infrastructure, classifications, and rules, and to the social relations through which people negotiated them.

Accounts in Indonesian peatlands show residents hold different positions in relation to wetland resources, transport routes, markets, village institutions, gendered work, and generational knowledge. Accounts of livelihood loss have been particularly pronounced among those dependent on interior swamp resources and poorly connected to administrative networks. Uncertainty over status, jurisdiction, and permissible use have affected fishing, cultivation, canal maintenance, and planning for livelihoods. Ecological practices sustain access and memory; some have political significance because they depend on contested claims or they challenge imposed control.

The article examines peatland political ecology in Perigi and Riding, two neighboring villages in Ogan Komering Ilir, South Sumatra. The expression *Orang Rawang* is an interpretive term for peoples with histories and livelihoods associated with the swamp interior, as also examined in earlier work (Handoyo *et al*., 2021). It is used here as an analytical descriptor rather than indicating a fixed ethnic identity or a uniformly adopted self-identification. One strand of remembered history links this position to people cast out from settled communities, while other accounts emphasize flight from labor demands elsewhere or colonial pressure. The term carries stigma and is neither a verified administrative category nor a uniformly self-ascribed identity. We therefore use it carefully and retain 'hidden population' as an analytical concept for the limited legibility of particular histories, livelihood practices, and resource claims within formal territorial governance.

The article asks how overlapping territorial regimes changed access to the Perigi–Riding peat swamp; why those changes affected locally differentiated residents in unequal ways; and how people sustained livelihoods and claims under uncertain conditions. Its contribution is threefold. First, it connects material territorialization with the discursive production of an apparently empty or administratively simplified landscape. Second, it uses feminist political ecology to show how dispossession is mediated by social position, gender, and generation. Third, it recasts 'hiddenness' as

a political outcome of governance rather than an inherent attribute of a bounded community. The analysis combines ethnographic field material, policy history, indicative livelihood valuation, and descriptive land-cover evidence to follow these processes across time.

2. Conceptual framework: Territorialization, differentiated exclusion, and produced invisibility

Territorialization describes efforts to define, bound, classify, and administer space in ways that make resources and populations governable. State territorialization proceeds through material practices, including boundary markers, canals, roads, patrols, and land conversion, as well as discursive practices that identify legitimate functions and users. Peluso (2003) shows how representations of land as empty or insufficiently managed help authorize state zoning and resource allocation. Eilenberg's (2014) analysis of frontier constellations similarly demonstrates that sovereignty is assembled through overlapping actors and practices rather than exercised by a single coherent authority. These insights are useful in Perigi–Riding, where production forests, transmigration infrastructure, conservation, plantation permits, forest management, and restoration have accumulated in the same wetland landscape.

The material and discursive dimensions of 'hidden populations' are mutually constitutive. A canal through a swamp can enable timber removal, planned settlement, boat travel, fire access, and hydrological restoration at different moments. A boundary sign converts a line on a map into a warning encountered during everyday movement. Terms such as production forest, wildlife reserve, degraded land, or restoration zone do descriptive and political work by making some uses visible and authorized while placing others outside the categories through which decisions are made. Territorialization is thus examined here through changes in both physical access and authoritative representation.

Territorialization redistributes access. Access includes the practical ability to benefit from resources, which may depend on technology, capital, markets, authority, identity, knowledge, and social relations as much as on formal property (Ribot & Peluso, 2003). Hall, Hirsch, & Li (2011) identify regulation, force, markets, and legitimation as powers that shape exclusion in Southeast Asia. Work on new frontiers of land control similarly shows that authority over land is repeatedly remade rather than settled once (Peluso & Lund, 2011). This situated approach offers the main vocabulary for examining the case. Harvey's (2003) concept of 'accumulation by dispossession' provides a broader account of how assets and control can be transferred through political-economic restructuring, while Hall and colleagues allow closer attention to the concrete mechanisms through which particular actors gain or lose access. Green grabbing remains relevant where environmental objectives legitimize enclosure (Fairhead *et al*., 2012), although it captures only part of a history that also includes commercial logging, settlement engineering, and plantation expansion.

Exclusion of different forms does not affect a homogeneous local community. Feminist political ecology directs attention to the ways gender, generation, social standing, household labor, and institutional connections shape environmental knowledge and vulnerability (Rocheleau *et al*., 1996; Nightingale, 2006). The approach also qualifies assumptions often associated with common-pool resource analysis (Ostrom, 1990). Local rules and ecological knowledge may support collective management of natural resources, yet the capacity to participate in a commons depends on prior access and authority. In Perigi–Riding, the relevant question is therefore not whether a unified community once sustainably managed a clearly bounded resource. It is how territorial change over time has altered differentiated abilities to reach fishing grounds, collect forest products, cultivate seasonal plots, obtain information, and negotiate with officials.

Work on 'hidden populations' addresses problems of visibility, access, and the relation between identification and power (Fitzgerald, 1996; Morgan, 1996). This article develops that connection for peatland governance through the concept of 'produced invisibility.' Administrative systems may recognize people as residents while poorly representing their land-use histories and resource claims. Hiddenness is relational: particular claims are obscured in specific documents or decision-making processes even when people remain known in village life. Our contribution concerns the territorial mechanisms through which this selective visibility is produced and experienced. The concept of 'hidden populations' does not establish ethnicity, indigeneity, or an absence from civil registration.

Scholarship on the politics of uncertainty in such communities shows that ambiguity is experienced and governed unevenly, especially in contexts of marginalization and environmental change (Stirling, 2010; Scoones & Stirling, 2020). We use the term *governance through exclusion* to explain rules and arrangements that limit access or representation, and *governance by uncertainty* for situations in which overlapping mandates, unstable procedures, unclear boundaries, or unpredictable ecological effects constrain access claims and decisions. The latter is an extension of existing work on the politics of uncertainty, applied here to the territorial governance of peatlands. It does not require a claim that every ambiguity was deliberately designed. Its political force lies in explaining who can act despite uncertainty, and who must absorb the costs of uncertainty.

Responses to exclusion range from compliance and adjusting livelihoods, to negotiation, evasion, and everyday resistance. Following Scott (1990), resistance need not take the form of organized public confrontation. There are other types of resistance. However, ordinary survival becomes resistance when an everyday practice also sustains a contested claim, evades a restriction, retains an alternative territorial memory, or negotiates imposed control. In this case, resistance includes the limited continuation of *sonor*, a rainfed rice practice undertaken on seasonally dried wetland plots during prolonged dry periods and historically involving the burning of surface vegetation before sowing, and fishing. There is also more explicit resistance to canal construction, and negotiations documented during a plantation dispute.

3. Methods

The qualitative case study examines Perigi and Riding in Ogan Komering Ilir, South Sumatra, within a landscape shaped by timber concessions, the Air Sugihan transmigration project, plantations, production-forest management, and the Padang Sugihan Wildlife Reserve. Figure 1 situates the village boundaries and an approximate 5–10 km canal-and-river corridor used only for geographic orientation. The corridor is neither a customary territory boundary nor the unit used for land-cover analysis.

The principal fieldwork was conducted in 2018 and focused on the historical formation of the local population interpreted through the concept of 'hidden population', changes to livelihoods and income under different forms of land control, and related socio-ecological conditions. Research undertaken by the lead author in the same area in 2019 and 2021 addressed other themes; only observations relevant to this article supplement the 2018 material. The study is therefore not presented as a systematic longitudinal panel.

The core interview group comprised approximately thirty respondents: twenty residents associated with swamp-based livelihood histories described through *Orang Rawang*; six associated with *Risan* or *Sungai* positionality (explained below); and four village officials, local authorities, or governmental and non-governmental actors working on forestry and environmental issues. The first twenty-six supplied livelihood and income information, while institutional interlocutors contributed

policy and program accounts. Participants were selected purposively through local introductions and long-standing research relationships in the area.

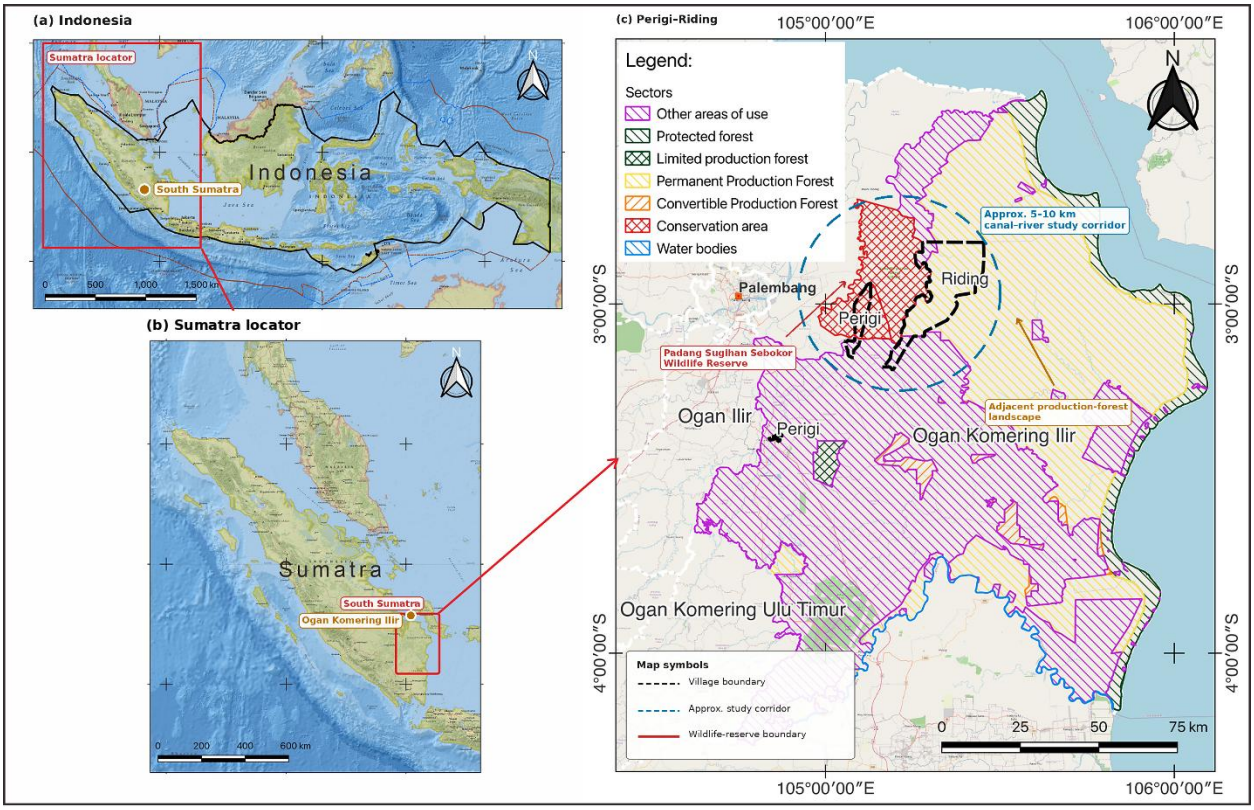

Figure 1: Location of the study area: (a) Indonesia, with South Sumatra highlighted; (b) Sumatra, with South Sumatra and Ogan Komering Ilir highlighted; and (c) Perigi, Riding, the Padang Sugihan Wildlife Reserve, surrounding land-use zones, and an approximate canal-and-river corridor used for geographic orientation. The corridor doesn't represent a customary territory boundary. Sensitive fishing and harvesting sites are not shown.

Interviews were exploratory and retrospective, covering the respondent's settlement history, their use of fishing and harvesting forest products, livelihood change, government programs, conservation restrictions, and relations with intermediaries. Sessions ranged from approximately one to two hours to around six hours. They took place in homes, field huts, and along canals. Participant observations documented mobility, fishing practices, canal use, household work, and encounters with regulatory signs and boundaries.

Women and men from different generations discussed provisioning, fish processing, wetland products, seasonal knowledge, schooling, wage labor, and migration, but gender and age were not fully broken down numerically so gender-specific analysis therefore relies on two records that identify women's roles directly: a detailed Perigi household account and a Riding program trained women as village motivators (Handoyo *et al*., 2018). Some comparisons are possible across livelihood and institutional positions.

Interviews were documented in contemporaneous handwritten field notes. Direct quotations in the Results below reproduce speech as recorded in those notes and are translated by the authors. Where the record preserves the substance of the quotes but word-for-word phrasing is not sufficiently reliable, we paraphrase the field-note accounts. The corpus includes the 2018 research report (Handoyo *et al*., 2018), an earlier livelihood manuscript based on the interviews, and the authors' subsequent publication (Handoyo *et al*., 2021). Oral histories were compared across community accounts and interpreted alongside policy documents, historical literature, and regional cultural-historical knowledge held by the research team.

The terms *Rawang*, *Risan*, and *Sungai* are not fixed descriptors but are informed by our regional knowledge and assessed against the field accounts. *Rawang* refers mainly to histories and livelihoods oriented toward the swamp interior; *Risan* to tributary and transitional areas; and *Sungai* to major river routes, markets, and village institutions. These positions are overlapping and changeable, for example through residence, marriage, livelihood, age, and mobility. They are not fixed ethnic groups, uniformly self-ascribed identities, official census categories, or formally recognized Indigenous or customary-law communities.

Thematic analysis examined how the swamp was represented and bounded, how access changed across policy periods, how experiences differed by livelihood and social position, and how people navigated livelihood or residence restrictions. Oral histories informed access trajectories; documents traced official categories; and livelihood accounts connected these changes to resource use.

Figure 2 uses a land-cover dynamics monitoring dataset, GLC_FCS30D 30m, to compare broad land-cover patterns in 1985, 2000, 2010, and 2022 using a common extent and class scheme at relatively high resolution (Zhang *et al*., 2024). The maps describe the landscape context. They do not establish legal tenure, permitted access, precise area change, or causal effects of an individual policy.

Indicative livelihood valuation refers to Perigi, while the qualitative comparison also covers Riding. The 2018 reconstruction combined recalled catches or harvests, activity frequency, activity-specific participation assumptions, and recorded prices. An approximate base of 500 households appears only in the pre-HPH fishing calculation.[2]

The research team worked within a government research institution and gained access through long-standing local relationships developed by its members. Researchers stayed in residents' homes, allowing extended conversation and observation while requiring care not to reproduce official classifications. Before interviews, researchers explained the study, its intended use, voluntary participation, and confidentiality, and participants gave oral consent. Questions were revisited during interviews to clarify retrospective accounts. Research summaries were not later returned for member checking, and no formal institutional ethics approval was obtained. Names are withheld from the household account, and Figure 1 omits sensitive fishing and harvesting locations.

Current conditions in Perigi were assessed through local communication and direct observation in 2025–2026. Observations of the canal-blocking structures required by the provincial conservation agency (Balai Konservasi Sumber Daya Alam, BKSDA) were made in 2025, while information on the proposed timber partnership and major livelihood activities was updated in

[2] Table 3 below reproduces rounded reported values; missing estimates are identified, and the HPH timber figure is retained although its participant multiplier and distribution among actors cannot be reconstructed. The figures illustrate livelihood composition and reported scale rather than mean household income, net profit, or representative welfare change.

September 2026. These qualitative updates were not used to recalculate the 2018 livelihood estimates or to estimate current participation rates or household incomes.

4. Results

Narrating Orang Rawang: settlement histories and meanings of the swamp

Three overlapping accounts of movement into the Perigi–Riding wetlands were reconstructed from community narratives and regional cultural-historical knowledge within the research team. One account traced settlement to families arriving from Sekayu and, in some versions, Java during the nineteenth century under colonial pressure. A second connected withdrawal into remote swamps with efforts to avoid forced labor in the pepper economy of the Palembang Sultanate. A third described people who violated customary norms, committed offenses, or were regarded as bringing shame to their families. They were cast out by relatives or other village authorities, an account retrospectively associated with Simbur Cahaya, a codified body of South Sumatran customary law (Handoyo *et al*., 2021).

The 2018 report records the related emic expression *orang Melayu buangan* and an account that people with stigmatized conditions were sometimes sent away or remained in the swamp, because returning to their village was difficult (Handoyo *et al*., 2018). An ancestral movement from Sekayu and Java was dated to around 1819, and names Talang Lama, *Sungai* Musi, and Lage Lalang as early destinations. We treat these narratives as remembered histories rather than as a single verified genealogy: neither the date, a particular customary sanction, nor its applicability to all people later described as *Orang Rawang* was independently established through archives.

The accounts nevertheless reveal layered forms of constraint and human initiative. Expulsion narratives suggested the authority of kin or village society to determine who remained; flight narratives emphasized withdrawal from labor demands or because of colonial pressure. Later movement toward village centers followed changing access to services, markets, and swamp resources. Residence near the village coexisted with a continued reliance on more distant fishing grounds, canals, and forest products.

The swamp has acquired meaning through these continuing social relations. Seasonal water levels shaped fishing grounds, travel, gathering, and *sonor* cultivation. Residents also collected *purun* (a sedge or grass, Cyperaceae) for weaving, alongside honey, rattan (Calamus rotang), and other products. The color of the water, its flow, vegetation patterns, and seasonal changes helped them to judge where these resources were accessible.

Collecting and harvesting took place from connected deep pools, vegetated margins, canals, and temporarily dry surfaces. Their use depended on the water levels, the availability of transport, physical capacity, and relations with people controlling access or exchange. This 'lived geography' lacked an uncontested communal territory: rather, it crossed residences, places of work, and settlement sites.

Orang Rawang condensed these relations while carrying meanings of remoteness, poverty, or shame as well as a close association with the swamp interior. Social exclusion was compounded by later administrative and territorial marginalization, leaving wetland histories and claims weakly recognized within formal land-use categories.

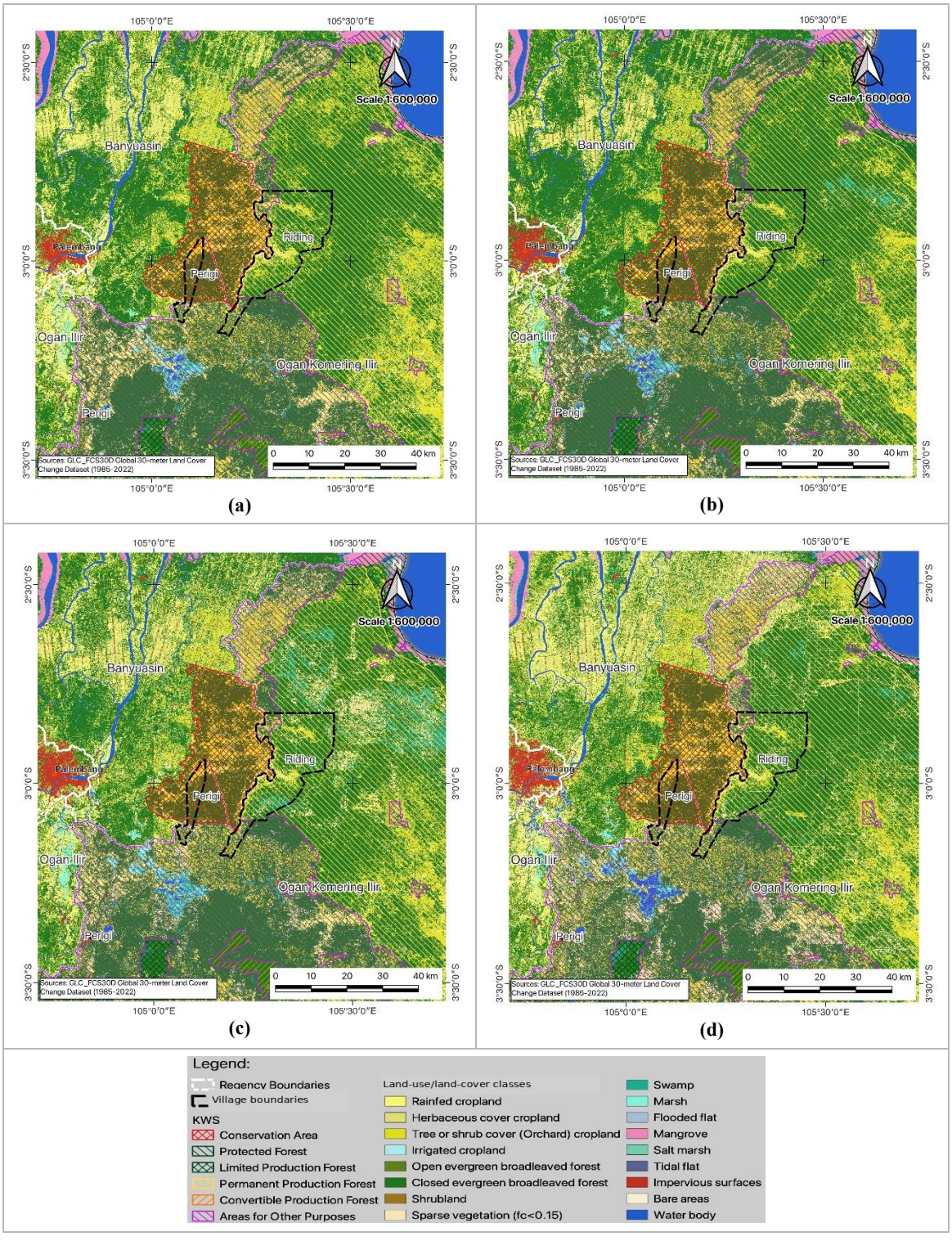

Figure 2: Land-cover maps of Perigi, Riding, and their surroundings: (a) 1985; (b) 2000; (c) 2010; and (d) 2022. All panels show the same geographic extent. Black dashed lines indicate the boundaries of Perigi and Riding villages. Source: authors' mapping using GLC_FCS30D (Zhang *et al*., 2024).

Territorializing the swamp: extraction, settlement, conservation, and restoration

Logging, settlement development, conservation, and plantation expansion introduced different ways of organizing the swamp over time. Retrospective field accounts recalled timber concessions in a period of intensified commercial extraction and expanding access routes. The Air Sugihan transmigration project in the early 1980s added canals and drainage infrastructure. These were intended to support settlement and agricultural development. These infrastructures continued to influence water movement and livelihood mobility even as land-use objectives changed.

Conservation became another territorial intervention within this changing landscape. In November-December 1982, Operasi Ganesha relocated elephants from the Muara Sugihan transmigration area to the Lebong Hitam forest block, subsequently associated with Padang Sugihan Wildlife Reserve (Direktorat Jenderal KSDAE, 2019). The reserve was initially designated (*penunjukan*) through Ministerial Decree No. 004/Kpts-II/1983 of 19 April 1983, covering approximately 75,000 ha (Menteri Kehutanan Republik Indonesia, 1983). Its legal establishment (*penetapan*) under Decree No. SK.2858/Menhut-VII/KUH/2014 of 16 April 2014 covered 88,148.05 ha (Menteri Kehutanan Republik Indonesia, 2014a). The development of conservation space became linked to human-elephant conflict associated with new settlement.

Decisions about the Reserve operated within wider provincial arrangements. Decree No. 76/Kpts-II/2001 concerned the designation of forest and water areas across South Sumatra (Menteri Kehutanan Republik Indonesia, 2001). Decree No. SK.866/Menhut-II/2014, subsequently amended by Decree No. SK.454/MenLHK/Setjen/PLA.2/6/2016, addressed provincial forest and aquatic conservation areas (Menteri Kehutanan Republik Indonesia, 2014b; Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia, 2016). Separately, Decree No. SK.76/Menhut-II/2010 provided the basis for delineating production and 'protection forest' management units, or KPHP and KPHL, across the province (Dinas Kehutanan Provinsi Sumatera Selatan, 2021). These instruments organized distinct forest functions and management jurisdictions within the wider landscape.

The authorization of plantations followed a separate administrative pathway (Table 1). Satriawan *et al*. (2025, pp. 3-4), analyzing litigation involving PT Waringin Agro Jaya, found an OKI district location permit dated 17 April 2008 and a plantation business permit dated 21 April 2008. They also report an environmental assessment decision made on 20 October 2008 that covered activities in Sirah Pulau Padang, Pampangan, and Pangkalan Lampam. These records establish a district-level chronology of plantation authorization. The village-level consequences examined below draw on residents' accounts of plantation activities and changes in access.

The 2015 crisis involved extensive forest and peat fires across Indonesia, including South Sumatra, and produced severe haze and livelihood losses; the national economic cost was estimated at US$16.1 billion (World Bank, 2016). The Perigi research record also notes that 35 rubber trees belonging to residents burned during the 2015 fires (Handoyo *et al*., 2018). From 2016, peat restoration introduced additional interventions in Padang Sugihan, including rewetting, revegetation, and fire prevention under the Peatland Restoration Agency's program (Rosana, 2019). Table 1 brings together these interventions while distinguishing their geographical and administrative scope.

Period or date	Intervention or instrument	Geographical or administrative scope	Territorial significance
Logging period recalled as preceding and overlapping the early-1980s Transmigration project	Timber concessions (HPH)	Livelihood landscape described by residents	Commercial timber extraction and expansion of access routes
Early 1980s	Air Sugihan transmigration project	Settlement-development landscape	Canal construction, drainage, and planned agricultural settlement
November–December 1982	Operasi Ganesha	Muara Sugihan settlement area and Lebong Hitam forest block	Relocation of elephants from settlement areas into forest subsequently associated with the reserve
19 April 1983	Ministerial Decree No. 004/Kpts-II/1983	Padang Sugihan	Initial designation of approximately 75,000 ha as a wildlife reserve
15 March 2001	Ministerial Decree No. 76/Kpts-II/2001	South Sumatra Province	Provincial designation of forest and water areas
April–October 2008	Location and plantation business permits, followed by an environmental-assessment decision concerning PT Waringin Agro Jaya (Satriawan *et al.,* 2025, pp. 3-4)	Ogan Komering Ilir Regency; the environmental-assessment decision refers to three subdistricts	District-level authorization of plantation development
2010	Ministerial Decree No. SK.76/Menhut-II/2010	South Sumatra Province	Delineation of production and protection forest management units
16 April 2014	Ministerial Decree No. SK.2858/Menhut-VII/KUH/2014	Padang Sugihan Wildlife Reserve	Legal establishment of the reserve, with a recorded area of 88,148 ha
29 September 2014; amended in 2016	Ministerial Decrees No. SK.866/Menhut-II/2014 and No. SK.454/MenLHK/Setjen/PLA.2/6/2016	South Sumatra Province	Provincial arrangements for forest and aquatic conservation areas
From 2016	Peat restoration following the 2015 forest and peat fires	Intervention sites within Padang Sugihan	Rewetting, revegetation, and fire-prevention activities

Table 1: Territorial interventions in Padang Sugihan and the wider Perigi–Riding landscape. Sources: Handoyo *et al*. (2018); Direktorat Jenderal KSDAE (2019); Menteri Kehutanan Republik Indonesia (1983, 2001, 2014a, 2014b); Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia (2016); Dinas Kehutanan Provinsi Sumatera Selatan (2021); Satriawan et al. (2025); Rosana (2019). Dates identify particular interventions and decisions; their infrastructures and legal effects persisted alongside later programs. Administrative coverage does not establish the parcel-level location of plantation activities within either study village.

These interventions accumulated through infrastructure projects as well as through legal (re)classifications. Canals constructed for the extraction of plantation crops, or for settlement, remained as tramsport routes even after new conservation objectives emerged. Residents also constructed canals for their own mobility and to access wetland resources. They used them to reach fishing and gathering areas, to move products, and to sustain household activities. Because the same canals also served as navigation routes, later restoration and water-retention measures (segmenting canals to stop peat from drying out, which leads to fire risk and CO_2 emissions) worsened movement and livelihood access in a landscape shaped by drainage. The surviving record does not establish the hydrological outcome of particular interventions, however.

Land cover maps provide a spatial context for this history. Figure 2 and Table 2 compare 1985, 2000, 2010, and 2022 using a common geographical area and a consistent classification system (Zhang *et al*., 2024). Black dashed lines indicate the boundaries of Perigi and Riding villages. The earliest date shows extensive forest and wetland cover, while the subsequent panels depict more fragmented combinations of forest, shrubland, cropland, and open water. Their causes and implications for access require some interpretation alongside our earlier field accounts and documentary evidence.

Map year	Broad pattern visible in the map series	Relevance to the analysis
1985	Extensive forest and wetland blocks	Landscape context for retrospective accounts of wetland resource use
2000	A more fragmented pattern of forest, shrubland, and cropland	Context for examining changes in livelihood routes and resource availability
2010	A mixed pattern of cropland, shrubland, and remaining forest	Context for comparing residents' access across differently-used parts of the landscape
2022	Open-water areas alongside forest, shrubland, and cultivated cover	Context for examining the landscape in which conservation, cultivation, and restoration operate

Table 2: Land-cover patterns and their relevance to the analysis of livelihood access. Note: The table summarizes mapped land cover in Figure 2, which does not independently identify tenure, permitted access, household livelihood loss, or the effects of a particular policy. Open water alone is not evidence of hydrological recovery.

Territorialization also operated through commercial rules and everyday encounters. In 2018 Handoyo *et al.* described how residents of Perigi were permitted to cut timber during the HPH period[3] only if they sold it to the concession holder. Attempts to sell to other buyers risked confrontation with the company's armed security team, remembered locally as TIM (Handoyo *et al*., 2018). Access to timber therefore depended on an enforced relationship with a particular buyer. Commercial extraction reorganized both the use of forest resources and the terms through which residents obtained value from them.

[3] *Hak Pengusahaan Hutan*, a Forest Concession Right or Forest Exploitation Right granted under the 1967 Forests Law. It applied to the 'Outer Islands' including Sumatra, and allowed large-scale commercial timber extraction.

Canals in the Perigi landscape did not have a single origin or function. Some were excavated to enable timber extraction or the development of new settlements, and others were constructed collectively by residents to connect the village with wetland resource areas. Figure 3a shows a straight canal constructed by Perigi residents through community-organized work. Its linear alignment, excavated banks, and use by boats identify it as a built waterway rather than a natural river channel. As noted, it typically supported travel, fishing, gathering, and the movement of wetland products.

Conservation made another set of rules visible. The sign shown in Figure 3b stood beside a straight water channel at the boundary of Padang Sugihan Wildlife Reserve. It listed prohibitions on occupying or cultivating the forest area, encroachment and hut construction, burning, tree felling, and collecting other forest products. Residents encountered these restrictions along waterways also used for fishing, gathering, and travel. Read alongside the community-built canal in Figure 3a and the concession account above, the sign illustrates how canals connected livelihood mobility with different forms of territorial authority. The surviving metadata do not establish when or by whom the channel beside the sign was constructed.

Figure 3: Canal infrastructure and conservation regulation in the Perigi–Padang Sugihan landscape. (a) A straight excavated canal, reportedly extending for approximately 30 km, constructed collectively by Perigi residents and used for boat travel and access to wetland resources. Photograph by Taufik Wijaya, 2015.[4] (b) A prohibition sign at the boundary of Padang Sugihan Wildlife Reserve beside a straight water channel. Construction date, builder, and original purpose unknown. Photograph by Handoyo, 2018

We interpret these processes as being the cumulative territorialization of a connected livelihood landscape. In the late 2010s administrative classifications distinguished production forest, land for settlement, plantations, habitat for wildlife, and peatland restoration sites, while residents' activities extended across them, as routes and seasonal resource areas. The resulting tension was this: whose spatial relationships acquired practical and legal recognition? Where established livelihood connections carried little authority in decisions about access and use, 'produced invisibility' occurred.

[4] This photograph documents community-built infrastructure and should not be read as evidence that all canals in the wider landscape had the same builder, date, or purpose.

Uneven positions in a changing wetland landscape

Drawing on field accounts and our own knowledge, different and sometimes overlapping relationships with the wetland landscape were found, involving *Rawang*, *Risan*, and *Sungai*. Residence, livelihood, marriage, mobility, age, and institutional access altered how people were positioned over time and these labels are not fixed identities.

Households strongly dependent on the swamp interior relied on mobile fishing, *purun*, collecting honey, rattan, and seasonal *sonor* (as noted above). There was some preference for tributaries where wetland resources could be combined with cultivation and transport; stronger river and road connections improved contact with traders, schools, village offices, and programs. Territorial memory of locations and practices persisted despite their formal reclassifications. As one resident put it, "We still call that canal by our ancestor's name, even though the government says it is a conservation area" (male resident, Perigi, field notes, 2018; authors' translation).

Horizontal relations were formed through individuals sharing livelihood activities and there were vertical relations with landholders, timber buyers, traders, officials, and program actors. These connections provided transport, access to markets, work, and communication with different institutions. They also reproduced dependency, when intermediaries controlled prices, contracts, and the representation or selection of beneficiaries.

During the HPH period, Palembang-based financiers purchased timber that was delivered by canals, and residents recalled earning around IDR 500,000 (approximately US$35) on working days while the concession holder controlled the purchases. Other arrangements included rubber tapping on a 50:50 share, and temporary cultivation of food crops while workers established rubber for landowners. We did not record whether the intermediaries identified as *Rawang*, *Risan*, or *Sungai*.

The study complicates a simple state-versus-community account common in political ecology studies. People whose skills and assets remained tied to wetland mobility had fewer options when access narrowed, while land, transport, cash, market contacts, and institutional connections improved the capacity to obtain information or to diversify livelihood systems. Arrangements were situational, rather than being controlled by a single patronage institution. A household might depend on sharecropping for rubber income, use its own ecological knowledge for fishing, and rely on traders for transport or sale. Patron-client relations therefore describe one mechanism of access whose form varied by the resource and the encounter. *Rawang*, *Risan*, and *Sungai* therefore function as porous positions within changing access relations.

Changing wetland livelihoods and reported economic values

Wetland livelihoods in Perigi were diverse, with fishing, sugar-palm collection, accessing honey from the forest, *sonor* rice cultivation, and harvesting some timber. Table 3 shows the 2018 valuation of the activities in some detail. We reproduce it here because it shows how their composition changed across the land-management periods recalled by the respondents. The figures are indicative and the periods overlap in their ecological effects.

The HPH period monetized timber harvesting while other wetland livelihoods contracted. Reported fishing value fell from approximately IDR 129.5 million (US$9,096) per day for the ewhole sample? before HPH to IDR 77.7 million (US$5,458) during HPH, and sugar-palm collection fell from IDR 25 million (US$1,756) to IDR 2.5 million (US$176). Our notes associate these changes with habitat disturbance, canal development, and reduced participation. Commercial extraction generated cash for cutters while weakening activities that had supplied food and income.

Livelihood activity	Before HPH	During HPH	Oil-palm plantation period	Wildlife-reserve period	Documented livelihood trajectory
Fishing	129.5 (US$9,096)	77.7 (US$5,458)	1.5 (US$105)	1.5 (US$105)	Catches and participation declined, although fishing continued for household consumption and limited sale.
Sugar-palm (*aren*) collection	25.0 (US$1,756)	2.5 (US$176)	2.5 (US$176)	0.5 (US$35)	The number of regular collectors declined substantially, although collection continued on a smaller scale.
Forest honey	6.4 (US$450)	6.4 (US$450)	NR	NR	Harvesting honey subsequently ceased or became negligible as the vegetation supporting bee colonies deteriorated, even where some nesting trees remained.
Sonor rice cultivation	2.1 (US$148)	NR	NR	NR	*Sonor* became intermittent as access, burning regulations, hydrological conditions, and the availability of suitable land changed.
Timber use and cutting	19.7 (US$1,384)	250.0[5] ($17,560)	NR	NR	Timber collected for household use was followed by paid commercial cutting during HPH operations; access subsequently ended as commercially valuable timber declined and restrictions increased.

Table 3: Reported changes in peat-swamp livelihood values and activities in Perigi across land-management periods. The values reported are indicative *aggregate* values for the respective livelihood activities in Perigi, based on activity-specific participation assumptions; they are not per-person or per-household, but rounded estimates generated in 2018. They combine recalled production, activity-specific participation assumptions, and prices documented in the calculation notes. There is no uniform denominator or a fully verifiable common-price conversion across all activities and periods. The figures indicate approximate orders of magnitude and changes in livelihoods; they are not net profit, or statistically representative welfare change. Seasonal honey harvesting & *sonor* cultivation are not directly comparable with activities undertaken more regularly. NR indicates that no reliable monetary estimate was available. The final column uses the accompanying qualitative accounts to distinguish missing monetary estimates from reported contraction or cessation. Sources: Handoyo *et al.* (2018), livelihood valuation, calculation notes, and field accounts.

[5] Monetary values are expressed in IDR million per day; approximate US dollar equivalents are shown using the 2018 average official exchange rate of IDR 14,236.9 per US$1 (World Bank, n.d.). These conversions are provided do not represent historical purchasing power or inflation adjustment. The 2018 livelihood reconstruction reports an aggregate HPH timber value of IDR 250 million (approximately US$17,560) per working day. Interviews documented recalled earnings of approximately IDR 500,000 (approximately US$35) per cutter per working day and described timber cutting as frequent during this period. The available calculation notes do not separately document the number of active cutters used to produce the aggregate figure. We therefore retain it as a reported historical estimate and do not treat it as verified village-wide income.

Honey depended on occupied *sialang* trees and surrounding forage. Participants reported that some trees remained after logging but bee colonies disappeared as their habitat deteriorated. *Sonor* was also intermittent, requiring a long dry season, suitable wetland plots, and permission to prepare land with fire. Burning restrictions, hydrological changes, and land allocations progressively narrowed those conditions; the later periods therefore have no reliable aggregate values.

By 2018, approximately thirty Perigi households were recorded as still fishing, but only four people fished regularly each day. Many participants reported catches of around 2-3 kg per day, far below earlier recollections. Outside traders had been supplying part of the village's fish demand since about 2010. Continuing fishing therefore concealed a substantial decline in scale and household provisioning.

Riding showed another contraction of activities: residents recalled dried fish once being sent to Java in substantial quantities, but the trade had ceased by 2018 as catches declined. Participants associated fish mortality and lower catches with canalization, fertilizer use in company cultivation areas, and worsening river water quality. The records identify Java as the destination but not the town or intermediary.

Monetary estimates capture only part of the loss. Lower catches reduced fish for subsistence as well as sales; declining honey, *sonor*, and less timber harvesting removed food, materials, and seasonal cash; and altered hydrology, in part as a result of disturbing the flow of canals to increase peatland wetting, increased the time, distance, and equipment required to reach productive sites. These changes redistributed labor even when no cash transaction was recorded.

A Perigi household account shows how these changes entered everyday life. A *Rawang* woman lived with two married children, their spouses, and grandchildren. The seven-person household occupied a stilt dwelling. Landless family members relied mainly on rubber sharecropping, from which she recorded about IDR 240,000 (approximately US$17) per week. After tapping, she sometimes walked up to 12 km into the swamp to fish with a line because she owned neither a boat nor a net; catches of 1-2 kg were normally consumed at home (Handoyo *et a*l., 2018, pp. 42-43). Therefore, earning cash and unpaid food provisioning occurred in the same working day. The lack of land, a boat, or a net increased the time and physical effort required to secure food for the household.

The woman recalled that her parents used to travel into the swamp in groups, sometimes staying for a week, using *sagang* bamboo rods and traps that produced much larger fish catches. They also established rubber for landowners in exchange for three years' use of the land for rice, vegetables, chilies, and cassava. Concern about the future of such knowledge was captured by another field-note statement: "When I die, who will still know when the *sonor* season comes?" (older male resident, Perigi, field notes, 2018; authors' translation).

Younger people faced different expectations as wetland work became harder and less secure for them. A middle-aged woman observed, "Nowadays the children don't want to go to the swamp anymore. They say it is better to work in town than come home exhausted and covered in mud" (female resident, Perigi, field notes, 2018; authors' translation). Such accounts identify a narrowing setting for practicing and transmitting knowledge; but they do not establish uniform abandonment across the villages.

The 2018 report also records a program in Riding that trained women as village motivators or interlocutors to facilitate communication between residents and village authorities. The intervention placed women in a prospective mediation role rather than treating them as undifferentiated household members (Handoyo *et al*., 2018).The record does not establish whether the trainees later exercised decision-making authority or how the role affected their livelihoods.

Programs intended to replace or improve livelihoods also produced uneven results (Table 4). Paddy-field development encountered hydrological and conservation-boundary constraints; an industrial-timber partnership left benefit-sharing unresolved; cage aquaculture produced modest recorded returns; and support for *purun* crafts lacked a stable market. Across these interventions, water control, recognized access, contracts, labor, participant selection, existing skills, and market connections shaped participation and benefits.

At the time of the 2018 fieldwork, the timber-company proposal offered IDR 27,000 (approximately US$1.90) for a metric ton of timber under a forty-year arrangement, while villagers sought a larger share and negotiations remained unresolved. A September 2026 field update confirmed that the proposed partnership was never implemented. The negotiations only resulted in an attempted livelihood arrangement. Cage aquaculture grew from twelve cages in 2017 to twenty in 2018, but the recorded return of IDR 1.48 million (approximately US$104) over two months for a twenty-member group was modest and was not shown to have been distributed equally. *Purun* production began, yet remained intermittent because the intended craft market did not stabilize.

Taken together, the valuation, household account, and program evidence show activities disappearing, contracting, or persisting over time but generally with fewer participants. Logging temporarily produced substantial cash earnings, while replacement livelihoods remained dependent on hydrology, access, bargaining power, labor, and markets. The 2018 fieldwork remains the latest systematic livelihood comparison used in this article. A September 2026 field update indicated livelihood recomposition rather than complete disappearance: some smallholder oil-palm cultivation has emerged, some residents maintain fruit gardens, and fishing continues. But we lack participation counts, income estimates, or evidence that their current returns compensate for the earlier contraction of wetland-based livelihoods.

Living with uncertain access

Uncertainty concerned where activities were permitted, which institution would clarify them, how altered water regimes affected resources, whether programs or markets remained viable, and who represented a claim. In the documented cases, unclear rules delayed canal work, ecological deterioration reduced catches, and modest program returns deepened dependence on intermediaries or migration. Table 5 links these dimensions to differentiated and, where the record permits, gender-specific consequences.

The available evidence does not show that every ambiguity was deliberately created. Its effects were nevertheless uneven. People whose livelihoods depended directly on wetland access bore the consequences of delayed decisions, overlapping mandates, and unclear boundaries more immediately. Residents with land, market connections, or relationships with institutional intermediaries had more options for seeking information or diversifying their livelihoods. We use governance by uncertainty to describe this unequal distribution of the capacity to obtain clarification, withstand delay, and respond to changing rules.

The 2015 Perigi paddy scheme illustrates these interactions. Making approximately 1,000 ha of converted wetlands productive required an 8 km canal to the river, but the route crossed the Sebokor conservation area. Residents reported learning of the boundary problem after investment and land conversion had begun. Conservation officials challenged the canal, and the reported compromise required canal blocking (Handoyo et al., 2018). Observations in Perigi in 2025 confirmed that the canal had initially been excavated for the paddy-field scheme and that BKSDA later required the installation of more than ten canal-blocking structures as an enforcement measure. Some of these structures remained in place while others had breached. No hydrological

measurements are available to determine the consequences of either the blocking or the subsequent breaches.

Intervention	Observed or reported outcome	Distributional implications
Paddy-field development initiated in 2015	Cultivation remained constrained by inadequate water control and difficulties developing drainage through an area administered for conservation. The canal had been constructed to support the paddy-field scheme. After conservation authorities challenged its passage through the conservation area, BKSDA[6] required the installation of more than ten canal-blocking structures as an enforcement measure. Observations in Perigi in 2025 indicated that some structures remained in place while others had breached.	Access to productive land depended on workable hydrological arrangements and coordination across administrative jurisdictions.
Proposed industrial timber partnership, 2018	At the time of the 2018 fieldwork, a forty-year partnership was proposed for contested land; the company offered IDR 27,000 (approximately US$1.90) per metric ton, while benefit-sharing negotiations remained unresolved. A September 2026 field update confirmed that the proposal was not implemented.	Contract terms, recognition of land claims, and bargaining power shaped access to prospective benefits.
Cage aquaculture, 2017–2018	The number of cages increased from twelve to twenty, while the recorded group return for twenty members remained modest.	Group membership, subsidized inputs, maintenance work, and the distribution of returns determined who benefited.
Purun craft support, 2017	Craft production began, but remained intermittent because a stable market had not developed. The report recorded no participation by residents associated with the Rawang position in this intervention.	Program selection, existing weaving skills and networks, and access to the intended market shaped participation and prospective benefit.
Women-focused village-motivator training in Riding (recorded in 2018 report)	Women were trained to facilitate communication between residents and village authorities; later authority, participation, and livelihood outcomes were not documented.	The intervention recognized women as prospective institutional mediators, but the surviving record does not show whether training altered representation or control over benefits.

Table 4: Livelihood interventions documented in Perigi and their distributional implications Source: Handoyo et al. (2018), program descriptions and livelihood-intervention assessment.

[6] Balai Konservasi Sumber Daya Alam, Natural Resources Conservation Agency.

Dimension	Question faced in everyday life	Uneven consequence
Legal	Where and under what conditions may people fish, cultivate, enter wetland areas, or maintain canals?	People relying on customary or orally remembered access had fewer means to clarify or contest formal restrictions.
Institutional	Which institution can authorize, prohibit, or clarify an activity?	Residents with direct institutional connections obtained information and pursued clarification more readily. Women trained as village motivators were expected to mediate communication, although their later authority was not documented.
Ecological	How will altered water flows affect fish, fire, cultivation, and travel?	Wetland-dependent households experienced ecological decline directly. In the documented Perigi household, a woman walked up to 12 km to fish after rubber tapping because she lacked a boat and net.
Economic	Will a market, livelihood program, or remaining resource continue to provide viable returns?	Households with fewer productive assets had less capacity to absorb delays or change livelihoods. In the documented case, a woman's fishing supplied household food while rubber sharecropping provided cash.
Social	Who can represent a claim, convey information, or mediate access?	Intermediaries influenced negotiations, program participation, and market connections. The report records women being trained for a mediation role but does not establish whether it changed representation or benefit control.

Table 5: Interacting dimensions of uncertainty in Perigi–Riding, 2018.

The reserve boundary sign shown in Figure 3b made prohibitions on cultivation, encroachment, burning, and tree felling visible, yet it did not tell residents how to establish the boundary's position from the water body, which institution authorized an activity, or what procedure residents should use to appeal conflicting land and water uses. The sign communicated the existence of restrictions more clearly than the procedures for interpreting or contesting them. Similar uncertainty had surrounded the paddy canal and benefit-sharing negotiations for the proposed industrial-timber partnership, which was subsequently not implemented.

Ecological knowledge guided fishing under changing water conditions. Fish dispersed during high water, concentrated in deeper *lebung* as water receded, and moved into canals in the dry season; fishers adjusted locations and used *tangkul* lift nets accordingly (Handoyo *et al*., 2018, pp. 42–43). Access was nonetheless uneven and risky. As one younger resident explained, "Not everyone knows which pools still have fish. If you are not careful, you will be caught by the officers" (younger male resident, Perigi, field notes, 2018; authors' translation). The statement links situated knowledge with uncertain regulatory access.

Uncertainty was mediated socially as well as administratively. Residents with relationships to traders, officials, or program actors obtained information and pursued clarification more readily.

Others depended on intermediaries whose assistance also shaped prices, representation, and entry into programs. These unequal connections help explain why the same unclear rule or delayed decision imposed different costs across households.

The clearest documented collective resistance occurred during the mid-2000s Perigi dispute over plantation expansion. Residents held that about 1,100 ha used across generations had been entered into a concession, affecting roughly fifty households. They constructed a canal to prevent further expansion and negotiated until the company withdrew from Perigi around 2007-2008. Because the canal marked an explicit land claim, this episode differs from household fishing or seasonal livelihood adjustment: participants used their livelihood activities as part of challenging challenge imposed control (Handoyo *et al*., 2018).

5. Discussion

The Perigi–Riding case links territorialization to the accumulated effects of infrastructure, authoritative classifications, and access rules. The conservation and restoration phases inherited landscapes altered by logging and settlement engineering, while production and plantation interests continued nearby. In the documented cases, protection and ecological repair generated additional restrictions within an already unequal field of access. Green grabbing captures part of that formation; a wider account of territorialization is needed to connect its industrial and environmental dimensions.

The case also sharpens understanding of the relationship between territorialization and exclusion. Following Hall, Hirsch, and Li (2011), regulation and legitimation worked with markets and earlier material transformations. Permits and conservation rules established formal authority; representations of the swamp through designated functions reduced the visibility of seasonal and mobile uses; market connections differentiated livelihood options; and institutional networks shaped who negotiated programs. 'Accumulation by dispossession' (Harvey 2003) describes the broad transfer of control, while the powers of exclusion reveal how that transfer was assembled in practice.

'Produced invisibility' is the article's central contribution. Conservation research has of course established displacement from land and livelihoods (West *et al*., 2006; Agrawal & Redford, 2009); this case highlights selective recognition of resource relations. People remained socially visible while their wetland histories and claims were illegible on maps, and in permits, programs, and negotiations. Remembered accounts of being cast out by kin or village society suggest an earlier layer of social marginalization, while later territorial regimes narrowed the formal visibility of livelihood claims. The first is retained as situated oral history rather than a single verified origin; together they show how social stigma and administrative simplification accumulated.

The findings qualify a straightforward commons narrative. Ecological knowledge, remembered settlement sites, and continuing practices indicate enduring collective and familial relations with the swamp. Yet access had already been fragmented, and the research did not document a complete former institutional system matching the design principles of a stable common-pool regime. The political question concerns the conditions under which collective management becomes possible when boundaries, authority, and membership are externally reorganized. Recognition of a romanticized community would not resolve internal inequality; governance must account for who participates, whose knowledge is used, and who receives benefits.

This point contributes to feminist political ecology by linking differentiated access with the changing territorial basis of social reproduction. The Perigi household account shows that declining fishing access lengthened a woman's sequence of rubber tapping, walking, fishing, and food provisioning, while the absence of land, a boat, and a net constrained her choices. The Riding program recruited women as prospective village mediators, although the record does not document

their later authority or benefits. These cases locate gender differentiation in access to assets, time, food provisioning, and institutional roles. They extend the analysis beyond the monetary values in Table 3 while supporting a situated rather than population-wide account of gendered and intergenerational change.

Following work on the politics of uncertainty (Scoones & Stirling, 2020), the case shows how ambiguity acquires territorial consequences. The paddy-field canal crossed different mandates, while unresolved benefit-sharing negotiations preceded the non-implementation of the proposed industrial-timber partnership. People with fewer resources to withstand delay or to negotiate rules that bore greater costs. 'Governance by uncertainty' identifies this distribution of capacity and exposure; it does not require that all ambiguity was intentionally designed.

The distinction between adaptation and resistance is made based on documented actions. The plantation dispute shows residents using a canal and ways of negotiation to defend their land claim. The household fishing account shows practical knowledge sustaining food provision under constrained access. These actions have different evidentiary meanings. Connecting each to its recorded purpose makes it possible to analyze agency without assuming that hardship, ecological expertise, or continued resource use necessarily establishes resistance or even sustainable stewardship.

6. Policy implications

More equitable and just peatland governance begins with first documenting the actual histories and patterns of use before new boundaries or hydrological interventions are implemented. Participatory mapping should record seasonal routes, fishing pools, canals, gathering sites, and identify categories of land and resource users in the hope of protecting sensitive locations. Such documentation should inform conservation and restoration decisions rather than function as a form of consultation after designs have been fixed.

Clarifying access to resources in communities requires coordination across conservation managers, forest management units, district and village governments, restoration agencies, and nearby license holders. Publicly intelligible rules should specify permissible activities, procedures, responsible institutions, and routes for appeal. Reducing uncertainty is especially important where older canals serve simultaneously as hydrological infrastructure, livelihood routes, and regulated access points.

Livelihood programs in this region need to be assessed as linked socio-ecological arrangements. Commodity efforts to maintain them will remain fragile when water control, secure access, transport, markets, labor, and distribution are treated separately. Any livelihood program design should include women, older knowledge holders, younger residents, and people with weak institutional connections directly, rather than relying solely on established village intermediaries.

Monitoring of such programs should consequently report distribution as well as aggregate outputs. Relevant indicators include who attends consultations, whose sites appear on working maps, who contributes unpaid labor, who controls equipment, who reaches markets, and how benefits differ across households and generations. These measures would make visible the social relations that project counts and restored-area targets often miss.

Mechanisms for recognition of these communities must also avoid turning a provisional analytical label into a new administrative box. The immediate policy object is the history and legitimacy of resource relations, not the certification of a homogeneous *Orang Rawang* identity. Available instruments, including collaborative management and appropriate social forestry

arrangements outside strict conservation zones, require site-specific legal assessment. Within the wildlife reserve, negotiated access and conservation-compatible roles must follow the governing conservation law and cannot be assumed to fit schemes designed for other forest categories.

7. Limitations and conclusion

Successive territorial projects in Perigi–Riding changed who defined, reached, and benefited from the swamp. Earlier livelihood geographies became less legible as permits, conservation functions, plantation control, and restoration procedures accumulated. Residents tied to interior wetland resources and weakly connected to institutions faced particular difficulties, while continuing practices and naming of landscape features kept their claims alive. In 2026, fishing and fruit cultivation continue, and smallholder oil-palm cultivation has emerged within this reconfigured landscape, while a proposed timber partnership did not proceed. Observations in Perigi in 2025 also showed that some of the canal-blocking structures required by BKSDA remained in place while others had breached. 'Produced invisibility' directs attention to whose relations with the landscape become authoritative, whose become difficult to see, and who carries the cost of unresolved uncertainty.

The analysis is constrained by an incomplete archive and uneven detail. Direct quotations are limited to those preserved in contemporaneous field notes; other interview material has been paraphrased. Administrative recognition of *Orang Rawang*, one of the goals of the study, was not independently established. Livelihood estimates use changing participation and accounting assumptions, and missing entries prevent a complete welfare comparison. The land-cover maps support broad comparison but not precise area estimates or policy-specific causal attribution. The conclusions therefore concern documented mechanisms and situated experiences rather than population-wide effect sizes.

Further research should examine civil and village records, map household and seasonal access with informed consent, reconstruct livelihood values using transparent household denominators and constant prices, and study how conservation and restoration agencies interpret overlapping mandates. Longitudinal work with women, younger migrants, and intermediaries would deepen the analysis of differentiation and knowledge transfer.

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