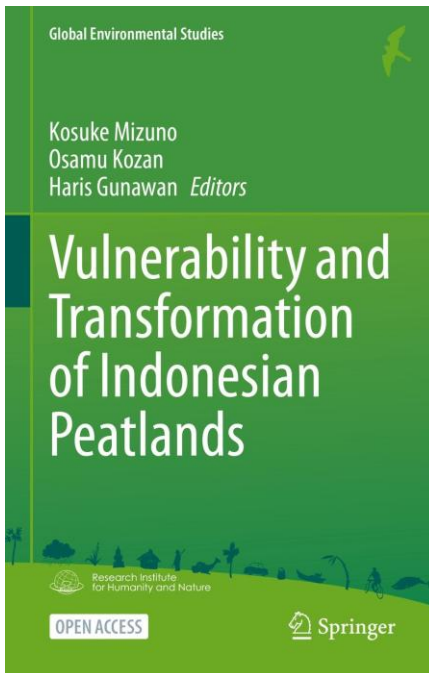


BOOK REVIEW

The Vulnerability and Transformation of Indonesian Peatlands: Navigating Social-Ecological Tipping Points for Resilient Futures

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Tropical peat swamp forests in Indonesia have undergone significant changes in recent decades, experiencing degradation from fires, drainage, and land conversion. This edited volume is the product of a collaboration between Dr Kosuke Mizuno, a professor of Development Studies at the School of Environmental Science, University of Indonesia; Dr Osamu Kozan, an associate professor at the Center for Southeast Asian Studies, Kyoto University, and a visiting associate professor at the Research Institute for Humanity and Nature, Kyoto; and Dr Haris Gunawan, a lecturer and researcher at the Ecology of Biology Department, University of Riau, and the team leader of the

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Global Environmental Facilities (GEF-5) Project on Sustainable Management of Peatland Ecosystem in Indonesia—a joint undertaking between the Ministry of Environment and Forestry and the International Fund for Agricultural Development. As outlined in the introductory chapter, peatlands that were relatively undisturbed until as recently as the 1970s and 1980s have now become highly vulnerable ecosystems across much of Sumatra and Kalimantan. However, a longer historical perspective reveals the resilience and adaptability of these landscapes prior to the major development pressures that emerged in the late twentieth century.

The opening chapter sets the stage by contrasting the current state of Indonesian peatlands, of which only 18.4% remain as undisturbed forests, with the state of their ecology before the emergence of large-scale disturbances. Commercial logging and smallholder clearing occurred in limited areas in the nineteenth and early twentieth centuries without triggering large-scale ecological transformation. Widespread drainage of land to establish plantations, plantation development, and the resulting fires have been occurring only since the 1980s and 1990s. The introduction highlights efforts to adapt to the ongoing peatland crisis, including government and civil society efforts to restore peatlands, such as the setting up of Indonesia's new Peatland Restoration Agency.

The specific relationships between industrial timber plantations, newly introduced drainage infrastructure, fires, and land tenure arrangements have led to increased deforestation and degradation across Riau province. These points are highlighted in Chapter 2. Notably, the chapter shows how unclear property rights contributed to smallholder encroachment and land speculation in areas adjacent to concessions. This scramble for land spurred further peat drainage and burning. Yet, the study also indicates the potential for strengthened local tenure to improve peatland management, as, after fires, titled lands fare better than informal claims.

Chapter 3 approaches ecological change in Riau's peatlands through the lens of avian biodiversity; it shows that their unique bird communities are more sensitive to habitat disturbances than those in lowland rainforests. All anthropogenic land use reduces bird populations and diversity, with species diversity declining more in degraded habitats. The results suggest potentially irrecoverable losses in distinctive peatland species. Chapter 4 provides further evidence of ecological disruption resulting from land-use changes using data on declining mammal and bird populations and reduced species richness in acacia plantations as compared to natural peat swamp forests.

Beyond biodiversity impacts, the book also examines carbon dynamics in drained peatlands. Chapter 5 analyses changes in soil CO₂ over a full annual

cycle in a bare peat site in Riau that was being drained for plantation use. Field measurements revealed significant CO₂ emissions, exceeding 50 metric tons per hectare annually. Interestingly, the model's results suggested a correlation between these emissions and environmental factors. As temperatures dropped and soil moisture approached saturation, CO₂ flux levels also decreased. Such landscape-level fluxes signal the likelihood of drained peatlands becoming major carbon sources.

At the same time, the book examines the complexities and nuances of peatland disturbances through fine-scale ecological studies. Chapter 6 overturns assumptions about termites being purely destructive pests, demonstrating their essential role in facilitating nutrient cycling, maintaining soil biodiversity, and contributing to food webs in both natural and managed peatlands. Chapter 7 explores the diverse timber processing and retail networks supplying the local construction market in the city of Pekanbaru. These enterprises provide livelihoods and materials for development even as they drive deforestation, underscoring the need for multi-functional approaches to restoration.

The final section of the book examines possibilities for transforming Indonesia's landscape through integrated peatland restoration. Chapter 8 reviews Indonesia's national-level commitment to restoring 2.67 million hectares of degraded peatlands to reduce carbon emissions as well as promote local livelihoods. Early government pilot projects to block drainage canals, reestablish native vegetation, and support community aquaculture enterprises have shown initial success in raising water tables and soil carbon levels across a range of degraded areas.

Expanding on these landscape-scale initiatives, Chapters 9 and 10 detail the technical components of comprehensive peatland restoration, combining hydrological rewetting, revegetation, and community partnership. Chapter 9 presents water management guidelines tailored to local conditions; these aim to stabilize water tables for ecosystem recovery while supporting livelihood activities. Chapter 10 discusses the genetic considerations when using native species like *jelutung* (*Dyera costulata*) for optimal planting across heterogeneous restoration sites.

The concluding chapter integrates the social and environmental dimensions of peatland transformation through a case study on issuing Indonesian Sustainable Palm Oil (ISPO) certification to smallholder cooperatives in Riau Province. Although the number of full certifications granted has lagged since 2011, ISPO processes have compelled negotiated shifts among companies and smallholders toward sustainable production. This complex

transition pathway symbolizes the long-term work ahead in fundamentally transforming Indonesian peatland systems.

This book provides a multi-faceted look at a landscape in flux. Building conceptual bridges between ecological change, environmental governance, and social dynamics across local and national levels, the volume constructs nuanced narratives of systemic disruption interwoven with stories of resilience and renewal. As Indonesia and the world continue to wrestle with interlinked peatland crises, from haze disasters to climate impacts, the fine-scale insights and cautious optimism in this book offer critical guidance for processes of adaptation and transformation.

A major strength is the book's balanced perspective. Many previous treatises on rapidly developing tropical forest landscapes prone to fire present overly simplified narratives of inevitable decline toward disaster. This volume avoids that trap. It squarely faces the stark reality that only 18.4% of Indonesia's peat swamp forests remain intact and clearly maps the feedback loops that have enabled large-scale drainage, burning, and conversion to plantations since the 1980s. Yet, the authors also uncover remarkable, historical systemic resilience, with Indigenous management systems sustaining peatlands over generations prior to industrial-scale disturbances.

Crucially, the book unpacks early signs of adaptation even today, highlighting government, corporate, and community-based initiatives that attempt to rewrite dominant destructive trajectories. Canal blocking, participatory planning that integrates rewetting with local livelihoods, and certification schemes that push sustainability transformations, among others, all provide grounded examples of complex transition processes in motion.

One critique, if at all, is the difficulty of bridging disciplinary divides, given the specialized nature of some technical chapters on genetic factors in reforestation or termites' nutrient cycling roles. Yet, collating such fine-scaled insights in a single edited volume holds value for comprehensive policy formulation. On the whole, the book strikes an admirable balance between depth of expertise and accessibility across various technical topics.

Additionally, the book highlights promising initiatives that integrate rewetting, alternative livelihoods, and governance reforms, although they are primarily observed in a singular location. Future publications could explore the reinforcement and replication of these models across Sumatra and Kalimantan while also evaluating emerging scalability challenges.

Given the escalating threat of peatland degradation, alongside the exacerbation of global climate change and the El Niño phenomenon, the content of this book is exceptionally pertinent. Its relevance extends beyond Indonesia, encompassing countries with tropical peatlands, such as those within the ASEAN region, South America, and even Africa. There exists an opportunity to enrich the content of future editions by incorporating comparative studies of peatland governance approaches implemented in other nations. Comparative analyses between countries can help in identifying best practices in effectively balancing conservation with the regional development needs of tropical peat ecosystems. Assessing the successes and failures of diverse policy mechanisms in Indonesia, Malaysia, and other relevant countries can aid in disseminating effective models.

Conflict of Interest Statement: No potential conflict of interest was reported by the author.