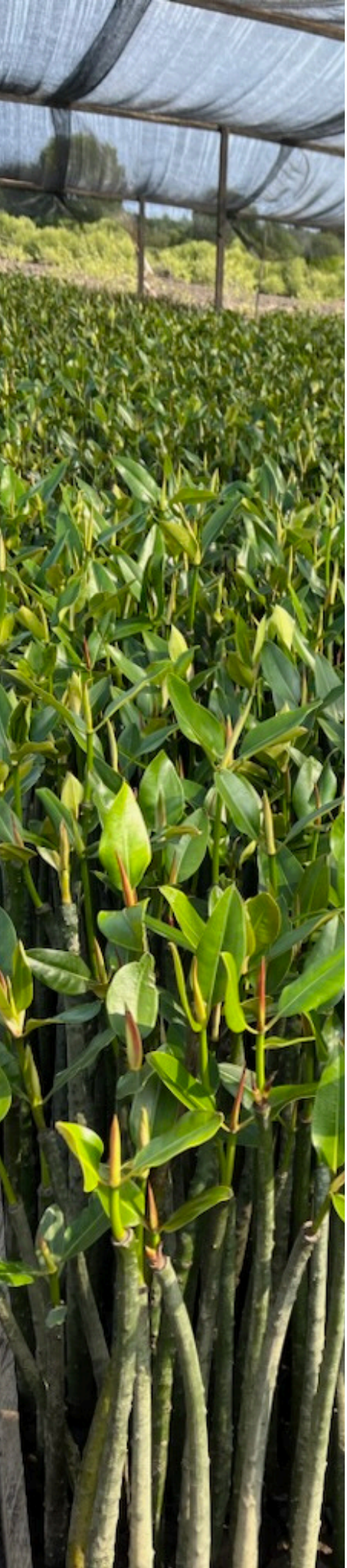

Ecosystem Restoration Field Dialogue

Background Paper

East Kalimantan, Indonesia

22-26 April 2024

The Forests Dialogue

The Forests Dialogue

TFD Steering Committee 2024

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About This Paper

This report provides an overview of the current state of knowledge about ecosystem restoration in Indonesia. This overview intends to provide a scientific 'common ground' for the participants of the Ecosystem Restoration Indonesian field dialogue on 22-26 April 2024 and future discussions. During the writing process the initiative Advisory Group of representative stakeholders steered the developing of the paper, providing feedback and shaping the paper's direction. During the dialogue, stakeholder feedback was solicited from dialogue participants and incorporated to produce the final version.

About The Forests Dialogue

The Forests Dialogue (TFD) is an organization that designs and implements multi-stakeholder dialogues aimed at fostering social learning, building trust, and supporting processes for collaborative and adaptive land management across sectors. TFD believes that structured dialogue is fundamental to breaking deadlocks and creating meaningful change in the forest sector. Housed within The Forest School at the Yale School of the Environment, TFD's Secretariat is directed by a group of Steering Committee members representing globally significant forest stakeholders. TFD implements its mission through initiatives identified by TFD's Steering Committee members. Initiatives address a global forest issue through a series of dialogues. Field dialogues occur in countries where the issue is or has historically caused conflict and seeks to deliver impact in-country and inform global discourse through grounded examples. TFD's process includes bridging efforts at multiple scales through sharing international, national, and local perspectives, combining field-based discussions with structured meeting facilitation, and giving participants the mandate to determine outputs and outcomes. Country level dialogue topics and case studies are driven by local priorities, as determined by in-country host organizations and a multi-stakeholder Advisory Group that shapes dialogue planning and implementation.

About the Authors

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1. Introduction

Responding to calls to scale up Ecosystem Restoration in degraded landscapes in line with the United Nations Decade on Ecosystem Restoration (UNDER), The Forests Dialogue (TFD) Ecosystem Restoration Initiative seeks to understand the opportunities for the forest sector to contribute to and drive restoration efforts worldwide. Ecosystem restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

In collaboration with the Food and Agriculture Organization of the United Nations (FAO) Advisory Committee on Sustainable Forest-based Industries (ACSFI), TFD convened a Restoration Roundtable in October 2022 to enhance the forest sector's engagement in ecosystem restoration. Discussions then progressed to identify key strategies to guide private sector actions and to identify the need to form coalitions with other stakeholder groups.

From 31 January-1 February 2023, TFD convened a Scoping Dialogue[1] to explore a range of stakeholder perspectives and understand potential paths forward for the Initiative. Participants determined that the Initiative should focus on the role of the forest sector in ecosystem restoration, in particular the private forest sector, in collaboration with other stakeholders and in the context of actors' roles, rights, and contributions to ecosystem restoration. Indonesia was recommended as a field dialogue location with participants sharing restoration needs, priorities, and experiences.

The following fracture lines emerged as key themes in need of further dialogue:

- The role and contribution of economically driven reforestation and related restoration activities in meeting restoration goals and expectations.
- The challenges and opportunities of climate/carbon/biodiversity focused financing.

[1] A summary of the Ecosystem Restoration Scoping Dialogue can be found here: https://theforestsdialogue.org/sites/default/files/tplscoping_dialogue_cochairsummaryfinal.pdf

- The pitfalls of incentivizing restoration at the expense of conservation/halting deforestation and conversion.
- Challenges to reconciling top-down vs. bottom-up approaches to scaling restoration.
- Meeting restoration targets while also meeting the needs of people.
- Credible verification of performance.

In the Asia-Pacific region, FAO member countries have endorsed the Regional Strategy and Action Plan for Forest and Landscape Restoration (FLR), which emphasizes the importance of collaboration and coordination for FLR, including promoting private sector participation and community-level actions to meet the demands for forest products and services. In this context, the Asia-Pacific Regional Conference invited FAO in 2022 to strengthen work on sustainable forestry, particularly the sustainable production and consumption of wood. As a key step in this direction, a Regional Dialogue *Integrating Sustainable Wood Supply with Forest and Landscape Restoration: Opportunities, Constraints, and Way Forward*, was organized in conjunction with the 30th Session of the Asia-Pacific Forestry Commission (APFC) in Sydney, Australia, on 2 October 2023. The Dialogue found that enabling conditions for Sustainable Wood Supply (SWS) and Forest and Landscape Restoration (FLR) are alike, providing opportunities to increase investment in FLR by producing wood in support of restoration goals. Achieving these opportunities will require actions in landscapes and along value chains resourced from public and private finance. Policy-makers across the region can drive these actions through developing and implementing enabling policies, fostering collaborative learning, delivering technical packages and building capacity, mobilizing finance to support all forms of SWS and FLR, and engaging small-scale actors in SWS and FLR. International organizations can play important facilitation roles in each of these action arenas (FAO, 2023).

Field dialogue on ecosystem restoration

As a follow-up on a Restoration Roundtable and a Scoping Dialogue, TFD, in collaboration with the FAO's ACSFI, will convene Indonesian and international experts, stakeholders, and rights holders for a multi-stakeholder field dialogue on ecosystem restoration. The field dialogue will be hosted by Mulawarman University (UnMul) in East Kalimantan, Indonesia and funded by the Australian Government Department of Agriculture, Fisheries, and Forestry (DAFF). The field dialogue phase of the Initiative has the following goals:

- Clarify ecosystem restoration needs and identify relevant stakeholders, define priorities for forest sector engagement in ecosystem restoration, and co-create paths forward to achieve positive ecosystem restoration outcomes in the region.
- Bridge understanding and foster coordination between global goals, national commitments, and restoration actions by the many restoration stakeholders on the ground.
- Build understanding of successful ecosystem restoration approaches, coalitions, and private forest sector engagement.
- Advance thinking and develop a cohesive strategy for how the forest sector can collectively contribute to restoration discussions, polices, and investments at global, regional, and national levels.

The dialogue will include both plenary and small working group formats as well as field visits to hear directly from local participants about existing ecosystem restoration needs, opportunities, and challenges. Outputs of the dialogue include a Background Paper synthesizing key science and knowledge related to ecosystem restoration in Kalimantan, Indonesia, a Co-Chairs' Summary highlighting key learnings and recommendations emerging from the dialogue, and a participant co-developed action plan of identified strategies and recommended next steps.

2. Global overview of ecosystem restoration

Deforestation and forest degradation continue worldwide. It is evidently clear that forest cover is likely decreasing, particularly in the large forest areas in Africa and South America. The unsustainable use of forest resources is not only accelerating climate change and destroying biodiversity, but also threatening the food, water, and energy security of hundreds of millions of people (FAO, 2020). Ecosystem restoration has emerged as a critical component in global conservation efforts, climate change mitigation, and sustainable development (Aronson and Alexander, 2013; Brancalion, *et al*., 2019; Edwards *et al.*, 2021). Recent studies found that restoring 15% of converted lands in priority areas could avoid 60% of expected extinctions and sequester 299 gigatons of CO_2, which is 30% of the total CO_2 increase in the atmosphere, or equivalent to 14% of total emissions, since the Industrial Revolution (Strassburg *et al*., 2020).

Opportunities for improvement through ecosystem restoration exist in a wide range of degraded ecosystems, such as agricultural areas, savannahs, wetlands, including peatlands and mangroves. Restoring peatlands and mangroves is crucial due to their high carbon storage capacity. Restoration efforts can vary from re-establishing ecological integrity in small-scale settings to large-scale landscape restoration projects. (UNDER, 2021a; IUCN, 2024). Successful restoration requires collaboration among diverse stakeholders, including scientists, policymakers, non-governmental organizations, private sectors, Indigenous people and local communities, potentially elders, religious leaders, women and youth (Aronson *et al*., 2020; Jellinek *et al*., 2021). Even though restoration needs long-term commitment and investment, the benefits for people and the planet can be profound (Abhilash, 2021; Thornton, 2022).

International initiatives and pledges on ecosystem restoration

Acknowledging that restoration is pivotal for averting environmental catastrophe is now widespread, with restoration emerging as a critical theme in various global policy frameworks. The United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Desertification (UNCCD), the Convention on Biological Diversity (CBD), Kunming-Montreal Global Biodiversity Framework, and Sustainable Development Goals all underscore the imperative to scale up restoration efforts and stimulate private sector involvement. Given its centrality in global policy discourse, numerous regional and global ecosystem restoration initiatives have been launched, including the Bonn Challenge, Initiative 20x20 in Latin America, AFR100 in Africa, ECCA30 in Eastern and Central Europe, and the Agadir Commitment for Mediterranean countries (The Forests Dialogue, 2023). The declaration of 2021-2030 as the United Nations Decade on Ecosystem Restoration (UNDER) has further reinforced the global recognition of ecosystem restoration as an environmental imperative (UNDER, 2021b). A

key step in creating a shared vision of ecosystem restoration is to adopt the Ten Principles that underpin the complete set of ecosystem restoration activities (Annex 1) (UNDER, 2021c).

Forest and Landscape Restoration (FLR) is considered to be a crucial strategy for conserving global biodiversity and mitigating climate change (Bastin *et al*., 2019; Chazdon and Brancalion, 2019; Lewis *et al*., 2019). FLR is "an active process that brings people together to identify, negotiate and implement practices that restore an agreed optimal balance of the ecological, social and economic benefits of forests and trees within a broader pattern of land uses."[2] (FAO-APFNet 2018: 5). FLR involves actions across multiple land uses, with forests and landscapes restored by various combinations of tree planting, seeding, managed or natural regeneration, enrichment planting, silvicultural management, and improved management of riparian zones and wildlife corridors, both in forests and through various agroforestry systems (FAO-APFNet, 2018 and Keenan *et al*., 2023). Some FLR options are shown in Annex 2.

Challenges and opportunities of global ecosystem restoration

The challenges and opportunities of ecosystem restoration are profoundly intertwined and context-dependent. Across diverse geographical regions such as Asia, Africa, and the Americas, these challenges and opportunities arise from local to national levels, encompassing various types of ecosystem restoration efforts, ranging from grassroots projects to those integrated into systematic government initiatives (Chazdon *et al*., 2021;). Despite this variation, Annex 3 presents the common challenges and opportunities of ecosystem restoration including knowledge and capacity building (Temperton *et al*., 2019; Haq *et al*., 2023), policy and governance (Chazdon *et al*., 2021), stakeholder engagement (Sayer and Boedhihartono, 2018; Waring, 2024), funding (Sewell *et al.,* 2016; Löfqvist *et al*., 2023), magnitude of restoration (Waring, 2024), ecosystem services and biodiversity conservation (Budiharta *et al.*, 2018; Weidlich *et al*., 2020), climate change resilience (Timpane-Padgham *et al*., 2017), socioeconomic benefits (Edwards *et al.*, 2021), and technology innovation (Perring *et al*., 2015).

Potential roles of the private sectors, particularly the forest sector, in ecosystem restoration

Restoring deteriorated ecosystems at a global scale requires substantial investment. As outlined in the State of Finance for Nature report (UNEP, 2021), a total investment of USD 8.1 trillion is needed between now and 2050 to address climate, biodiversity and land degradation crises. This entails a threefold increase in the current annual finance level by 2030 and a subsequent quadrupling until 2050. Given the constraints of public finance, directing private sector funds towards ecosystem restoration becomes imperative. In that regard, the private sectors, including the forest sector[3], can play a significant role in advancing ecosystem restoration efforts through its diverse range of investments, partnerships with NGOs and local communities, adopting

[2] This definition builds on the original: "a planned process that aims to regain ecological integrity and enhance human wellbeing in deforested or degraded landscapes" (GPFLR, 2023).

[3] Forest private sector throughout the paper will be defined as those with commercial interests in forests including native forest logging and tree plantation companies, forest-based industries, individuals and family forests, small and medium forest-based enterprises as well as community forest-based enterprises.

sustainable practices[4], embracing biocultural approaches [5], innovation in restoration technologies, integrating restoration into Corporate Social Responsibility (CSR)[6] and Environment, Social and Governance (ESG)[7] strategies, and stakeholder engagement (STF-UNDER, 2021; Jepson, 2022; FAO-ACSFI, 2023). Private companies across a range of sectors, including mining, oil and gas, technology, and finance – have been engaged primarily through reforestation and tree planting initiatives. Examples of these investments are the Trillion Trees initiative, Bezos Earth Fund, L'Oréal Fund for Nature Regeneration, (The Forest Dialogue, 2023), and Regeneration, which is the latest international restoration and remining social enterprise launched by RESOLVE with funding from Rio Tinto, Apple, Mejuri, and Paul Hasting. Ironically, the private forest sector has yet to invest in restoration projects as massively as the non-forest sectors have.

Hence, in October 2022, the FAO's Advisory Committee on Sustainable Forest-based Industries (ACSFI) in collaboration with The Forests Dialogue (TFD) convened a roundtable on understanding ways to enhance the forest sector's engagement in ecosystem restoration and identified the following six priority areas to move forward: 1) Build unity within the forest sector through a shared ecosystem restoration vision, simple key messages, and identifying champions to motivate and share learnings, 2) Develop good metrics to facilitate goal setting and measurement of outcomes from restoration, 3) Collaborate with other stakeholder groups in restoration activities to build understanding and to enhance impact, 4) Understand how degraded land and forest sector capacity aligns, 5) Establish new business cases for ecosystem restoration based on research and practice, and 6) Identify and build understanding about business and financial models that enhance shared value and deliver multiple outcomes.

Potential benefits for the private sector of being engaged in ecosystem restoration

Private sector involvement in ecosystem restoration, especially in the context of forests, can bring numerous benefits. By actively participating in ecosystem restoration, the private sector can not only contribute to environmental conservation but also realize various economic, social, and reputational benefits. A restored ecosystem can provide new opportunities for ecotourism, create jobs in restoration and maintenance, facilitate payment for ecosystem services, and provide other economic benefits (De Groot *et al*., 2013, Sabogal *et al.*, 2015; Smith *et al*., 2020; Edwards *et al.*, 2021). For example, the restoration of the Florida Everglades has brought back a diverse array of wildlife and improved water quality in the region (Perry, 2008). In China, the restoration of the Loess Plateau has reduced erosion and improved the productivity of farmland (Zhao *et al*., 2013).

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[4] Forest private sector can adopt sustainable forest management, reduced-impact logging (Putz *et al*., 2008), sustaining timber yield (Putz *et al*., 2022), alternative silvicultural system (Fernandez-Vega *et al*., 2017), comply with legality verification (FLEGT), adopt voluntary forest certification (e.g., FSC, PEFC, SFI), and contribute to sustainable wood supply (FAO, 2023).

[5] Biocultural restoration integrates traditional knowledge and local needs into ecological restoration efforts, aiming to restore social-ecological systems effectively. Contrasting with ecosystem-oriented approaches that prioritize taxonomic and phylogenetic diversity but may result in socially disconnected habitats, biocultural restoration emphasizes culturally important species selected for their multiple uses, enhancing local engagement and the sustainability of restoration outcomes (Sena *et al*., 2022).

[6] The limitation of conventional CSR often results in a lack of educational impacts and hinder the development of genuine entrepreneurship.

[7] The increasing prominence of ESG initiatives, alongside the shared goal of forward-thinking investors and businesses to achieve carbon neutrality and enhance nature preservation, is driving the need for ecosystem restoration solutions and investments (Jepson, 2022, p. 1410).

The UN Decade Finance Task Force, chaired by the World Bank, has also identified market and non-market benefits for different types of private investment. Market benefits of restoration investment gained by the private sector are increased food production yield, ecotourism revenue for businesses, reduced costs for water regulation and purification, carbon market revenues, avoided damages and costs of natural disasters, increased supply chain resilience, market opportunities (sustainable products, certifications), lower insurance premium (parametric disaster risk), increased concessional finance opportunities, and quicker access to ESG finance. Meanwhile non-market benefits for the private sector are decreased disaster risk, climate mitigation and adaptation, low-carbon economy transition, and biodiversity/genetic resources (World Bank, 2022).

Current financial practices and monitoring system in ecosystem restoration

As reported by UNEP in the State of Finance for Nature 2022, investments on ecosystem restoration remain inadequate compared to the scale of nature loss. Governments currently provide approximately 83% of nature-based finance. Nevertheless, it is anticipated that this amount is unlikely to increase to the necessary levels due to fiscal constraints and priorities, inflation, debt, and poverty facing many countries (UNEP, 2022; World Bank, 2022). Through these funds, UNEP is currently supporting a shift in financial metrics and flows to reduce consumer footprints on forests while supporting partners and Member States in deforestation-prone landscapes to embrace practices with less impact on forests. Examples of these approaches are: the Responsible Commodities Facility in Brazil; Restoration Seed Capital Facility in Central and South America, Southeast Asia, and Africa; and AGRI3 Fund (UNEP, 2022). Even though many pledges remain unfunded, it is crucial to monitor the progress of ecosystem restoration. The Restoration Barometer, launched in 2016 as the Bonn Challenge Barometer, is one of the tools already used by governments to track the progress of restoration targets across all terrestrial ecosystems including coastal and inland waters. The Barometer provides an opportunity for national and sub-national governments to simplify and streamline reporting on their restoration commitments and can help track and record progress towards global goals[8]. Additionally, Climate Focus and World Resources Institute developed the Restoration Monitoring Tools Guide in partnership with UNDER Task Force on Monitoring and members of the Global Restoration Observatory.

Potential influence from financial perspectives to bring new actors from the private sector into ecosystem restoration

Private actors have a strong influence over landscape changes through their investment decisions. They can potentially play a significant role in complementing limited public sector fundings in ecosystem restoration (Löfqvist *et al.*, 2023). In that regard, finance from the private sector needs to be mobilized across the full restoration continuum through both 'greening finance' (i.e., making sure that financing does not flow to activities which degrade nature) and 'financing green' (i.e., directing capital towards direct investments in restoration) (Gann *et al.*, 2019). A series of studies estimated that for every dollar spent on ecosystem restoration, between US$7 and

[8] The global initiatives that are being monitored are: the Bonn Challenge, the 30x30 target under the Post-2020 Global Biodiversity Framework, the Paris Agreement, the Land Degradation Neutrality Target, and 1 Trillion Trees.

US$110 in economic benefits [9] are derived from ecosystem services (World Bank, 2022). There are also three market incentives for the private sector to finance restoration: 1) as a means to mitigate climate change and adhere to net-emission-reduction commitments, 2) to enhance sustainability of supply chains, and 3) for impact and sustainability branding (Löfqvist *et al.*, 2023).

The Taskforce on Nature-related Financial Disclosures (TNFD) has also developed a global nature-related risk management and disclosure framework to help businesses and financial institutions identify and act on nature-related impacts, risks, dependencies, and opportunities. The TNFD is supported by G7 Finance, Climate and Environment Ministers, and the G20 Environment Ministers. In September 2023, the TNFD released its recommendations after extensive consultation. These recommendations provide guidance for assessing, managing, and disclosing nature-related risks, impacts, dependencies, and opportunities. A suite of additional guidance is also available to help organizations throughout the process. In January 2024, over 300 organizations globally, from across industries and the financial sector, committed to nature-related disclosures based on TNFD's recommendations (Kirby, 2024).

3. Ecosystem restoration in Kalimantan, Indonesia

The landscape and land use context

Indonesia

Indonesia is the third-largest tropical forest country in the world after Brazil and Democratic Republic of Congo. The country is characterized by rich mangrove forests along the shorelines, lowland tropical rainforests, mountain forests in inland Sumatra, Sulawesi, and Borneo, and subalpine and alpine vegetation in Papua. In addition, the southern parts of Kalimantan and the eastern coast of Sumatra Island accommodate vast areas of peat swamp forests. Indonesia has the fourth largest tropical peatlands ecosystems and the largest remaining mangrove areas in state forest zones worldwide. All these forest ecosystems, especially peatlands and mangroves, serve as important carbon sinks (Donato *et al*., 2011, Tsujino *et al*., 2016).

Indonesia began to use forest resources to its economic benefit and developed the country's wood-processing industry. Forest logging concessions were one of the most influential drivers of forest loss between 1970 and 1990, exacerbated by international demand for wood or pulp, mainly from Japan and neighboring countries (Tachibana, 2000; Tsujino *et al*., 2016). This period accounted for the loss of 64 million hectares in just 20 years (Simon, 2004). From 2001 to 2016, the conversion of state forest zones into oil palm plantations emerged as the primary driver of deforestation. Oil palm plantations have caused a loss of 2.8 million hectares of forest cover and contributed 23% to national deforestation (Austin *et al*., 2019), especially in peatland ecosystems. Concurrently, the considerable growth of aquaculture, initially spurred by the surge in prices during the Asian Financial crisis, led to the extensive conversion of mangrove coastlines into fishponds. This expansion holds notable significance, with Indonesia emerging as the world's second-largest aquaculture producer in 2018 (Mursyid *et al*., 2021).

[9] Range based on a series of studies are including FAO and UNEP (2021), Verdone and Seidl (2017), UNEP *et al.* (2018), Blignaut et al. (2014), Groot *et al.* (2013), and WRI (2017).

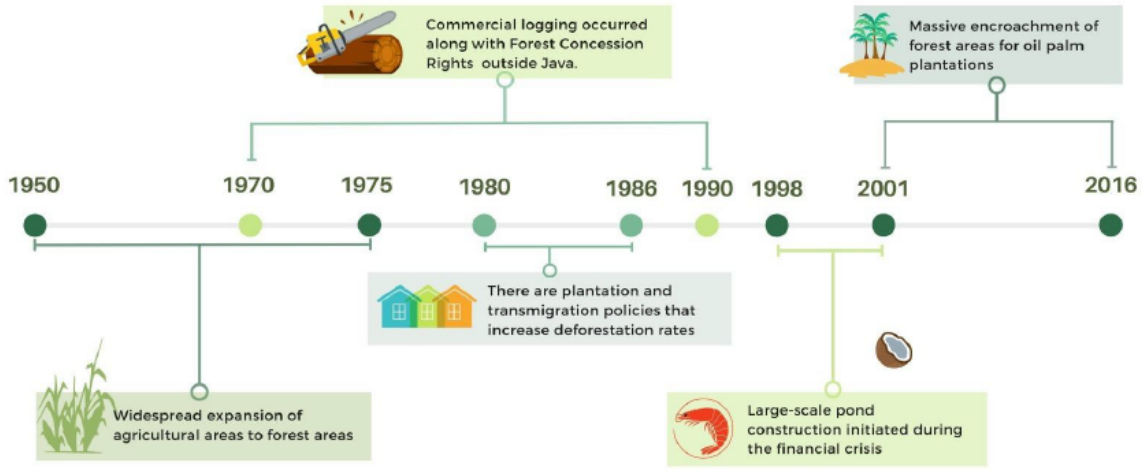

Figure 1. Historical timeline of the causes of deforestation and land degradation in Indonesia
Source: EUREDD Facility, 2023

In order to prevent further forest cover loss, the Government of Indonesia issued Presidential Instruction Number 10 of 2011 on Moratorium of New License Issuance and Governance Improvement of Primary Forests and Peatlands. The Presidential instruction that was valid for two years had been extended for three times and then made permanent in 2019 through Presidential Instruction Number 5 of 2019 on Termination of the Issuance of New Licenses and Governance Improvement of Primary Forests and Peatlands. Under this regulation, the permanent moratorium covers approximately 66.2 million hectares of primary forests and peatlands. As a result, the deforestation rate in Indonesia between 2019 and 2020 recorded as the lowest rate since 1990 because of decreased forest and land fires, rehabilitation of degraded land, mangrove forests, and peatlands. The Ministry of Environment and Forestry (MoEF) consistently monitors Indonesia's deforestation[10] rate, comparing against the baseline information of 1990, which is presented in Figure 2 (MoEF, 2022).

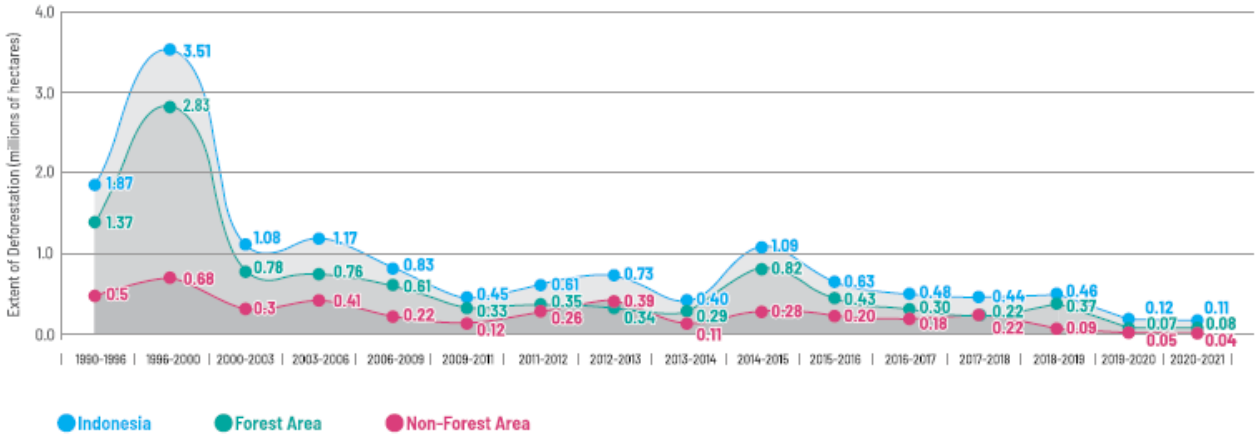

Figure 2. Deforestation Trends (1990-2021) in Indonesia
Source: MoEF, 2022

[10] According to the Forestry Ministerial Regulation Number 30 of 2009, the definition of deforestation is permanent alteration of forested area to a non-forested as a result of human activities.

In the Long-Term Strategy for Low Carbon and Climate Resilience 2050 document, the Government of Indonesia also envisages achieving the Forestry and Other Land Use Net Carbon Sink by 2030, referred to as FOLU Net Sink 2030. It is a set of strategic measures to reduce around 140 million tons of CO_2e by 2030 from the FOLU sector that have been successfully prepared and are now being implemented on the ground (MoEF, 2022). The National Strategy for FOLU Net Sink 20230 employs four central policies as follows:

1. Avoiding deforestation: curbing deforestation rates to achieve the FOLU Net Sink 2030 which limits planned deforestation up to 6.8 million hectares by 2030;
2. Conservation and sustainable forest management: reducing forest degradation driven by excessive logging and state production forest encroachment, and extending protected forest areas in both the state production forests and other land use (*Area Penggunaan Lain/APL*[11]).
3. Protection and restoration of peatlands: emissions from peatlands account for 50% of total emissions in the agriculture, forestry and other land use sectors.
4. Sink enhancement: accelerating afforestation and reforestation of severely degraded land outside and inside state forest areas as well as urban revegetation.

Kalimantan

Borneo, the world's third-largest island located in Southeast Asia, was endowed with one of the oldest rainforests in the world. Borneo Island is politically divided between Kalimantan, Indonesia (73%) and Malaysia (26%), with the remainder forming Brunei Darussalam. Administratively, there are five provinces in Kalimantan: West, East, South, North, and Central Kalimantan. As of 2023, the total population in Kalimantan is 17.09 million, where the highest population is in West Kalimantan (33%), followed by South Kalimantan (24%), East Kalimantan (23%), Central Kalimantan (16%) and North Kalimantan (4%) (BPS Kalbar, 2023; BPS Kalsel, 2023; BPS Kaltim; BPS Kalteng, 2023; and BPS Kaltara, 2023).

The forests of Kalimantan, home to orangutans, clouded leopards, and pygmy elephants, are among the world's most biodiverse ecosystems. They are also home to several hundred Indigenous peoples, nowadays referred to as Dayak, who have been in Borneo for several thousand years and remain the majority population in many areas (UNEP, 2024). The Dayak tribe has 268 sub-tribes, grouped into six families: Punan, Klemantan, Apokayan, Iban, Murut and Ot Danum. Besides Dayak, the other three dominant tribes living in Kalimantan are Banjar, Hakka and Melayu. The Banjar people are native to South Kalimantan and mostly live along the coast as traders, but they are now moving inland as farmers around the Meratus Mountains. Hakka is a native of China and living in Central Kalimantan. Meanwhile, the Melayu people primarily reside on the coast and have relative relationships with Melayu in Sarawak and Brunei Darussalam (Subroto and Ningsih, 2022).

In 1973, Kalimantan's intact old-growth forest area was estimated at 40.3 million hectares. However, total deforestation between 1973 and 2015 reached about 14.3 million hectares. As of 2015, the remaining forest area in Kalimantan is still intact (65%) and logged (35%) (Gaveau *et al*.,

[11] Public lands which are not designated as Forest Area.

2014; Gaveau *et al*., 2016, Goh, 2020; Goh and Potter, 2023). The map in Figure 3 illustrates the spatial pattern of deforestation in Kalimantan from 1990 to 2015. It shows areas deforested during the period from 1990 to 2012 cumulatively, while deforestation occurring in subsequent observation periods is displayed separately for each period. In 2013, West and North Kalimantan provinces experienced deforestation rates exceeding their respective reference levels[12]. Nevertheless, there is a positive trend to note where deforestation in East, Central and South Kalimantan provinces has decreased compared to their reference levels. In 2014, however, all provinces exhibited deforestation rates lower than their reference levels. By 2015, three out of five provinces had deforestation rates below their reference levels, whereas Central and North Kalimantan recorded values surpassing the reference level. Over the three-year span, South and East Kalimantan consistently maintained performance (Wegscheider *et al*., 2017).

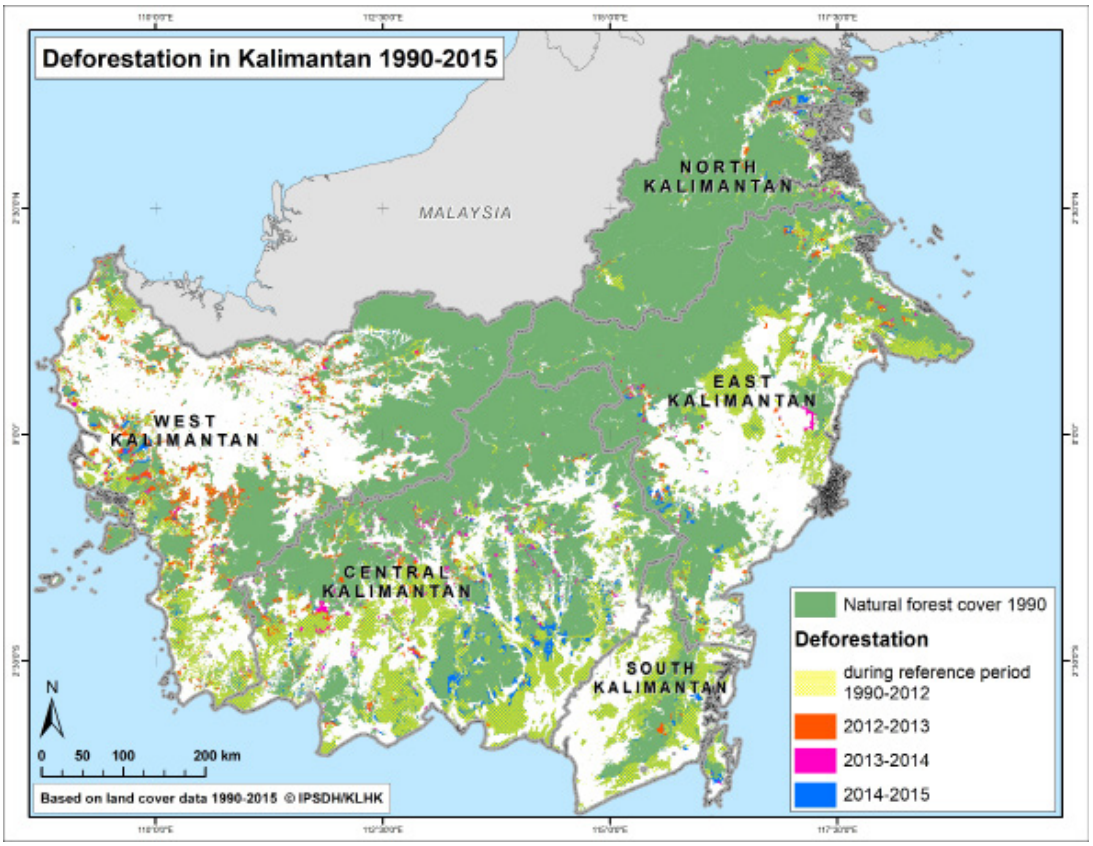

Figure 3. Spatial distribution of deforestation in Kalimantan during the period of 1990-2012 (accumulated) and the subsequent observation periods 2012-2013, 2013-2014, and the natural forest cover as of 1990. Source: Wegscheider *et al*., 2017

Forest loss and degradation in Kalimantan was driven by a complex interplay of various factors, including economic, social, political and environmental forces. Similar to other regions in Indonesia, the primary drivers of forest loss and degradation in Kalimantan are the logging and timber industry, the expansion of palm oil plantations and other agricultural commodities (e.g.,

[12] For each of the five provinces in Kalimantan, a reference average annual deforestation level, as well as a reference average annual emission level, have been calculated in accordance with the national Forest Reference Emission Level (FREL) that Indonesia submitted to UNFCCC during COP21 in Paris in 2015.

rubber, coconut, rice), infrastructure development (e.g., roads, dams), and small-scale shifting cultivation by local communities. Kalimantan is rich in natural resources, including coal, gold, and other minerals. Mining activities have resulted in the clearance of forests and environmental degradation. Additionally, the use of fire to clear land for agriculture, especially during the dry season, can lead to widespread forest fires and haze. These fires contribute to deforestation and negatively impact air quality, human health, and biodiversity (Goh and Potter, 2023).

The latest development of the Nation's Capital (*Ibu Kota Nusantara*/IKN)[13] in East Kalimantan brings pros and cons. In August 2019, President Joko Widodo announced that Indonesia would move its capital city from Jakarta to a site in East Kalimantan province. This decision was primarily driven by Jakarta's severe problems with congestion, pollution, and sinking due to over-extraction of groundwater. The new capital will be built in a sparsely populated area of East Kalimantan, covering parts of Penajam Paser Utara and Kutai Kartanegara districts. The government conducted thorough studies to determine the most suitable location, taking into account factors such as geography, environmental impact, and infrastructure (Syaban and Appiah-Opoku, 2023).

Addressing forest degradation and environmental issues requires not only conservation and restoration efforts but also attention to the underlying land tenure and governance system. Some key challenges related to land tenure and governance issues in Kalimantan include weak governance; unclear land tenure, especially of Indigenous peoples' territories; and inadequate enforcement of environmental regulations contribute to deforestation (Sahide and Giessen, 2015). More details about land governance issues and current measures in Indonesia that also apply to Kalimantan can be seen in Annex 4 (Daryono, 2010; Neef, 2016; Tanner *et al.,* 2020; Hayward, 2021).

Ecosystem restoration policies in Indonesia

Key public actors

Ecosystem restoration efforts in Indonesia are unsurprisingly complex, involving many institutions guided by various ministries, special agencies under direct supervision and mandates by the President, and local governments with varying roles. Table 1 shows three main functions of government agencies in ecosystem restoration in Indonesia: coordination, executing, and supporting (EUREDD Facility, 2023).

Table 1. Key ecosystem restoration stakeholders in government

Coordination Function	▪ Ministry of National Development Planning (Bappenas) ▪ Coordinating Ministry of Maritime Affairs and Investment (Kemenkomarves)
Executing Function	▪ MoEF – Directorate General of Watershed Management and Forest Rehabilitation (DG PDAS-RH)

[13] The establishment of the new capital is mandated by Law 21 of 2023 jo. Law 3 of 2022 about *Ibu Kota Negara*. The latest Law (21/2023) stated the total of land and coastal area designated for IKN is 252,600 hectares and 69,769 hectares, respectively. Compared to the previous Law (3/2022), the total of land area has decreased as much as 3,483 hectares but the coastal area has increased for 1,580 hectares.

	▪ MoEF – Directorate General of Natural Resources and Ecosystem Conservation (DG KSDAE) ▪ MoEF – Directorate General of Sustainable Forest Management (DG PHL) ▪ MoEF – Directorate General of Pollution and Environmental Damage Control (DG PPKL) ▪ Ministry of Marine Affairs and Fisheries (MoMAF) ▪ Ministry of Villages, Development of Disadvantages Regions, and Transmigration (MoV) ▪ Peat and Mangrove Restoration Agency (BRGM) ▪ Provincial Government ▪ Forestry Management Unit (KPH)
Supporting Function	▪ MoEF – Directorate General of Social Forestry and Environmental Partnership (DG PSKL) ▪ MoEF – Directorate General of Climate Change (DG PPI) ▪ Fiscal Policy Agency (*Badan Kebijakan Fiskal*) ▪ Environmental Fund Management Agency (BPDLH)

Source: EUREDD Facility, 2023

As the institution that designs the National Development Framework, Bappenas plays a key role in coordinating ecosystem restoration. This is made explicit through the RPJMN 2020–2024, the Indonesia's Low Carbon Development Plan (LCDI), as well as the Sustainable Development Goals (SDGs). Bappenas coordinates with MoEF, MoMAF, and other implementing ministries/agencies that have ecosystem restoration mandates. In that regard, MoEF provides ecosystem data (including target, location, timeline) mainly in the state forest area (drylands, peatlands, and mangrove). Meanwhile, MoMAF provides mangrove rehabilitation data (including target, location, timeline) in the coastal area. For monitoring, Bappenas uses *Satu Alas* online spatial platform to present data on plans and evaluations at the site level. This platform helps to monitor increases in forest cover in rehabilitated areas (down to the village level) provided data is available for planting areas.

Kemenkomarves coordinates various ministries and technical institutions tasked with mangrove rehabilitation, including the MoEF, MoMAF, MoV, and BRGM. Kemenkomarves is preparing a roadmap for the National Action Plan for Mangrove Rehabilitation, so that an integrated and non-overlapping mapping of rehabilitation locations can be obtained between MoEF, MoMAF, and BRGM for 2022–2024. MoV is no longer included in the 2022–2024 mangrove rehabilitation plan because they no longer received National Economic Recovery Program allocations after 2021 for mangrove rehabilitation. MoV retains the policy to allow Village Funds to be used for environmental and climate change responses, of which ecosystem restoration could be a good component. In addition to coordinating mangrove rehabilitation activities, MoMAF has a mandate to seek funding and investment assistance from various sources.

Ecosystem restoration initiatives are the main responsibility of the MoEF Directorate General of Watershed Management and Forest Rehabilitation (DG PDAS-RH), which previously was named as DG of Watershed Management and Protected Forests. This DG underwent a nomenclature change in 2021 because rehabilitation previously suggested limited focus on protected forests

and excluded other forest types and non-forest zones. The name change intended to broaden public understanding of rehabilitation mandates as reaching beyond protected areas. The Watershed Management and Forest Rehabilitation Agency (BPDAS-RH) serves as the Technical Implementing Unit (UPT) of DG PDAS-RH, and is responsible for monitoring and assessing the success of a permit holders' rehabilitation initiative.

DG of Natural Resources and Ecosystem Conservation (DG KSDAE) is tasked with restoring ecosystems in conservation area, but they still involve DG PDAS-RH and its UPT. Meanwhile, DG of Sustainable Forest Management (DG PHL) is responsible for rehabilitation and restoration in production forests. By having coordination, this DG monitors and evaluates the extent of ecosystem restoration activities in former Forest Concession Rights and Forest Plantation Rights areas. DG of Social Forestry and Environmental Partnership (DG PSKL) and DG of Climate Change (DG PPI) do not have a direct mandate to carry out ecosystem restoration activities. However, restoration initiatives are being integrated into social forestry programs under DG PSKL. Meanwhile, DG PPI coordinates with DG PDAS-RH in identifying rehabilitation locations that have a high biogeographic and carbon sequestration index. DG PPI also supervise Village Resilient Programme which encourage adaptation activities, and restoration could potentially be one of them.

The Directorate of Peat Ecosystem Damage Control, under the DG of Pollution and Environmental Damage Control, holds the authority to formulate policies and prepare technical guidelines for peat restoration. This Directorate plays an important role in the preparation of the National Peat Ecosystem Protection and Management Plan, which is used to guide peat restoration efforts. For site-level implementation, this DG coordinates closely with BRGM, by supporting community institutions through the Independent Village Care Program for Peat. DG Pollution and Environmental Damage Control then has the authority to monitor peat restoration carried out by plantation forest concessions.

The primary responsibility of BRGM is to facilitate the acceleration of peat restoration and mangrove rehabilitation in target provinces. In carrying out its duties, BRGM coordinates with various ministries and institutions. BRGM coordinates with DG PPKL on the distribution of peat restoration areas. BRGM's peat restoration work is mostly located outside of state forest zones because peat areas located inside state forest zones have largely been used for plantation forest businesses under the authority of DG PPKL. To assist the implementation of peat restoration and mangrove rehabilitation at the regional level, BRGM collaborates with local governments by forming a Peat Restoration and/or Regional Mangrove Rehabilitation Team. Provincial Governments have authority to carry out rehabilitation within limited state forest zones, including Forest Parks (Tahura), non-state forest zones that have not been encumbered with rights, urban forests, and planting along roadsides. Provincial governments have an important role in ecosystem restoration success especially by incorporating the national program into their regional spatial plans. The local governments are also in good position to develop Ecosystem Essential

Estates[14] [15] [16] [17] [18] . This decentralized policy could extend the conservation and restoration areas.

Current ecosystem restoration policies and regulatory framework

The concept of ecosystem restoration and the use of various terminologies (rehabilitation, *reboisasi*, *penghijauan*, restoration, reclamation, and revegetation) have continued to evolve. These terms are often interconnected with broader concepts such as global governance, emerging policies, or discourse, and are directly linked to legal obligations, regulatory tasks, or administrative functions. The Job Creation Law (Law No. 11/2020) established various new policy references on forest ecosystem restoration. This section will explain how the interpretations of different concepts outlined in the law have evolved based on the most recent regulations (post-Job Creation Law). The terms of Forest Restoration and Rehabilitation are categorized into three main categories: rehabilitation, reclamation, and restoration (see Figure 4) (EUREDD Facility, 2023).

Forest and land rehabilitation policies

The term of forest and land rehabilitation *(Rehabilitasi Hutan dan Lahan/RHL)* first emerged in the Basic Forestry Law No. 41/1999. The definition of this terminology has not changed with the Job Creation Law and its implementing instruments Government Regulation Number 23 of 2021. It states that "rehabilitation is intended to restore, maintain, and improve the functions of forests and land so that their overall carrying capacity, productivity, and role in supporting life support systems are maintained." The Ministry of Forestry Regulation (before being merged with Ministry of Environment) states that the success rate of plant enrichment in state forest zones is at least 70% of the total planting holes (MoF, 2008).

Rehabilitation activities are not allowed in the nature reserves and national park core zones to maintain the authenticity and uniqueness of flora, fauna, and ecosystems. Nonetheless, in urgent conditions such as a natural disaster, rehabilitation can be carried out in these areas through a revision of the ecosystem recovery plan. However, to date there is no national regulation on rehabilitation in nature reserves and core zones of national parks. In addition to rehabilitation in degraded conservation areas, non-rotational rehabilitation efforts in conservation areas can be carried out on open lands that have been utilized by the community through a forestry partnership scheme (EUREDD Facility, 2023).

[14] Law Number 32 of 2009 concerning Environmental Protection and Management (State Gazette of the Republic of Indonesia 2009 Number 140, Supplement to the State Gazette of the Republic of Indonesia Number 5059).
[15] Ministry of Environment Regulation Number 29 of 2009 concerning Biodiversity Conservation in the Region.
[16] Ministry of Environment Regulation Number 03 of 2012 concerning Biodiversity Parks (State Gazette of the Republic of Indonesia 2012 Number 200).
[17] DG KSDAE Regulation Number 8 of 2016 concerning Determination of Wildlife Corridors as Essential Ecosystems.
[18] DG KSDAE Regulation Number 1 of 2021 concerning Technical Guidelines for Effectiveness Assessment of Essential Ecosystems Management.

Legend:
BRGM – *Badan Restorasi Gambut dan Mangrove* (Peat and Mangrove Restoration Agency)
IPPKH – *Izin Pinjam Pakai Kawasan Hutan* (Borrow-to-use Forest Zones Permit)
MoEF – Ministry of Environment and Forestry
RE – *Restorasi Ekosistem* (Ecosystem Restoration)

Figure 4. Concept map for rehabilitation, reclamation, and restoration
Source: EUREDD Facility, 2023

Forest and land reclamation policies

Forest and land reclamation does not only focus on planting, but also involves improving soil structure. Forest and land reclamation is carried out in damaged forest zones that have undergone land cover and land surface changes. However, the basic law of forestry does not explain the threshold of "damaged" forests. The absence of a single definition of degraded/damaged land creates confusion over its area, location, and legal status. Furthermore, reclamation is often associated with activities in the mining sector because it is the final stage of mining activities after the exploration and exploitation stages. However, the Basic Forestry Law

No. 5/1967 and the Basic Mining Law No. 11/1976, did not mention the "reclamation" terminology. This term only emerged in the Basic Forestry Law No. 41/1999 stating that reclamation activities are not only required for the holder of a *Izin Pinjam Pakai* for mining, but also other permits that result in significant changes to surface cover and the subsurface. In general, the stages of forest reclamation include two main activities: land management and revegetation. Revegetation is defined as an effort to repair and restore damaged vegetation through planting and maintenance activities in areas that have been used as state forest zones. Revegetation is the main indicator for assessing the success of forest reclamation by the MoEF, covering aspects of planting area, percentage of plant growth, and plant composition (EUREDD Facility, 2023).

Peatland and mangrove ecosystem restoration policies

Protection of peatlands in Indonesia began with the issuance of the Presidential Decree Number 32/1990 on the Management of Protected Areas, which mandated the protection of peat areas featuring peat soils having a depth of three meters or more. The depth of three meters is still used as a neutral, unambiguous, and measurable standard, and in theory the government can determine which peat areas should be protected. The Government issued a regulation on Peatland Ecosystem Protection and Management in 2014 and amended in 2016[19], followed by five implementing environment and forestry ministerial regulations[20]. Further, the MoEF Regulation Number 40/2017 on Government Facilitation on Industrial Plantation Forests calls for the protection and management of peatland ecosystems. Managers of underperforming Tree Plantation Forest Concessions located in peatland ecosystems risk having their permits revoked, or adjustments made to protect the protection function of the peatland ecosystem (MoEF, 2022).

Since 2016, strengthening efforts on peatland restoration has been coordinated by the National Peatland Restoration Agency (BRG), which has become the Peatland and Mangrove Restoration Agency (BRGM). The Government has adopted new policies on peatland governance and management, including (1) taking more comprehensive measures to prevent forest and land fires; (2) suspending the issuance of new permits for the use of protected peat; (3) prohibition of further land clearing on protected peatlands; (4) reviewing existing forest/plantation permits and rearranging the existence of concessions by taking into account the existence of peatlands and their hydrological functions; (5) implementing a strict monitoring system on peatland burned in 2015; and (6) requesting industrial plantation forest managers to restore peatlands by closing canals to maintain a minimum water level of 0.4 meters (MoEF, 2022).

The MoEF Decree Number 246/2020 on the National Peatland Ecosystem Protection and Management Plan was issued to provide detailed strategic plans for the use of peatland

[19] Government Regulation Number 71/2014 jo. Number 57/2016 on Peatland Ecosystem Protection and Management.
[20] (1) MoEF Regulation Number 14/2017 on Procedures for Inventorying and Determination of Peat Ecosystem Functions; (2) MoEF Regulation Number 15/2017 on Procedures for Measuring Groundwater Levels at Peat Ecosystem Compliance Points; (3) MoEF Regulation Number 16/2017 on Technical Guidelines for Restoring Peat Ecosystem Functions; (4) MoEF Regulation Number 10/2019 on Determination, Determination and Management of Peat Dome Peaks Based on Peat Hydrological Units; and (5) MoEF Regulation No. 60/2019 on Procedures for Preparation, Determination, and Amendment of Peatland Ecosystem Protection and Management Plans.

ecosystems, controlling degradation (prevention, mitigation, and restoration), maintenance (reserve and conservation areas), and climate change mitigation and adaptation in peatland ecosystems. The National Peatland Ecosystem Protection and Management Plan (NPEPMP) has become a reference in the preparation of development plans, such as long/medium term development plans, spatial plans, and forestry plans (MoEF, 2022).

Mangrove ecosystems had not yet gained national prominence during the drafting of the 2020–2024 National Development Plan (which was compiled in 2019) due to the lack of mangrove data at that time. In conjunction with the UN Decade for Ecosystem Restoration 2021-2030[21], international attention on blue carbon is starting to highlight the significant role of mangroves as natural systems for offsetting GHG emissions (Fourqurean et al., 2012). Therefore, efforts to improve mangrove ecosystems have risen in prominence in many countries, especially Indonesia. With the largest mangrove ecosystem areas in the world, Indonesia sees immense opportunity in contributing to global commitments in climate change mitigation. The government has since added the mandate for mangrove rehabilitation into BRG stipulated through Presidential Regulation No. 120/2020. Attention to mangrove ecosystems is also reflected in the formation of a coordinating team for wetland management involving multiple ministries, including Bappenas, MoEF, MoMAF, MoASP, and MoV. This wetland management coordination team was ratified through Decree of Bappenas No. 89/2020. This team was formed to support an integrated mangrove ecosystem database and design a mangrove management roadmap, which includes a mangrove rehabilitation plan (EUREDD Facility, 2023).

Current ecosystem restoration goals, priorities and activities in Indonesia

Current goals and priorities of ecosystem restoration

A review of the degraded lands map is conducted every five years. Initially performed in 2013, the mapping of degraded lands was carried out again in 2018. This second iteration determined that Indonesia has 14 million hectares of “highly degraded” and “degraded” land[22], in Bahasa known as *lahan sangat kritis* and *lahan kritis*, respectively. Highly degraded lands amount to an area of 4.55 million hectares, while degraded lands cover an area of 9.45 million hectares. The total area of degraded land has significantly decreased compared to 2013, when it was estimated at 24.3 million hectares (Central Agency on Statistics, 2019).

As of 2019, the area of peatland and mangrove in Indonesia was about 13.4 million hectares. In order to manage peatland ecosystem, the Ministry of Environment and Forestry designated the Indonesian Peat Hydrological Units *(Kesatuan Hidrologi Gambut/KHG*)[23] covering an area of 24.7 million hectares. These areas are distributed throughout Indonesia, with 9.6 million hectares located in Sumatra, 8.4 million hectares in Kalimantan, 6.6 million hectares in Papua, and 0.06 million hectares in Sulawesi (MoEF, 2022; BRGM, 2023a). Meanwhile, based on One Map

[21] Through this commitment, the United Nations General Assembly set a mangrove restoration target of two billion hectares worldwide.
[22] According to the Indonesian Government Regulation (*Peraturan Pemerintah*) Number 37 of 2012 about Watersheds Management, degraded land is defined as a land with low soil functions as a medium for regulating water management and as an element of land productivity, thereby causing disruption to the balance of watershed ecosystem.
[23] The MoEF Decree No. SK. 130/Menlhk/Setjen/Kum.1/2/2017 about Determination of the National Peatland Ecosystem Function Map

Mangrove Indonesia 2013–2019, there were 637,624 hectares of degraded mangroves from a total 3.31 million hectares of estimated total mangrove area in Indonesia. These degraded mangroves were then used as a target for rehabilitation until 2024 (BRGM, 2023b).

The Government of Indonesia has set a target of peatland restoration and mangrove rehabilitation through the issuance of Presidential Regulation Number 120/2020. During the period of 2021-2024, the target of peatland restoration is 1.2 million hectares which is spread over seven provinces: Riau, Jambi, South Sumatera, Central Kalimantan, West Kalimantan, South Kalimantan, and Papua (BRGM, 2023a). Meanwhile, the target of mangrove rehabilitation is 600,000 hectares which is spread over nine priority provinces: North Sumatra, Riau, Riau Islands, Bangka Belitung, West Kalimantan, East Kalimantan, North Kalimantan, Papua, and West Papua (BRGM, 2023b).

Current activities and achievement of ecosystem restoration

Forest and land rehabilitation is the classic dryland approach, in Bahasa known as *reboisasi* and *penghijauan*. *Reboisasi* is conducted inside the state forests, while *penghijauan* is done outside the state forest. The targets of forest and land rehabilitation are degraded lands in prioritized watersheds areas in all types of forest areas (except nature reserves and core zones of national parks), and promoting exotic fast-growing crops in production forests. Upstream watersheds are prioritized because they are prone to floods, droughts, and landslides; catchment areas from reservoirs, dams, and lakes; recharge areas in upstream watersheds; river border areas; springs, lakes, and reservoirs; and downstream watersheds that are prone to tsunamis, seawater intrusion, and river abrasion. Forest rehabilitation is an effort to plant forest tree species in damaged forest areas in the form of bare land, reeds, or shrubs to restore forests. Reforestation is prioritized in protection forests that aim to restore basic functions to protect life support systems to regulate water systems, prevent flooding, control erosion, prevent seawater intrusion, and maintain soil fertility. Forest and land rehabilitation activities from 2015 to 2021 can be seen in Table 2.

Table 2. Area for Forest and Land Rehabilitation in 34 Watersheds (2015-2021)

Year	2015	2016	2017	2018	2019	2020	2021
Conservation/Protection Forests	10,508	7,087	19,482	25,170	206,000	15,434.30	69,961
Mangrove Forests/ Beaches/Swamps/Peat	481	497	1,175	960	1,000	18,709.54	1,381
Urban Forest	240	215	452	-	-	-	-
Agroforestry	7,624	13,416	15,875	-	-	-	-
Land rehabilitation with seedlings from community nurseries and Permanent Nursery	181,594	177,151	164,006	162,500	188,168	78,276	81,112
Total	**200,447**	**198,366**	**200,990**	**188,630**	**395,168**	**112,419.41**	**152,454**

Source: MoEF, 2022

The basic principles used in the restoration of peatland ecosystems, known as 3R, are improving water management by building rewetting infrastructure (rewetting), rehabilitating vegetation (revegetation), and improving people's social, cultural, and economic wellbeing and livelihoods (revitalization). Peatland restoration interventions through water management maintain the stability of the water regulation in the peatland ecosystem so that it remains wet and can support various uses.

Rewetting

Rewetting prevents the oxidation of peat and reduces the likelihood of unwanted peat fires. When restoring a drained peatland, rewetting is carried out by blocking canals to raise the level of the water table across the peat dome back to their naturally high, swamp conditions. As a peat dome is a single hydrological unit through which tremendous volumes of water can circulate, the draining of any part of a peatland will negatively impact water availability in surrounding peatland areas. Thus, rewetting programs must give consideration to the resultant changes in water flow that will occur across large areas, as well as the impact this may have on local land use and livelihoods. Furthermore, at the site-level, the approach taken to rewetting may vary according to the land use. Canal blocking often takes place in drained peatlands located within cultivation zones, whereas permanent back filling is a better approach in drained peatland that is located within protected forest.

Revegetation

Revegetation, as well as rewetting, decreases the risk of fires in degraded peatland areas. A closed forest canopy provides a humid, cool microclimate for the peat, and the tree roots help keep the peat aerated and able to store water. Revegetation approaches depend on the level of degradation of the original peat swamp forest. A severely degraded, multiple burned landscape may show little sign of natural regeneration and may therefore require direct planting in addition to rewetting in order to recover. However, locations that have a lower burn history and are still near the state of fragmented forest may still have sufficient seed dispersal and seedling growth to regenerate naturally, requiring just rewetting and low-intervention methods such as weeding. In all cases, revegetation efforts should only take place where fire prevention is active and successful. Revegetation of settled peatland areas should focus on growing and planting peat swamp species that can provide important economic benefits for nearby communities, such as tree species that produce fruits, nuts, latex or timber. All active planting should only include native species adapted to living on peatlands, and concerted efforts may be focused on value adding (and marketing) of local species such as ramin, jelutong, balangeran thereby incentivizing sustainable plantings by local communities.

Revitalization

Revitalization strategies require peat-friendly livelihoods to be defined and developed through consultation with local communities. These future sustainable livelihoods must be economically and technically feasible for rewetted peat soils, as the key message from research worldwide is that peatland should not be drained. Draining peatlands for agricultural purposes inevitably leads to the degradation and decomposition of the peat as well as an increase in fire frequency. In addition to increased greenhouse gas emissions, peatland drainage leads to land subsidence and

the possibility of permanent flooding and saltwater intrusion. By contrast, agriculture and agroforestry that is suited to rewetted conditions can maintain the overall integrity of a peat body, sustain ecosystem services, and facilitate carbon accumulation.

The seven priority provinces have 514 Peat Hydrological Units (KHG). However, not all KHG have received restoration intervention. Of those units, restoration intervention locations are in 106 KHGs. As a results, in 2021, 3.6 million hectares and 49,874 hectares of peatland managed by companies and communities, respectively, have been restored. Meanwhile, BRGM has restored 900 thousand hectares of peatland.

As of 2021, the achievements of peatland restoration in concession and non-concession areas can be seen in Tables 3 and 4, respectively.

Table 3. Achievements of Peatland Restoration in Concession Areas as of 2021

Data	Industrial forest	Oil palm plantation	Total
Number of companies	72	248	320
Restored area (ha)	2,268,199.70	1,398,485.49	3,666,685.18
TMAT compliance point (unit)	5,086	5,364	10,450
Rainfall station (unit)	269	599	868
Canal blocking construction (unit)	8081	22,597	30,678
Vegetation rehabilitation (ha)	5,943.67	-	5,943.67

Source: MoEF, 2022

Table 4. Achievements of Peatland Restoration in Non-Concession Area (2016-2021)

Province	Deep Wells (unit)	Canal Blocking (unit)	Canal Backfilling (unit)	Revegetation (ha)	Revitalization (group)
Riau	1,125	1,639	5	285	234
Jambi	741	660	152	325	128
South Sumatra	354	1,057	61	340	154
West Kalimantan	491	806	0	150	154
Central Kalimantan	10,664	3,108	115	750	261
South Kalimantan	629	135	0	42	47
Papua	0	0	0	0	107
Total	**14,004**	**7,405**	**333**	**1,892**	**1,085**

Source: BRGM, 2023a

Mapping key private sector involvement in ecosystem restoration in Kalimantan

Private sector involvement in ecosystem restoration activities in Kalimantan is crucial for achieving sustainable and effective outcomes. Here are some key private sector stakeholders that can be involved in ecosystem restoration efforts in the region:

- Natural forest concessions
- Tree plantation concessions
- Wood processing companies
- Palm oil plantations and mills
- Mining companies
- Agribusiness companies
- Tourism industries
- Philanthropic
- International Development Agencies
- Environmental NGOs
- Conservation Organizations
- Indigenous People and Local communities (IPLC)
- Academic and research institutions
- Women and youth groups
- Women's farmer group (KWT)
- Forest farmers' group (KTH)

Potential public-private partnerships for enhanced ecosystem restoration in Kalimantan

The importance of partnerships between the public and private sectors to support forest conservation and restoration was recognized in early 2020 at the World Economic Forum in Davos. Heads of state and multinational leaders repeatedly highlighted the importance of multi-stakeholder collaboration to address pressing global sustainability challenges. In that regard, identifying potential public-private partnerships (PPPs) for enhanced ecosystem conservation and forest restoration Kalimantan involves considering the unique environmental challenges, stakeholders, and opportunities in the region. Furthermore, implementing a public-private-people partnerships (4Ps) framework could harness the collective efforts of governments, businesses, and local communities to achieve sustainable development goals while preserving biodiversity and improving livelihoods in the region.

The Green Growth Compact

Over the last decade, East Kalimantan has been increasing its capacity, strategies, and aspirations to transition to a sustainable, forest-friendly model of development. Led by the Provincial Government of East Kalimantan, in collaboration with The Nature Conservancy (TNC) and their local partner Yayasan Konservasi Alam Nusantara (YKAN), the Green Growth Compact was established in September 2017. This initiative is a distinctive partnership consisting of 25 companies, government agencies, communities and NGOs committed to working together to conserve forests, reduce emissions and advance sustainable economic growth. Notably, it is Indonesia's first public-private-community partnership prioritizing innovative forest management practices to protect orangutan habitat (TNC, 2024).

The Green Growth Compact is the fruit of an exceptional combination of factors: visionary leadership at the provincial level; forest communities motivated by acute environmental pressures; NGOs able to mobilize local capacity; logging and palm oil companies recognizing the need for change; global initiatives like Reducing Emissions from Deforestation and Forest Degradation (REDD+) and the Paris Agreement; and rising awareness of the destructive impacts of climate change. These forces coincided to make East Kalimantan a world leader in natural climate solutions. At the heart of the Green Growth Compact are two interrelated targets: 1) to cut deforestation by at least 80% by 2025 while restoring forest to make up for the remainder; and 2) to increase economic growth by 8% while reducing emissions by 1,000 tones of CO_2e per US$ 1 million GDP by 2030 (TNC, 2024).

The success of the Green Growth Compact depends on scaling up successful local initiatives. Since 2010, TNC has been a catalyst behind the Berau Forest Carbon Program (BFCP), an initiative that is now one of the pillars of the Green Growth Compact. BFCP aims to secure 1 million acres of forested land under effective management and to protect the orangutans' habitat. The work is based around the TNC-developed Communities Inspiring Action for Change (*Aksi Insipiratif Warga untuk Perubahan*/SIGAP) approach, which is an approach to building village capacity that undertakes proper village and land use planning to protect their forests against illegal logging and poaching, replant degraded areas, and develop green livelihoods, all of which reduce carbon emissions. Communities also receive assistance to secure rights over their forest areas and access funding opportunities. The SIGAP model has so far been replicated in 99 villages in Berau District and is set to expand further under the Green Growth Compact, which plans to help hundreds of villages launch smart land use plans (TNC, 2024).

TNC and YKAN are also working with the government and natural forest logging concessions to advance sustainable forest management (SFM) certifications and expand Reduced Impact Logging Carbon practices across East Kalimantan under the Forest Carbon Partnership Facility – Carbon Fund scheme, which TNC work has shown can cut carbon emissions by as much as 50%.
In addition to the Essential Ecosystem Area for Orangutan in the Wehea-Kelay landscape, public-private-community partnership is promoted in East Kalimantan to protect remaining essential ecosystems by undertaking sustainable management practices. To prepare for the new era of Indonesian forestry that does not depend on timber as the sole of product of forestry, TNC and YKAN supports the development of multi-business by natural forest concessions through wood waste utilization (TNC, 2024).

East Kalimantan's Provincial Climate Change Council is currently overseeing and supporting its partners to implement prototype initiatives as the main vehicles for implementing the Green Growth Compact. Actions include supporting and accelerating the implementation of 11 prototype initiatives which include, among others, (i) the acceleration of the establishment of Forest Management Units (FMUs) by the provincial government that provide added capacity[24] at the field level to manage the forest estate, while also supporting companies and communities

[24] This includes developing FMU managers' capacity in sustainable forest management and conflict resolution, as well as building financial self-sufficiency through innovative business models.

in their forestry operations, (ii) working with the palm oil sector to support implementation of a commitment by provincial and district leaders to protect more than 400,000 ha of forest within areas slated for oil palm development[25], and (iii) strengthening the implementation of social forestry to achieve the target area of more than 600,000 hectares (TNC, 2024).

Emission Reduction Payment Agreement

The World Bank's Forest Carbon Partnership Facility (FCPF)[26] is providing a REDD+ Readiness Grant to the Indonesian Ministry of Forestry to support analytical work, management of the readiness process, reference emission level estimation, and monitoring, reporting and verification (MRV). East Kalimantan is the first jurisdiction in Southeast Asia and the Pacific region to receive advance payments under the FCPF scheme. Indonesia received an advance payment of US$20.9 million (IDR320 billion) under the Emissions Reduction Payment Agreement (ERPA)[27] between the Government of Indonesia and the World Bank's (FCPF) REDD+ in East Kalimantan province. Under the Agreement, Indonesia would receive up to US$110 million (IDR1.6 trillion) for verified emissions from reducing deforestation and forest degradation (WB-FCPF, 2022).

Indonesia has become the first country in the East Asia Pacific region to receive payments through the World Bank's FCPF, which represents 13.5 percent of the value of the emissions reduction reported in the Government of Indonesia's Monitoring Report for the 2019-2020 crediting period. The full payment will be released once the independent third-party verification of the reported emissions reductions, which is currently ongoing, is complete. The advance payment will facilitate the start of the East Kalimantan program's Benefit Sharing Plan, which was developed by the Government of Indonesia and issued in October 2021. The Benefit Sharing Plan document was developed through a consultative, transparent, and participatory process to ensure that all relevant stakeholders of the program are able to access the benefits from the emissions reduction payments. The document outlines the agreed arrangements for how ERPA payments will be shared with beneficiaries, from national and local government to local communities (WB-FCPF, 2022).

Ecosystem Restoration Concessions

In the early 2000s, the Indonesian Ministry of Forestry in cooperation with the British Royal Society for the Protection of Birds and BirdLife International, together with its affiliate

[25] Some instruments are developed to identify areas best suited for development, avoid conversion of high conservation value forest areas, and finance forest conservation through offsetting commitments.

[26] The World Bank's Forest Carbon Partnership Facility (FCPF) is a global partnership of governments, businesses, civil society, and Indigenous Peoples' organizations focused on reducing emissions from deforestation and forest degradation, forest carbon stock conservation, the sustainable management of forests, and the enhancement of forest carbon stocks in developing countries, activities commonly referred to as REDD+. Launched in 2008, the FCPF has worked with 47 developing countries across Africa, Asia, and Latin America and the Caribbean, along with 17 donors that have made contributions and commitments totaling US$1.3 billion.

[27] The ERPA is a legally binding contract to provide payments for environmental services, in other words, compensation for Indonesia's efforts to preserve tropical forests and in so doing reduce the emission of greenhouse gases into the atmosphere. The payments are designed to help Indonesia and its stakeholders achieve long-term sustainability in financing forest conservation. They are intended to help reduce climate change impacts from forest loss and degradation by making forests more valuable standing than cut down, by offering countries results-based incentives for reducing emissions in their forestry and broader land-use sectors.

organization Burung Indonesia, started to develop the concept of Ecosystem Restoration Concession (ERC). The conservation organizations conceived of ERCs as a promising strategic tool to reverse deforestation and the degradation of forests in Indonesia's large Production Forest areas, which, although particularly threatened, still have a high potential for nature conservation. Besides the conservation organizations, various development institutions also promoted the ERC concept and provided considerable funds for the establishment and implementation of ERCs.

The Katingan Peatland Restoration and Conservation Project (Katingan Project) is an ecosystem restoration initiative on a peat swamp forest in Central Kalimantan, Indonesia. It is managed by an Indonesian company, PT. Rimba Makmur Utama (RMU). In October 2013, the Ministry of Forestry granted RMU an ERC license in the Katingan district portion of their project zone (108,255 hectares), which effectively cut the proposed project area in half, but currently, their area is twice as large as Singapore (157,875 hectares) (RMU, 2024). Other ERCs are PT Ekosistem Khatulistiwa Lestari and PT Rimba Raya Conservation which managed 14,080 hectares in Kubu Raya, West Kalimantan, and 36,935 hectares in Seruyan, Central Kalimantan, respectively. These three companies are already selling their carbon sequestration to the voluntary markets (Forest Digest, 2024).

Sustainable Palm Oil Management

In implementing the goals of environmental and social sustainability in the supply chain of land-based natural resource commodities, USAID Sustainable Environmental Governance Across Regions (SEGAR) collaborates with the private sector to protect biodiversity and mitigate environmental impacts from land use activities. One step taken is jointly promoting the adoption of environmental and social standards and requirements, both mandatory and voluntary (USAID-SEGAR, 2024).

In West Kalimantan, USAID SEGAR cooperates with two private sector entities to develop sustainable supply chains and ecosystem restoration. In Sanggau District, USAID SEGAR, together with Credit Union Keling Kumang (CU KK), join together in developing green supply chains and establishing sustainable palm oil mills based on cooperatives. This collaboration also involves facilitation support from USAID SEGAR to CU KK to access technical support and funding from various institutions to achieve these goals. Meanwhile, in Ketapang District, USAID SEGAR and PT Hutan Kencana Damai (HKD) work together to plan and prepare for ecosystem restoration processes by integrating compliance with sustainable principles into the business plans within PT HKD's concession area. In this partnership, USAID SEGAR provides technical support in planning and preparing forest restoration and protection programs, community empowerment, and biodiversity conservation (USAID-SEGAR, 2024).

To mark the agreement of this collaboration, USAID SEGAR and the two business entities, CU KK and PT HKD, signed a Memorandum of Understanding (MoU) in March 2024 in Pontianak, West Kalimantan. The signing of this agreement is expected to contribute to the targets and commitments of the West Kalimantan Provincial Government in implementing inclusive green economy principles as outlined in the Regional Development Plan (RPD) of West Kalimantan Province for the period 2024-2026 (USAID-SEGAR, 2024).

4. Private sector engagement in ecosystem restoration in Kalimantan, Indonesia

Policy context for private sector engagement in ecosystem restoration in Kalimantan, Indonesia

Presidential Regulation Number 120/2020 on BRGM Article 15 stated that the Provincial Government should establish the Regional Peat and Mangrove Restoration Agency (*Tim Restorasi Gambut dan Mangrove Daerah*/TRGMD), which is regulated under Head of BRGM's Regulation Number p.7/KaBRGM/2021 on Guidance, Establishment and Implementation of TRGD (only peat)/TRMD (only mangrove)/TRGMD (peatland and mangrove). Each priority province in Kalimantan has developed this regional agency, which comprises of Provincial Government (Environmental Provincial Services), academic institution, local NGOs, private sectors and communities to strengthen the efforts of peat and/or mangrove restoration in the region (see Table 5). Additionally, BRGM also facilitated community participation at the village level by creating community-based peatland conservation and restoration (*Desa Mandiri Peduli Gambut*/DMPG) program. The DMPG program is not an independent program, but coordinates and facilitates restoration activities in priority areas.

Table 5. The Regional Peat and/or Mangrove Restoration Agency in Kalimantan

Province	Regional Agency	Governor Decree
West Kalimantan	Peat and Mangrove (TRGMD)	Number 113/2022
Central Kalimantan	Peat (TRGD)	Number 188/2021
South Kalimantan	Peat (TRGD)	Not yet found
North Kalimantan	Mangrove (TRMD)	Number 7/2019
East Kalimantan	Mangrove (TRMD)	Number 33/2021

The jurisdictional approach (JA) has emerged as a key framework for engaging the private sector in ecosystem restoration in Indonesia. JA involves aligning government policies, private sector commitments, and community participation at the subnational (provincial or district) level. This approach aims to create an enabling environment for private investment in sustainable land use by improving land-use planning, strengthening land tenure, and addressing legacy issues like concession agreements and land conflict.

Specific policy initiatives that support private sector engagement in restoration include:

- Ecosystem restoration licenses – a 60-year license to restore degraded land issued by the Government of Indonesia to private companies. These licenses provide a legal framework and long-term tenure to enable private sector investment in restoration
- Ecological fiscal transfers – the Government of Indonesia has implemented ecological fiscal transfers, which use funds from the national budget, known as Anggaran Pendapatan dan Belanja Negara (APBN) to reward local governments for protecting forests and other ecosystems. In turn, these local governments may collaborate with private sector to carry out restoration projects.
- REDD+ initiatives that provide results-based payments to the Government of Indonesia for reducing deforestation and forest degradation also create incentives for private sector involvement in restoration.

Potential forest and non-forest private sector interests in ecosystem restoration in Kalimantan, Indonesia

Ecosystem restoration in Kalimantan, Indonesia presents a range of opportunities for private sector involvement, given the region's ecological significance and the increasing recognition of the importance of sustainable practices. There are some potential areas where private sector interests could align with ecosystem restoration efforts in Kalimantan:

- Agroforestry and Sustainable Agriculture: Private companies can invest in agroforestry practices that integrate trees into agricultural landscapes, promoting biodiversity conservation and sustainable land use. This approach can help restore degraded lands while also generating income for local communities through the production of sustainable crops like coffee, cocoa, or spices.
- Addressing Carbon Footprint and Mitigating Climate Change: Businesses interested in mitigating their carbon footprint and contribute to climate change mitigation can invest in forest conservation and reforestation projects in Kalimantan. This could involve supporting initiatives such as avoided deforestation programs, reforestation of degraded areas, or investments in community-based forest management.
- Ecotourism and Conservation: Private sector investment in sustainable ecotourism initiatives can promote conservation while providing economic opportunities for local communities. Companies can invest in the development of eco-lodges, guided tours, and other tourism infrastructure that highlight Kalimantan's unique biodiversity and ecosystems, while also supporting conservation efforts.
- Bioenergy and Biomass: Companies can explore opportunities in sustainable bioenergy production using biomass resources from restored ecosystems in Kalimantan. This could involve investments in biomass power plants, biogas facilities, or biofuel production, contributing to both renewable energy generation and ecosystem restoration.
- Corporate Social Responsibility (CSR) Initiatives: Many companies have CSR programs focused on environmental conservation and community development. Private sector involvement in ecosystem restoration projects in Kalimantan can align with these objectives, providing funding, expertise, and resources to support local conservation efforts and sustainable development initiatives.
- Research and Development: Private companies, particularly those in sectors such as pharmaceuticals, biotechnology, and agriculture, may have an interest in investing in research and development projects related to the biodiversity of Kalimantan's ecosystems. This could involve partnerships with local research institutions or community organizations to study and conserve unique species and habitats.
- Sustainable Supply Chain: Companies sourcing products from Kalimantan, such as palm oil, timber, or minerals, can invest in sustainable supply chain practices to promote ecosystem restoration and conservation. This may include commitments to zero-deforestation sourcing, responsible land management practices, and supporting certification schemes that prioritize environmental and social criteria.

Engaging the private sector in ecosystem restoration efforts in Kalimantan requires collaboration between businesses, government agencies, NGOs, local communities, and other stakeholders. Public-private partnerships, incentive mechanisms, and policy frameworks that promote

sustainable investment and practices can help harness the resources and expertise of the private sector to achieve shared conservation and development goals in the region.

Potential opportunities and constraints of private sector engagement in ecosystem restoration in Kalimantan, Indonesia

Opportunities

- The Indonesian government is offering significant tax deductions to companies that invest in rehabilitating degraded lands in the new capital city of Nusantara in East Kalimantan. This provides financial incentives for the private sector to participate in restoration efforts.
- Mining companies in East Kalimantan have significant opportunities to support ecosystem restoration by leveraging their expertise in rehabilitation, allocating financial resources, and applying advanced technologies for sustainable mining practices. Collaboration with local communities, NGOs, and governmental agencies is crucial for inclusive restoration projects that benefit both ecosystems and communities.
- Private sector participation is seen as crucial to accelerating the pace of restoration in the new capital region, which the government estimates would take 88 years to fully rehabilitate at the current government-only pace. Private investment and labor can help speed up this process.
- Successful private sector-led restoration projects like the Katingan Mentaya project in Central Kalimantan demonstrate the potential for the private sector to contribute to peatland protection, rewetting, and reforestation. These models can be replicated.
- The East Kalimantan Green Growth Compact has brought together the provincial government, NGOs, experts, and companies to collaborate on sustainable, forest-friendly development. This type of multi-stakeholder partnership can facilitate private sector engagement.

Constraints

- The rapid expansion of coal mining in East Kalimantan has driven significant forest degradation and deforestation, creating large areas in need of restoration. Addressing this legacy of environmental damage will require substantial investment.
- Ensuring that private sector restoration efforts are "right on target" and properly monitored will be important to maximize the impact, according to experts. Lack of oversight could undermine restoration goals.
- Securing the participation of all relevant stakeholders, including local communities, will be crucial for the success of restoration projects, as highlighted by the Katingan Mentaya project. Coordinating these diverse interests can be challenging.
- While carbon revenues can help finance restoration, the timescale for realizing these benefits may be longer than the scope of some private sector investment horizons.

In summary, there are significant opportunities for private sector engagement in ecosystem restoration in Kalimantan, particularly through financial incentives, leveraging existing obligations, and building on successful models. However, the scale of the restoration challenge, the need for robust monitoring and coordination, and the long-term nature of some restoration benefits present constraints that will need to be carefully managed.

5. Lessons learnt from ecosystem restoration case studies in Kalimantan and Indonesia

The key lessons learnt from the Katingan Mentaya ecosystem restoration project in Central Kalimantan are as follows:

- Financially sustainable model: The Katingan Mentaya project is not a donor-funded philanthropic model, but rather a financially sustainable approach that generates revenue from selling carbon credits on the voluntary carbon market. This allows the project to be scaled up and maintained long-term.
- Community partnership and empowerment: The project views local communities as partners, not just beneficiaries. It involves them in planning, decision-making, and sharing the benefits of restoration. This collaborative approach is crucial for the project's success.
- Addressing root causes of degradation: The project takes a comprehensive approach that not only restores degraded peatlands, but also tackles the underlying drivers of deforestation and drainage, such as unsustainable palm oil and acacia plantations. This political ecology perspective is key.
- Combining protection, restoration, and sustainable livelihoods: The project combines efforts to protect intact peatland forests, rewet drained areas, and implement agroforestry and reforestation. It also supports sustainable community development to improve livelihoods. This integrated approach is critical.
- Leveraging carbon finance for conservation: By quantifying and monetizing the avoided carbon emissions from deforestation and degradation, the project is able to generate carbon credits that fund its conservation activities. This carbon finance model is a key innovation.
- Importance of long-term, landscape-scale efforts: The project operates at a large scale (157,875 hectares) and takes a long-term perspective, recognizing that ecosystem restoration requires sustained commitment. This contrasts with short-term, piecemeal approaches.

The key lessons learnt from the community-led restoration efforts in Indonesia's wetlands in Teluk Semanting village in East Kalimantan are:

- Restoring mangrove forests can provide significant benefits to local communities. The villagers in Teluk Semanting transitioned unproductive shrimp ponds into a protected mangrove area, which has led to the return of various marine species like crabs, fish, and shellfish. This has improved the quality and value of the traditional fish cracker products made by the local women's group.
- Community engagement and ownership are critical for successful wetland restoration. The villagers in Teluk Semanting made the bold decision to protect the mangroves, despite the initial loss of their primary economic source. They worked collaboratively to plant mangrove seedlings and construct a bridge to reconnect the community with the ecosystem.
- Wetland restoration can have global climate benefits. Indonesia's wetlands, including mangroves and peatlands, have the third-highest global potential for carbon sequestration through natural climate solutions. Preserving mangroves alone could mitigate 60.20 Mt CO_2e per year, while avoiding peatland conversion could prevent 514.24 Mt CO_2e of

emissions annually, which is nearly 70% of Indonesia's total natural climate solutions opportunities.

The key lessons learnt from the APRIL Restorasi Ekosistem Riau (RER) in Riau project are as follows:

- Collaboration is crucial for successful ecosystem restoration. RER has partnered with government, scientific experts, and local communities to implement its restoration efforts on the Kampar Peninsula and Padang Island. These partnerships have been vital to the project's progress over the past decade.
- Integrating sustainable production forestry with conservation can provide the necessary funding and resources for long-term restoration. RER utilizes a "production-protection" approach, where nearby sustainably managed production forestry supports the scientific and operational aspects of the restoration work.
- Restoring degraded peatland ecosystems requires a comprehensive, multi-faceted approach. RER has focused on protecting the area, assessing its biodiversity, restoring the hydrology and vegetation, and engaging with local communities- the "Four Element Approach" of Protect, Assess, Restore, and Manage.
- Long-term commitment and patience are essential for successful ecosystem restoration. RER has been operating for over a decade, demonstrating the need for sustained effort to repair the damage caused by past activities like logging and drainage.
- Sharing knowledge and lessons learned can help scale up ecosystem restoration efforts globally. RER's experiences can provide a model and inspiration for other tropical restoration projects around the world to adopt similar collaborative, science-based, and financially sustainable approaches.

The key lessons learnt from mining rehabilitation efforts in East Kalimantan, Indonesia are:

- Existing regulations are not sufficient to drive meaningful change in mining rehabilitation. Despite increased regional regulations in 2013 mandating mine pit refilling and land restoration, an estimated 1,735 coal mine voids remain unfilled in East Kalimantan and deaths from people falling into the pits continue to occur.
- Restoring mined land to its "original condition" as required by law is an unrealistic target that misrepresents the true scale of degradation caused by surface mining. Even in the best-case scenarios, current rehabilitation methods cannot fully restore the land to its pre-mining state.
- Lack of effective enforcement and monitoring allows mining companies to view rehabilitation as an "unnecessary expense" rather than a priority. Without consequences, companies driven solely by profit will neglect proper mine closure and clean-up.
- The large number of abandoned and unregistered illegal mines, estimated at over 800 in South Kalimantan alone, poses a major challenge that the government has struggled to address.
- The environmental degradation from mining, including deforestation of watersheds, has exacerbated natural disasters like deadly floods, underscoring the need for more comprehensive rehabilitation efforts.

6. Conclusions

The imperative to engage the private sector in ecosystem conservation and restoration efforts, particularly in Kalimantan, Indonesia, emerges as a critical strategy for enhancing biodiversity and fostering sustainable development. Through an exploration of global initiatives and the potential role of private sector actors, alongside a focused examination of the Indonesian context, this background paper sheds light on the challenges, opportunities, and lessons learned in this complex landscape.

The global landscape underscores the urgent need for ecosystem restoration, driven by imperatives such as biodiversity preservation, climate change mitigation, and the development of bioeconomies. International commitments and frameworks, including the UN Decade on Ecosystem Restoration and the ten principles guiding restoration efforts, provide a roadmap for action and collaboration. Central to these efforts is the engagement of the private sector, particularly within the forest sector. Through platforms like The Forest Dialogue, discussions have highlighted the potential of private sector involvement, alongside the importance of sustainable practices and financial mechanisms.

Zooming into Kalimantan, Indonesia, reveals a landscape rich in biodiversity but facing significant threats from land use change and development pressures. Despite challenges posed by infrastructure projects, energy transitions, and land tenure issues, there are opportunities for inclusive governance and public-private-people partnerships to drive ecosystem conservation and restoration efforts forward. Examining the policy context and the interests of forest and non-forest private sector entities in Indonesian Borneo unveils a spectrum of potential contributions and constraints. From sustainable wood supply initiatives to broader ecosystem restoration models, private sector engagement holds promise for achieving conservation goals while meeting economic objectives.

This is not the time for siloed thinking, but for collaborative problem solving. It is crucial for the private sector to collaborate to promote social good and seek systemic change, and for the public sector to facilitate market incentives. The private sector needs to speak the language of social change, and the public sector needs to create economic incentives to harness the private sector's innovation and expertise to address society's challenges. With shared goals, targeted action and monitored impact, it is time to move beyond dialogue and aspiration to the co-creation of a more inclusive, prosperous, and sustainable future.

It is clear that a multifaceted approach is required to address the complex challenges of ecosystem conservation and restoration in Indonesia and beyond. This necessitates continued dialogue, innovative partnerships, and a commitment to balancing environmental, social, and economic objectives. In conclusion, by harnessing the expertise, resources, and innovation of the private sector in collaboration with government, civil society, and local communities; transforming is needed towards a more sustainable and biodiverse future for Kalimantan, Indonesia and the planet as a whole.

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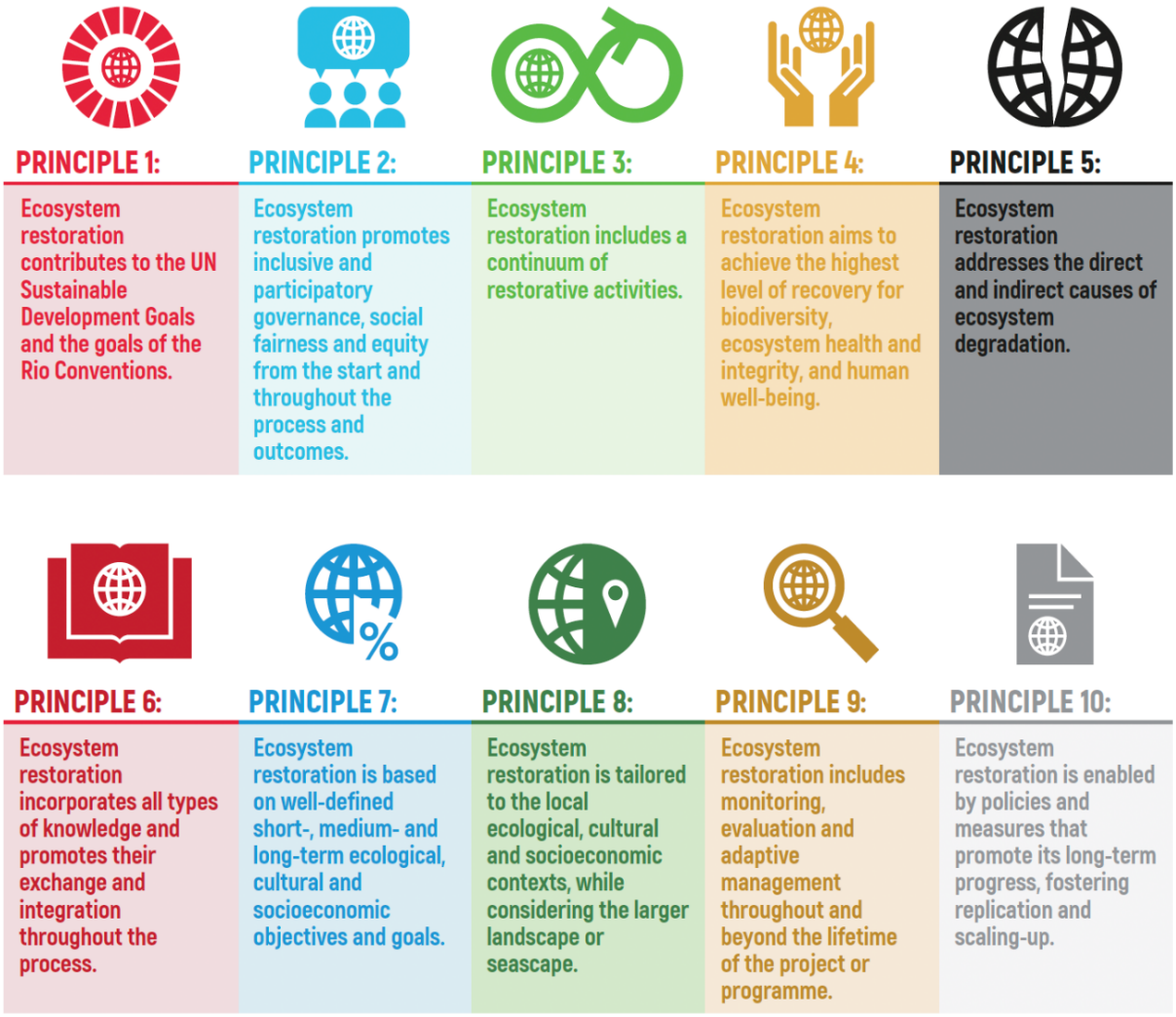
Annexes

Annex 1 – Ten Principles underlining Ecosystem Restoration



Source: FAO, SER and IUCN CEM (2023)

Annex 2- Forest and landscape restoration options framework

Land Use	Land sub-type	General category of FLR option	Description
Forest land Land where forest is, or is planned to become the dominant land use → **Suitable for wide-scale restoration**	If the land is without trees, there are two options:	1. Planted forests and woodlots 	Planting of trees on formerly forested land. Native species or exotics and for various purposes, fuelwood, timber, building, poles, fruit production, etc.
		2. Natural regeneration 	Natural regeneration of formerly forested land. Often the site is highly degraded and no longer able to fulfil its past function – e.g. agriculture. If the site is heavily degraded and no longer has seed sources, some planting will probably be required.
	If the land is degraded forests:	3. Silviculture 	Enhancement of existing forests and woodlands of diminished quality and stocking, e.g., by reducing fire and grazing and by liberation thinning, enrichment planting, etc.
Agricultural land Land which is being managed to produce food → **Suitable for mosaic restoration**	If the land is under permanent management:	4. Agroforestry 	Establishment and management of trees on active agricultural land (under shifting agriculture), either through planting or regeneration, to improve crop productivity, provide dry season fodder, increase soil fertility, enhance water retention, etc.
	If it is under intermittent management:	5. Improved fallow 	Establishment and management of trees on fallow agricultural land to improve productivity, e.g. through fire control, extending the fallow period, etc., with the knowledge and intention that eventually this land will revert back to active agriculture.
Protective land and buffers Land that is vulnerable to, or critical in safeguarding against, catastrophic events → **Suitable for mangrove restoration, watershed protection and erosion control**	If degraded mangrove:	6. Mangrove restoration 	Establishment or enhancement of mangroves along coastal areas and in estuaries.
	If other protective land or buffer:	7. Watershed protection and erosion control 	Establishment and enhancement of forests on very steep sloping land, along water courses, in areas that naturally flood and around critical water bodies.

Source: IUCN and WRI (2014), Table 2

Annex 3 – Common challenges and opportunities of global ecosystem restoration

Aspect	Challenges	Opportunities
Knowledge and capacity building	▪ Lack of awareness of the importance of conserving rather than restoring ecosystem ▪ Lack of knowledge in effective restoration techniques ▪ Indigenous and local knowledge is often overlooked in restoration activities ▪ Gender inequality and capacities	▪ Investing in training, workshops and education programs ▪ Integrated scientific and traditional knowledge to inform ecosystem restoration activities ▪ Inclusive and gender-sensitive capacity building approaches
Policy and governance	▪ Poor alignment across levels and sectors of government[28] ▪ Lack of supportive legal instruments and policies[29] ▪ Lack of bridging institutions to facilitate integrated landscape management	▪ Advancing polycentric governance approaches ▪ Advocacy for supportive policies and good governance ▪ Accessible tools and guidelines focusing on governance aspects
Stakeholder and local community engagement	▪ Imbalance of power and needs among stakeholders and local communities ▪ Conflicting interests among stakeholders and local communities ▪ Lack of bottom-up, participatory approaches	▪ Building consensus through dialogue and collaboration (multi-stakeholder platforms) ▪ Private sector engagement ▪ Participatory and community-based restoration projects
Funding	▪ Limited funding sources ▪ Lack of a clear Return on Investment (ROI) profile in the restoration projects	▪ Public-private partnerships ▪ Securing funding through carbon and biodiversity credits
Magnitude of restoration	▪ Vast areas affected by deforestation and forest degradation ▪ The sheer magnitude of restoration requires coordinated efforts at an unprecedented scale[30] ▪ Restoration efforts on the ground have lagged far behind global targets	▪ The potential benefits of scaled-up ecosystem restoration are immense and aligned with the SDGs ▪ Forest Landscape Restoration (FLR) offer new frontiers for ecosystem regeneration
Ecosystem and biodiversity conservation	▪ Complexity of ecosystem service ▪ Loss of biodiversity and habitat fragmentation ▪ Spread of invasive species	▪ Maintain healthy ecosystems and restoring natural habitats to protect endangered species ▪ Invasives species control measures
Climate change resilience	▪ Global climate change exacerbates ecosystem degradation ▪ Increased frequency of extreme weather events can complicate restoration efforts	▪ Restored ecosystems act as carbon sinks, helping mitigate climate crisis[31] ▪ Incorporating climate-resilience species into restoration
Socioeconomic benefits	▪ Unbalanced distribution of land ownership and resource rights impede ecosystem restoration ▪ Capital subsidies to companies for massive land-use change causes displacement of local communities[32]	▪ Integrating restoration into socio-ecological systems ▪ Creation of green and sustainable jobs ▪ Providing alternative livelihoods through restoration (ecotourism, medicinal plants, water-energy-food nexus)
Technology innovation	▪ Ethical questions surround the use of genetically modified material ▪ Limited access to advanced technologies	▪ High throughput next generation DNA sequencing and functional gene mapping ▪ Utilizing remote sensing and GIS for monitoring

[28] In Peru, land-use planning governed by the Ministry of Environment, but land use change governed by the Ministry of Agriculture, who is responsible for issuing titles and permits. As a result, the Ministry of Environment often has little leverage to support forest conservation (including natural regeneration) in spite of being the responsible entity for implementing avoided deforestation payments (Kowler *et al.,* 2016).

[29] In Northern Thailand (the Ing watershed), supportive legal instruments for participatory management of ecosystem restoration are lacking and discouraged communities to engage and invest in forest restoration (Sapkota *et al*., 2021).

[30] In Colombia, the government is the biggest ecosystem restoration driver: setting up the necessary policy framework to promote ecosystem restoration, and initiating 64% and fully financing 78% of the projects in the country. However, projects lack depth in participatory governance and adequate planning and monitoring, limiting their potential for sustainability and knowledge sharing, both of which are necessary for scaling up (Murcia et al., 2015).

[31] The second-growth forests in the Amazon can potentially accumulate a total aboveground carbon stock of 0.9Mg C ha^{-1} $year^{-1}$ via low-cost natural regeneration or assisted regeneration, corresponding to a total CO_2 sequestration of 3.2 Mg CO_2 ha^{-1} $year^{-1}$ (Chazdon et al., 2016).

[32] In Indonesia, forestry agencies largely control 'degraded' forests and often channel capital subsidies to companies for massive land-use change while at times displacing local communities (Barr and Sayer, 2012). As our current observations and interviews demonstrates, people evictions by private companies are still ongoing in 2024.

Annex 4 – Land governance in Indonesia

Indonesia has a complex pluralistic land system, with hundreds of regulations relating to land. In article 33 of the 1945 Constitution, "land, water and the natural resources in it are under the powers of the State and used for the people's prosperity". The foundation of land legislation is the Basic Agrarian Law (BAL) no. 5 (1960) (Daryono, 2010). This defines the basic types of rights for private individuals, with a ceiling for landholdings, and the role of the state. BAL recognizes customary land law (adat) as representing agrarian land law, although without clarifying any principles of indigeneity, and with the stipulation that it cannot conflict with the interests of the nation or the state. This last point has proved contentious, and the new Land Acquisition Law (2012) has been criticized for making it easier for the government to expropriate land (Neef, 2016). The Ministry of Agrarian Affairs and Spatial Planning (ATR) has merged with the National Land Agency (BPN), and together they administer all non-state land, namely privately-owned residential areas and agricultural land, and non-forest state land. This makes up around 30% of all land in Indonesia. Titles can be issued through the BPN, although adat land must be converted into formal state rights (Daryono, 2010).

State forest zones (*kawasan hutan*) is governed under the Forestry Law no. 41 (1999, replacing Basic Forestry Law no. 5, 1967). Through this law, nearly 70% of all land is designated as state forest land (an implementation of rights that remains a major of conflict today for forest-based communities) and is administered by the Ministry of Environment and Forestry (MoEF). It is sub-divided into conservation, protection and production forest areas, while the titled forest is administered as non-state land by ATR and BPN (Sahide and Giessen, 2015). With the MPR decree 35, 2013, Adat land is recognized as forest areas commanding non-state rights, although formalized recognition requires a long and often expensive process including the legal recognition of the adat community by regional government. Meanwhile concessions are granted for timber, mining and agribusiness plantations (Hayward, 2021).

A landmark event for local rights was the 2012 Constitutional Court decision 35/2012 recognizing the existence of adat communities and their ownership rights over what had always been considered as 'State Forest' held by the Government of Indonesia (GOI) under its constitutional 'powers'. GOI policy has since begun to shift markedly, at least in formal terms, to include measures to recognize adat communities, devolve forest land to them with full registered title, initiate a land reform program (TORA in Bahasa), and expand and develop a social forestry program where villages are given licenses and long leases to use and manage the forests they live in and depend upon. Alongside these measures, the GOI has also been implementing the Systematic and Complete Titling Program (PTSL in Bahasa) as part of the One Map program run through the MAASP. The objective of the current program is to title 23 million parcels of land, including some four million hectares of land degazetted as forest and made available to smallholders (Tanner *et al.,* 2020).

The Social Forestry (SF) program is a clear GOI response to overcoming the poverty and livelihoods impact of land allocations to the private sector over previous decades. The SF program was defined by the State as 'a system of management of forests (on either state forest or private forestland) that involves local communities with the goal to improve their wellbeing and realize

sustainable forestry' (Forestry Law 19/2004). In 2014, the new Government of President Joko Widodo continued the GOI commitment to the existing SF program and established the goal of releasing 12.7 million hectares of state-forest area for utilization under five currently existing SF schemes. This was given further emphasis when the General Directorate for Social Forestry was created in the MOEF in 2015. The TORA land reform aims to distribute nine million hectares to smallholders, including 4.5 million hectares of legalized land and 4.5 million hectares redistributed from state forest concessions and plantation areas (Tanner *et al.,* 2020).

The third progressive change is the recognition of adat communities and the formal transfer of forest ownership to them once they have been mapped, demarcated and registered. However, this process is complex and almost totally under the control of provincial and district (Regency) governments. There is a long list of bureaucratic and documentary requirements, and the process of securing the necessary local regulation (Perda) is subject to political pressures and can take many years. This process is easier in some areas where adat leaders are active in local government, but even here their influence is not always beneficial to the communities they represent. Nonetheless, with the help of national and local CSOs such as the Indigenous Peoples Alliance of the Archipelago (AMAN), the Indonesian Institute for Forest and Environment (RMI) and the *Perkumpulan Hukum dan Masyarakat* (HuMa), many communities have initiated the process of seeking recognition and acquiring rights over what the Constitutional Court has declared as 'their' forests (Tanner *et al.,* 2020).

Table A1. Status of social forestry and TORA programs

	Government Target (2014-2019)	Status of Progress (2018)	Submissions by *Adat* Peoples and CSOs
Social forestry programme	12.7 million hectares consisting of: • Social forestry schemes allocated through user-permits to communities for a given period of time • Customary forests given to communities with title after Constitutional Court Ruling No 35	2.5 million hectares of social forestry including: • 2.48 million hectares of permit-based social forestry schemes • 17 244 hectares of customary forest allocated to *adat* peoples with title deeds • 6 324 hectares of state forest already allocated to rights-based customary forest (*hutan adat)* • 10 919 hectares of non-state forest already allocated to rights-based customary forest (*hutan adat*) • 10 627 hectares earmarked to rights-based customary forest (in the process of being allocated to *hutan adat*)	6.8 million hectares of customary territories indicated by *adat* peoples and NGOs, consisting of: • 6.5 million hectares of State Forest areas • 247 570 hectares of non-State Forest Areas • 3 915 water bodies (Period: 2014-2019)
Agrarian reform programme (TORA)	9 million hectares consisting of: • 4.5 million hectares of legalized land • 4.5 million hectares of redistributed land (4.1 million hectares from State Forest; 0.4 million hectares from plantation areas)	3.6 million hectares of land redistributed and legalized, consisting of: • 1.2 million hectares of redistributed land (994 761 hectares from state forest area and 270 237 hectares from plantation area) • 2.3 million hectares of legalized land	Assets to be legalized: • 1.7 million hectares

Source: Tanner et al., 2020