



IPB University
— Bogor Indonesia —



IPB Centre for Applied Research
in Nature-based Solutions

Rooted in Science, Powered by People

I-CAN Living Laboratory:

Advancing Applied Nature-based Solutions Across Indonesia



In partnership with
Canada



UNIVERSITY OF
WATERLOO

FINCAPES

Flood Impacts, Carbon Pricing, and Ecosystem Sustainability



I-CAN Living Laboratory: Advancing Applied Nature-based Solutions Across Indonesia

The I-CAN Living Laboratory is a flagship initiative of IPB University that transforms scientific knowledge into tangible, field-based impact. Designed as a collaborative platform for innovation and learning, it tests, refines, and scales Nature-based Solutions (NbS) across real-world landscapes.

Through the integration of applied research, restoration practice, community engagement, and multi-stakeholder partnerships, the Living Laboratory addresses ecosystem degradation while supporting resilient and inclusive livelihoods. By combining scientific rigor with local knowledge, it enables hands-on experimentation, adaptive management, and continuous learning in diverse ecological contexts.

More than a research site, the Living Laboratory serves as a bridge between science, policy, and society, generating evidence, practical models, and policy insights that can be replicated and scaled. In doing so, it strengthens IPB University's leadership in biodiversity conservation, climate resilience, and sustainable landscape management, reinforcing its commitment to advancing impactful Nature-based Solutions for Indonesia and beyond.

These interconnected challenges demand integrated, evidence-based solutions. The Living Laboratory therefore functions not only as a research platform, but as a problem-solving space where restoration, resilience, and livelihood strategies are developed and validated in real conditions.

This platform responds directly to pressing challenges observed in the field, including:



Degraded ecosystems that have lost their ecological functions



Increasing risks of fire, flooding, and carbon emissions



Unproductive lands that provide limited benefits to surrounding communities who depend on ecosystem sustainability



Our Three Living Laboratory Sites

Taman Hutan Kampus Living Lab

IPB Dramaga Campus, Bogor

Located within the IPB University campus, Taman Hutan Kampus is both a conservation area and an educational forest. Established under Rector Decree No. 086/1995, it functions as an ex situ conservation space and green open area that supports air, water, and soil regulation.

Home to 39 wildlife species and diverse vegetation, the park serves as:

- A field laboratory for students and researchers
- A biodiversity monitoring site
- A hub for conservation education and interpretation
- A model for biodiversity-based educational tourism

Through hands-on learning and guided environmental interpretation, the Campus Forest Park reflects IPB's commitment to sustainable campus management and environmental stewardship, while contributing to the Sustainable Development Goals (SDGs).



Mangrove Restoration Living Lab

- **Jambi (Pangkal Babu)**
- **Lampung (Pasir Sakti)**

The Mangrove Living Lab focuses on restoring degraded coastal ecosystems while strengthening community resilience.

This site integrates:

- Mangrove rehabilitation and ecosystem-based adaptation
- Blue carbon conservation and climate mitigation
- Community-based restoration and livelihood development
- Gender-inclusive and socially responsive approaches

Restoration areas function as living classrooms where students, researchers, local communities, and government partners collaborate to develop scalable models for sustainable coastal management.

Peatland Restoration Living Lab Jambi (Sungai Gelam & Pematang Rahim)

The Peatland Living Lab addresses the complex challenges of degraded peat ecosystems, including fire risk, carbon emissions, and land-use pressures.

The site integrates:

- Peatland rewetting and revegetation
- Hydrological and carbon monitoring
- Fire risk reduction strategies
- Socio-economic and gender-responsive planning

Through applied research and field validation, the peatland site supports evidence-based restoration planning aligned with national peatland governance priorities and climate commitments.

Strengthening IPB University's Leadership

Through the Living Laboratory, IPB University strengthens its identity as a biodiversity campus and a national hub for applied Nature-based Solutions. The platform demonstrates how research, education, and community engagement can work together to restore ecosystems, build resilience, and advance sustainable development.

The I-CAN Living Laboratory embodies IPB's commitment to innovation, collaboration, and impact—bridging science and society for a more resilient future.

How the I-CAN Living Lab Works

Across all sites, I-CAN applies a consistent framework:

Applied & Collaborative Research



Integrating science with local wisdom



Developing restoration models that support livelihoods



Direct on-site implementation and validation



Analyzing successes, failures, and contributing factors



Multi-Stakeholder Collaboration



- Communities
- Government
- NGOs
- Universities
- CSR / Private Sector

Learning & Capacity Strengthening



Conducting periodic evaluations and drawing lessons from ongoing processes



Providing skills training and technical assistance in the field



Ensuring inclusive participation and gender equality



Emphasizing hands-on practice ("learning by doing") as the primary learning approach

Scaling & Replication



Policy solutions:

Transforming field data into the basis for policy and concrete action



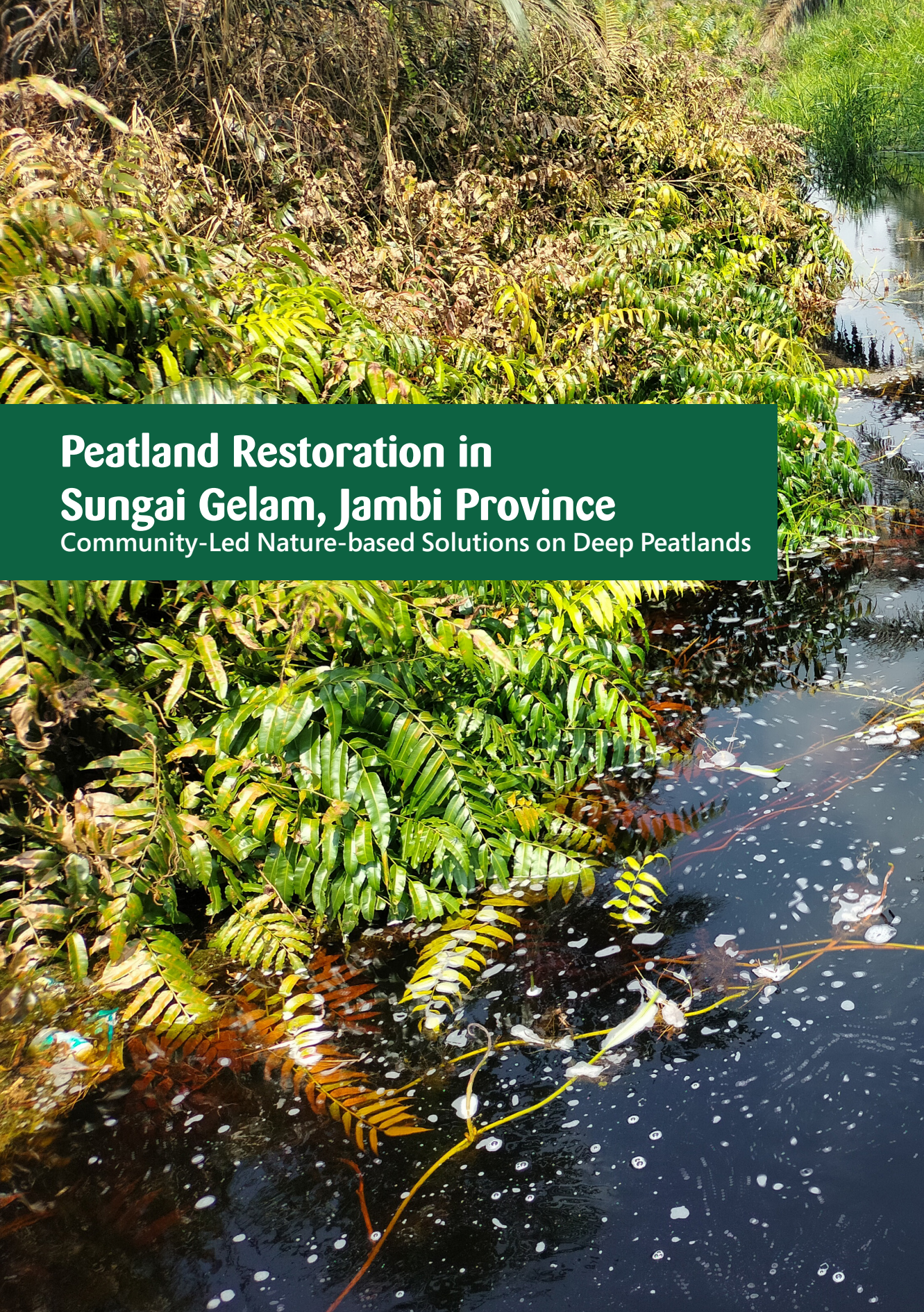
Landscape replication:

Applying successful models across other regions



Knowledge sharing:

Disseminating lessons learned at national and global levels



Peatland Restoration in Sungai Gelam, Jambi Province

Community-Led Nature-based Solutions on Deep Peatlands



The Site at A Glance

The peatland restoration site is located in Sungai Gelam Sub-District, Muaro Jambi Regency, Jambi Province, within the planned Air Merah Village, a proposed administrative division of Sungai Gelam Village. The site lies approximately 38.6 kilometers from Jambi City and is accessible by two- or four-wheel vehicles. Due to poor road conditions along several sections, travel time ranges between 2 to 2.5 hours, reflecting the remoteness of the area and the logistical challenges faced by communities living and working in peatland landscapes.

The restoration area is managed by the Multiusaha Mandiri Cooperative, a community-based organization holding **Social Forestry** management rights over approximately 1,764 hectares of state-owned peatland. Portions of this landscape consist of deep peat, with depths reaching up to seven meters, making it both ecologically critical and highly vulnerable to degradation, fire, and long-term carbon loss.

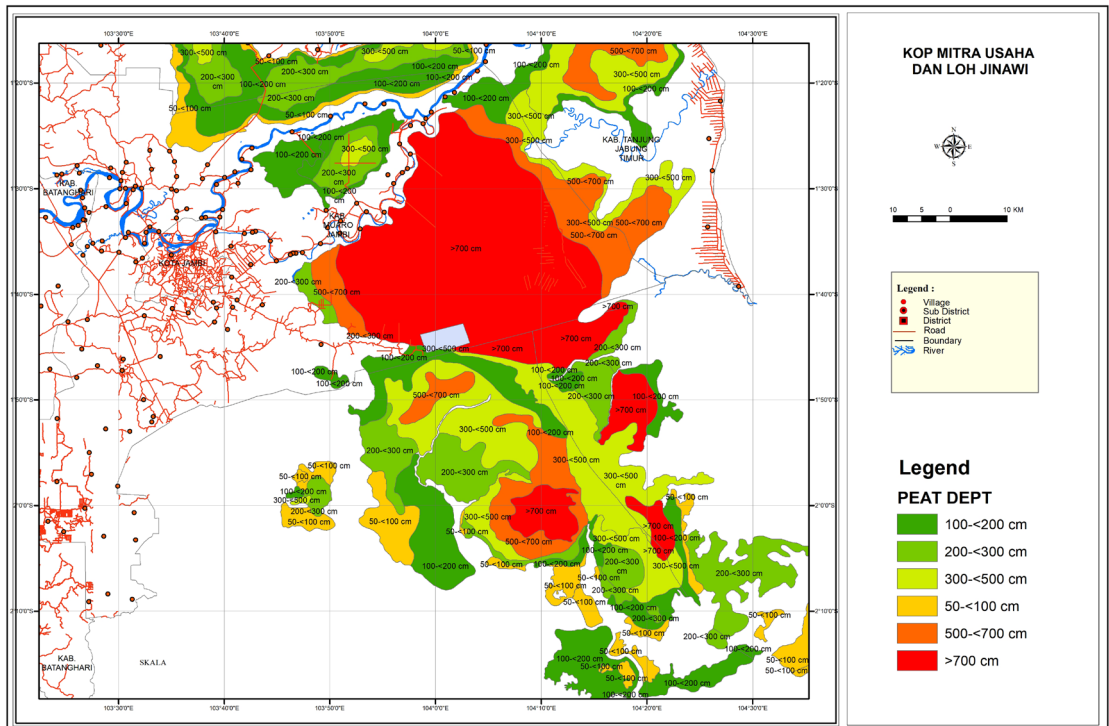
Social Forestry in Indonesia – At a Glance

Social Forestry (Perhutanan Sosial) is Indonesia's national policy that grants local communities legal rights to manage state forest land, turning them into partners in conservation and sustainable development.

Since 2014, more than 7.6 million hectares have been allocated to communities, benefiting over 1.3 million households through schemes such as Community Forests (HKm). The policy aims to address land tenure insecurity, rural poverty, and forest degradation, while contributing to Indonesia's climate commitments under the Paris Agreement and FOLU Net Sink 2030.

Experience shows that permits alone are not enough: meaningful impact depends on post-permit support, including ecosystem restoration, livelihood development, and strong community institutions.

Importantly, the site is located on deep peat close to a peat dome, the natural “*water tower*” of the peatland system. Restoring and rewetting this area helps stabilize water levels not only at the site itself, but also across surrounding peatlands, thereby reducing fire risk, protecting carbon storage, and strengthening the resilience of the wider landscape.



What Happened to This Landscape

This peatland landscape has experienced significant degradation over several decades. Historically, the area was used under concession-based land management, followed by peat-incompatible cultivation practices, including oil palm planting. These activities were accompanied by drainage canals, which lowered the peat water table and disrupted natural hydrological functions.

Repeated peat fires during dry seasons further accelerated degradation. As a result, the area now faces:



Lower peat water levels



High fire risk



Loss of natural peat vegetation



Declining and unstable community livelihoods



Increased carbon emissions

These impacts are not only ecological but also social, as local communities depend heavily on peatland ecosystems for income and daily survival.

Community Context: Strengths & Limitations

Sungai Gelam Village has approximately 10,684 residents, with livelihoods strongly linked to agriculture and plantations. Around one-fifth of the population works directly as farmers or plantation laborers, often with limited income buffers against climate shocks.

The **Multiusaha Mandiri Cooperative**, established in 2006, demonstrate strong social capital, including collective values, community solidarity, and a high degree of honesty and willingness to engage in restoration efforts. These qualities form a critical foundation for long-term peatland recovery.

Multiusaha Mandiri Cooperative is a community-based cooperative established in 2006 that serves as the legal holder of the Social Forestry permit (IUP HKm) in Sungai Gelam, Muaro Jambi. In 2016, the cooperative was formally granted an IUP HKm covering 1,764 hectares of peatland, following provincial approval, enabling the community to legally manage and restore state forest land.

With 470 registered members from Sungai Gelam, Mingkung Jaya, and Gambut Jaya villages, the cooperative is responsible for the planning, implementation, and oversight of peatland ecosystem restoration, ensuring activities align with approved management plans, actively involve cooperative members, and comply with prevailing regulations.

However, community-based management takes place within a complex social and institutional context. While motivation is high, institutional capacity remains limited, particularly in cooperative governance, business management, restricted access to finance and markets, and long-term planning.

These realities underline the need for restoration approaches that strengthen institutions and livelihoods, not only ecosystems.

What Restoration Looks Like on the Ground: Nature-based Solutions in Practice

The Sungai Gelam program applies a Nature-based Solutions (NbS) approach that integrates:



Hydrological Restoration



Construction of three semi-permanent canal blocks



Designs adapted to local canal size, flow direction, and peat conditions



Objective: raise peat water levels, reduce fire risk and prevent long-term peat subsidence.



Vegetation & Agroforestry Restoration



Reforestation of shrubland using peat-native species (e.g. jelutung, balangeran, pulai rawa)



Agroforestry enrichment combining native trees with livelihood crops (coffee, pinang, fruit trees)



Community Capacity Building



Strengthening Agroforestry Business Groups (KUPS)

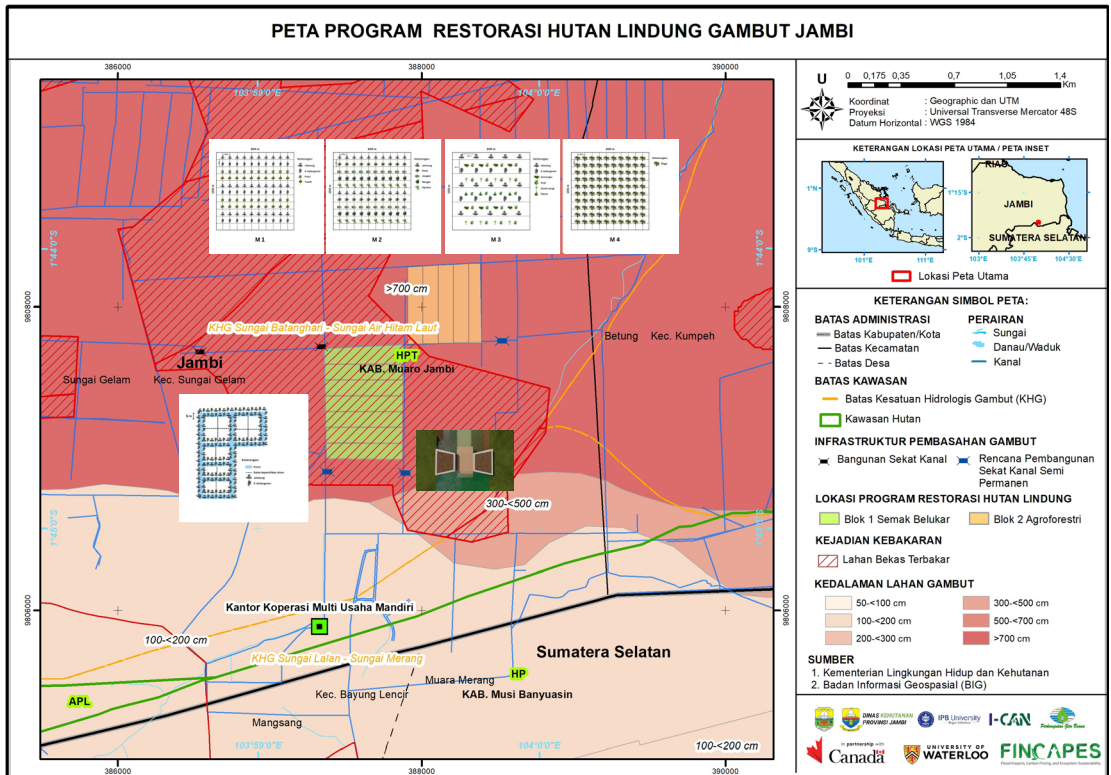
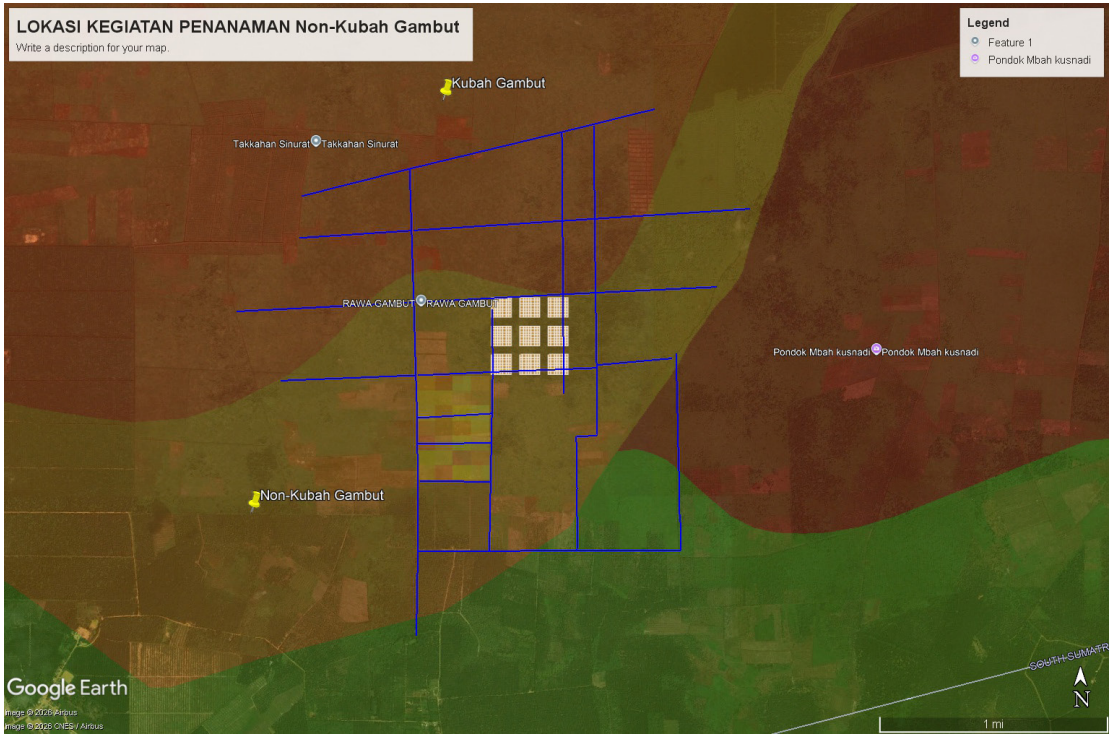


Strengthening Women Farmer Groups (KWT)



Training on peat restoration, peat-compatible agroforestry practices, fire prevention, nursery management, and cooperative business practices

Communities are positioned as primary actors in restoration, rather than passive beneficiaries.





Progress to Date (2025–Early 2026)

Since activities began in 2025, the program has achieved several key milestones:

Foundation Phase

- Baseline data collection and multi-stakeholder coordination involving FINCAPES, universities, local government, NGOs, and community groups
- Development of a technical peatland restoration design
- Initial planning for semi-permanent canal blocking to restore peat hydrology
- Early monitoring of peat water levels and vegetation conditions
- Establishment and initial mentoring of KUPS and KWT

Implementation Phase

Following the selection of Perkumpulan Gita Buana (PGB) as the technical implementation partner, field implementation is ongoing, including:

- Procurement and preparation of peat-native and economically valuable species (such as jelutung and balangeran)
- Land preparation, mound construction, and initial planting in shrub and agroforestry areas
- Construction of field working huts to support restoration activities



Targets & Outcomes

By the end of the restoration cycle, the project aims to deliver:



Restored hydrological function across 47 ha (12 ha Shrubland & 35 ha Agroforestry Areas)



Functioning KUPS Agroforestry and KWT as local managers



Reduced peat fire risk



Improved household income through peat-friendly agroforestry



Increased peat vegetation cover and carbon retention



A replicable, community-led peatland restoration model

Gaps and Challenges

As with all landscape-scale restoration initiatives, several challenges remain:



Canal blocking designs must be continuously adapted to field conditions, hydrological dynamics, and locally available materials



Market access and value-chain development for agroforestry products require further strengthening



Extreme weather events pose ongoing risks to planting success



Sustained coordination across diverse stakeholders is essential



Administrative and logistical process requiring the timeline for planting to be adjusted



Governance challenges within the cooperative require careful, long-term facilitation

Acknowledging these challenges is essential to ensuring realistic expectations and long-term success.

Who Is Involved in This Restoration

Peatland restoration in Sungai Gelam is a **collaborative, community-led effort** involving local institutions, farmer groups, women's organizations, and a long-standing civil society partner—each playing a distinct and complementary role.

- **Koperasi Multi Usaha Mandiri**

As the legal holder of the Social Forestry permit (IUP HKm), the cooperative is responsible for overall planning, implementation, and oversight of peatland restoration within its 1,764-hectare permit area. Established in 2006 and formally granted its HKm permit in 2016, the cooperative represents 470 members from Sungai Gelam, Mingkung Jaya, and Gambut Jaya villages. It ensures restoration activities follow approved management plans, actively involve members, and comply with national and provincial regulations.

- **Agroforestry Farmer Groups (Kelompok Tani Agroforestry)**

These groups act as the frontline implementers of restoration on the ground. With around 30 members, they carry out planting, maintenance, agroforestry practices, and the management of non-timber forest products (NTFPs). Their work integrates ecological restoration with livelihoods, with key commodities including pineapple alongside other peat-compatible crops.

- **Women Farmer Groups (Kelompok Wanita Tani – KWT)**

KWT supports restoration through plant maintenance, processing of restoration products, and development of household-based enterprises linked to NTFPs. Women in Sungai Gelam play an active role in social and economic life and increasingly contribute to farm management, harvest handling, and financial decisions. KWT represents a strong foundation for gender-responsive restoration, with clear potential to scale women's leadership through improved access, capacity building, and targeted support.

- **KPH Muaro Jambi**

The Forest Management Unit supports operational forest management, including vegetation rehabilitation, on-the-ground coordination, and alignment of restoration activities with broader conservation and forest management plans in Muaro Jambi.

- **Perkumpulan Gita Buana (PGB)**

PGB serves as the technical and community facilitation partner, supporting planning, field implementation, and monitoring and evaluation. With roots dating back to 1987 and decades of experience in conservation and community empowerment, PGB provides technical guidance, strengthens local institutions, builds community capacity, and ensures restoration principles, social inclusion, and environmental sustainability are applied consistently throughout the program.

- **IPB University - IPB Center for Applied Research in Nature-based Solutions**

IPB University serves as the academic and scientific partner, providing expert support for the technical restoration design, application of Nature-based Solutions (NbS), technical training on peat restoration, and monitoring of ecological outcomes and community institutional capacity.



- **Universitas Jambi**

As the local academic partner, Universitas Jambi supports baseline data collection, hydrological and vegetation monitoring, and strengthens local knowledge networks linking researchers, local government, and communities.

- **Dinas Kehutanan Provinsi Jambi**

The Provincial Forestry Agency plays a key role in forest governance and fire prevention (karhutla) in peatland areas, while providing technical coordination with district-level agencies and Forest Management Units (KPH).

- **University of Waterloo FINCAPES Project**

The University of Waterloo, through the FINCAPES Project (Flood Impacts, Carbon Pricing, and Ecosystem Sustainability), serves as the knowledge, research, and program backbone supporting peatland restoration in Sungai Gelam. FINCAPES provides the strategic framework, scientific guidance, and international partnership platform that connects community-based restoration with broader climate, carbon, and resilience objectives.

A photograph of a mangrove forest. In the foreground, a structure made of wooden posts and blue-painted horizontal rails is partially submerged in murky, brown water. Behind the structure, several young mangrove trees with green leaves are growing. In the background, a dense forest of taller mangrove trees with thin trunks and sparse foliage stands against a clear blue sky. The overall scene depicts a mangrove restoration project.

Supporting Coastal Resilience through Mangrove Restoration in East Lampung

Purworejo Village, Pasir Sakti District, East Lampung

Muara Sekampung Forest, known as Register 15, is a protected forest designated by Indonesian Law No. 5 of 1967.

Purworejo village in Pasir Sakti District, East Lampung, Lampung Province is one of three acting as a buffer zone for the Muara Sekampung Protected Forest.

Under state management, Muara Sekampung Forest actively involves the community in its monitoring and protection efforts, with strict prohibitions against exploitation due to its crucial role as a buffer zone for sustaining life.



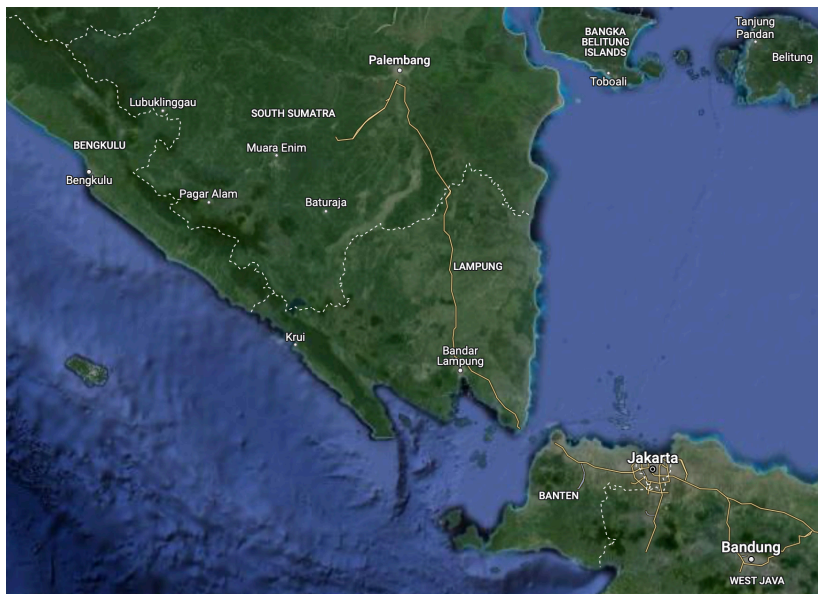
Muara Sekampung Protected Forest

Muara Sekampung Protected Forest houses a resilient mangrove ecosystem covering approximately 513 hectares, with ongoing restoration efforts addressing degraded areas.

Changing habitat conditions call for the consideration of restoring mangrove species like Rhizophora or Bruguiera, with a prime planting season from March to July and October to December, coinciding with ample rainfall, fostering mangrove growth.

The forest's significance extends to biodiversity, serving as a vital waypoint for migrating birds, including Arctic species like the Arctic Gull and Australasian Grebe.

Underwater species include Eeltail Catfish, Seabass, Mudskippers, and Mullet. Unique endemic species include Kuntul putih besar and Raja udang contribute to the richness of the ecosystem.



Mutiara Hijau: A Community's Commitment to Mangrove Restoration and Coastal Protection



Mutiara Hijau Farmers Group (KTH Mutiara Hijau), a community-driven group in Purworejo Village, East Lampung, has become a powerful force in restoring and protecting the local mangrove ecosystem. Faced with severe erosion and environmental damage caused by aquaculture expansion since the 1980s, the community, led by local fisherman Syamsudin, began replanting mangroves in 1995 to protect the coast and revitalize marine life.

Despite initial resistance from the other community members, the group demonstrated how mangrove conservation benefits both the environment and the community's long-term well-being.

Through innovative efforts like the eco-friendly APO Nets, which reduce wave impact and encourage sediment buildup, KTH Mutiara Hijau has successfully restored 400 meters of coastline, transforming previously eroded areas into flourishing mangrove forests. The group also established a mangrove nursery, engaging local women to prepare seedlings for planting. This nursery not only supports local restoration efforts but also supplies seedlings to other regions, creating additional income and underscoring the economic value of sustainable practices for the community.





Enhancing Community-Led Mangrove Restoration through FINCAPES and IPB Partnership

Timeline of Phase 1 Planting Activities

March - April

Preparation stage:

- Biophysics assessment, including oceanographic assessment
- Socio-Economics Mapping with series of consultation with Communities and Local Stakeholder

May- June

- Completed planting 19 Ha
- The first monitoring and evaluation has been conducted

July-August

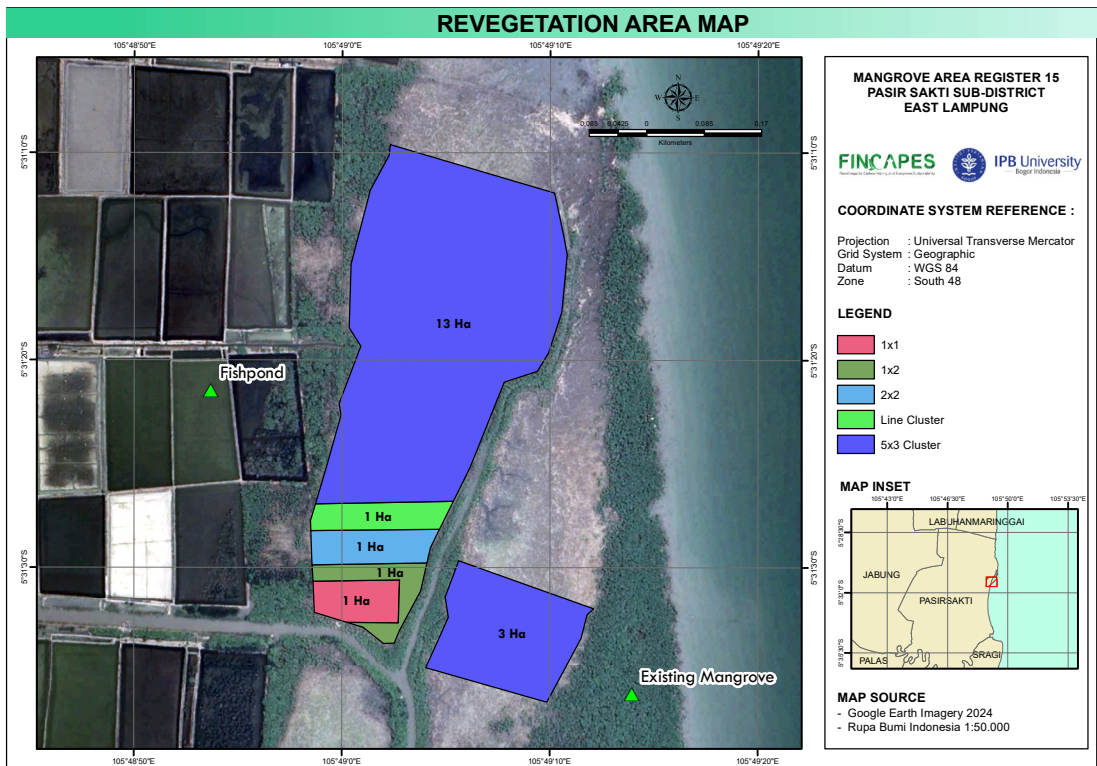
Planting paused due to extremely low water levels

September-October

- Second monitoring and evaluation has been conducted
- Completed planting 6,426 new seedlings on remaining 1 hectare, and replacing 3,000 failed seedlings
- Conducted capacity building for Mutiara Hijau Farmers Group

November to 2025

- Start preparation of Phase 2 of planting activities
- Implementation of capacity building series: empowering local economy through mangrove-based products, business development for mangrove-based product; mangrove ecotourism development.



The mangrove restoration project in Muara Sekampung protected forest, designed in partnership with experts from IPB University and ITERA University, incorporates insights from local community and government consultations. Based on soil, inundation, and salinity analysis, *Rhizophora apiculata* was identified as the ideal species, planted in clusters with variations in spacing (1x1m, 2x1m, 2x2m, 5x3 m and 5x2m) to evaluate growth, carbon capture, and biodiversity outcomes.

Led by KTH Mutiara Hijau, a local farmer group from Purworejo village, planting activities also involve a community-run mangrove nursery, empowering local women. This initiative exemplifies the strength of community-driven conservation for sustainable environmental and socio-economic benefits.

Progress of Phase 1



128,269 seedlings
have been planted



Actively involving **35 (8f, 27m)**
community members in seedling preparation
and planting efforts.



Completed planting in
20 hectares target area



15 farmer group members have
been trained on community
leadership



Strengthening Community Leadership for Mangrove Conservation through Capacity Building



The Mutiara Hijau Forest Farmer Group is essential to implementing Nature-based Solutions for mangrove ecosystems in Purworejo. To enhance their effectiveness, they received capacity-building training in organizational and human resources management. This training equips members with skills to optimize organizational structure, streamline operations, and develop strategies tailored to mangrove conservation.

Additionally, the training provides human resource management techniques, including recruitment, training, and performance evaluation, empowering members to foster engagement and build a cohesive team. By integrating these skills, Mutiara Hijau is now better prepared to drive impactful outcomes in ecosystem restoration and community resilience.



Information:

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FINCAPES Project



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