Nature-Based Solutions Through Mangrove Rehabilitation

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MANGROVE ECOSYSTEM SERVICES

Water Filter

2 to 5 ha of mangroves are able to filter pollutant from 1 ha of fishpond

Fishery

More than 3.000 fish species exist in mangrove ecosystem

Source of Livelihood

Approximately 120 million of people depend their livelihood on mangrove ecosystem

Beach Protection

Mangrove forest is 5 times cheaper in beach protection compared to concrete infrastrctures

Ecotourism

More than 2.000 attractions globally including *boat tours, boardwalks,* kayak, fishing, *edu-ecotourism,* etc.

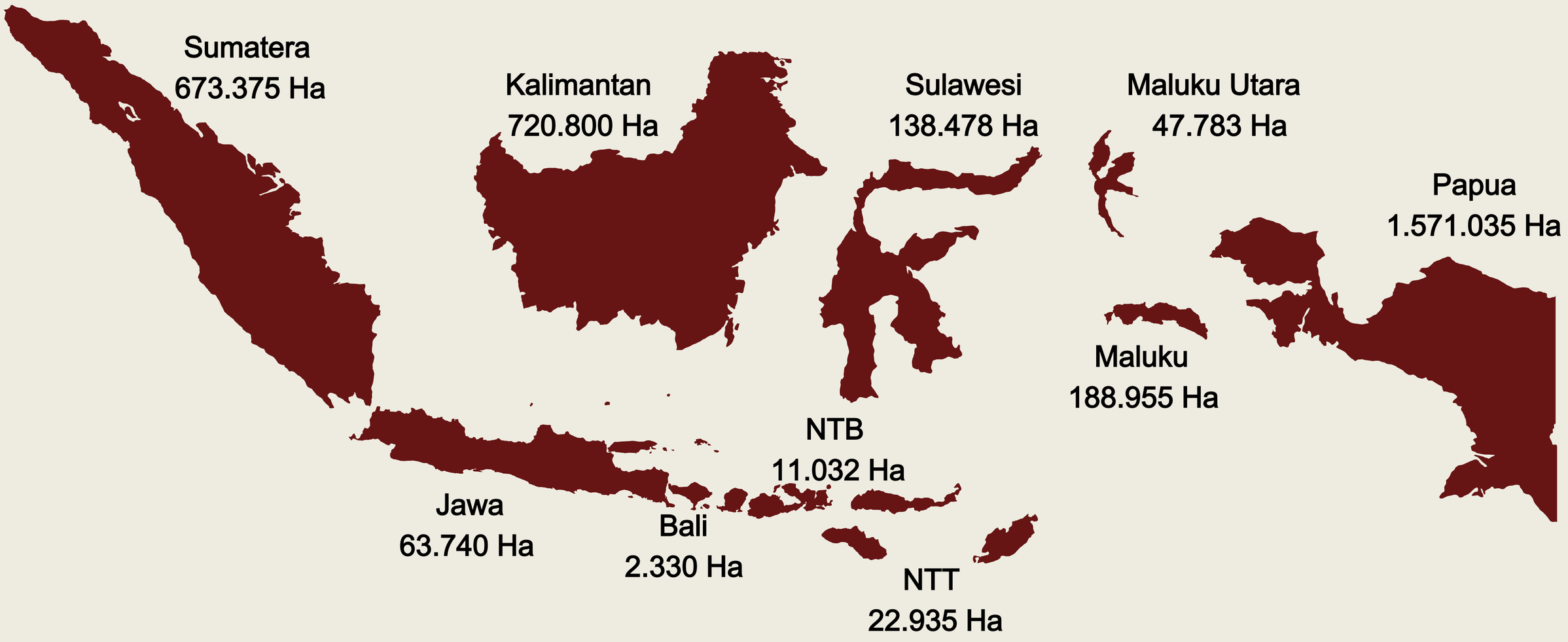
Climate regulator

Carbon stock in mangrove is 3-5 times larger than terrestrial tropical forest

Economy Value

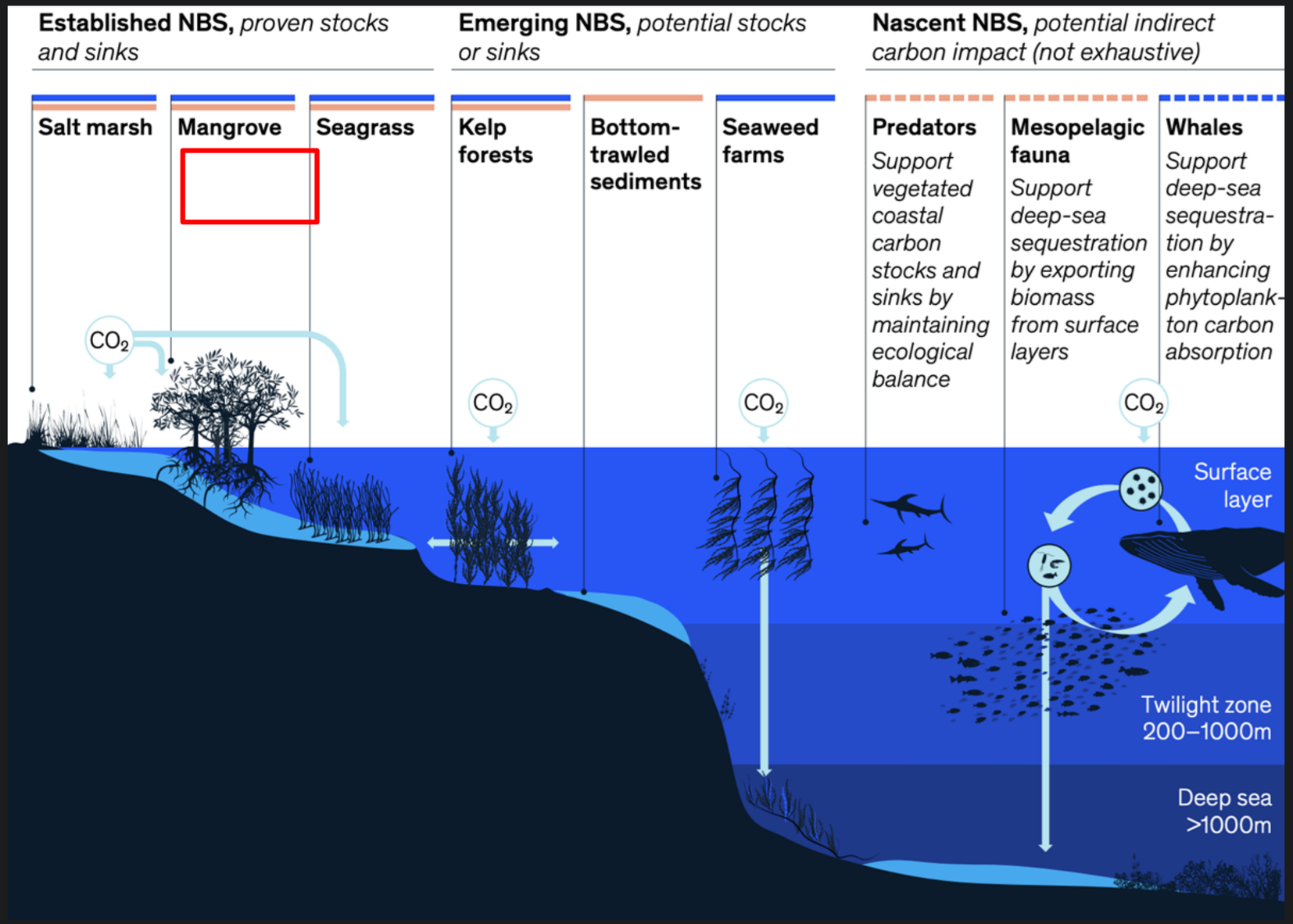
Total economy value from mangrove ecosystem services is predicted around USD 1.5 billion/year

MANGROVE ECOSYSTEM IN INDONESIA



Indonesia has 3.44 million hectares of mangroves (23% of the world's mangroves).
With 79.6% (2,739,138 Ha) being in the state forest areas, equivalent to 18% of the world's mangroves.

MANGROVE ECOSYSTEM AS A PROVEN CARBON STOCKS AND SINKS



Global Mangrove Ecosystem:
14.735.900 ha
can store
22.86 GT CO2 eq
(Global Mangrove Alliance 2022)

Indonesia covers 23% of the Global Mangrove Ecosystem

Indonesia's Mangrove Ecosystem:
3.44 Million ha
can store
5.33 GT CO2 eq

Source: McKinsey, 2022

THE STATE OF MANGROVE ECOSYSTEM IN INDONESIA

Mangrove

3,44
Million ha
Mangrove Existing in Indonesia
(MOEF, 2021)

756
Thousand ha
Potential Mangrove
(MOEF, 2021)

±1.016
MTon C/ha
carbon stored in Indonesia's Mangrove

Threats:

- Illegal logging.
- Mangrove conversion mostly aquaculture, plantations, infrastructure.
- Coastal reclamation.

Changes of Forest Cover on Mangrove

1. According to a study by the Instrument Standardization Agency (BSI), we would face the threat of annual deforestation estimated **at 29.926 ha/year**, especially in non-forest areas.

2. The change from mangrove to non-mangrove is dominated by **fish ponds**, covering an area of 631,802 ha (National Mangrove Map).

3. Deforestation into ponds mainly occurred in non-forest areas while the rest is in forest areas

4. The pond area's low productivity that occurred after years of exploitation without considering the sustainability (as in North Kalimantan), can potentially be the driving factor for the deforestation in mangrove

NATIONAL MANGROVE REHABILITATION PROGRESS IN 2021-2024

±84.396	Hectare for planting	2.992	Communities	4.5 million	Wages
2.172	Hectare for preservation	41.352	Workers	363	SMM based on Village

THE INITIATIVES OF NBS ON MANGROVE REHABILITATION

Silvofishery : Integrated solution between nature, ecology and economic

Silvofishery changes the paradigm from "mangroves OR ponds" to **"mangroves AND ponds"**. It is a win-win solution that aligns perfectly with rehabilitation and coastal resilience.

Benefits

1. Restoring the mangrove ecosystem
2. Providing natural feed
3. Improving the quality and economic value of pond products
4. Increasing resistance to pests and diseases
5. Coastal resilience
6. Building the coastal green belt and support for global climate change mitigation and adaptation programs

OTHER SUCCESS STORY OF NBS ON MANGROVE REHABILITATION

MANGROVE RESTORATION

Transformation—from a severely degraded ecosystem into a world-class center for conservation, education, and ecotourism

The area was not just "reforested"; it was given new value. It became a "**living laboratory**"

National Economic Recovery (PEN) program

Instead focusing on "grey" infrastructure (concrete), the government allocated a significant portion of PEN funds to **"green infrastructure"**—i.e. mangrove rehabilitation

Provide **Dual Benefits**:

1. Economic & Social Benefits
2. Ecological & Resilience Benefits

Build with Nature (BwN)

BwN focuses on fixing the hydrology (e.g., sediment traps) and promoting *Assisted Natural Regeneration*

REAL-WORLD CHALLENGES IN IMPLEMENTATION

Ecological Complexity

Mangrove restoration requires site-specific specific hydrological conditions, appropriate appropriate species selection, and multi-year year monitoring. One-size-fits-all approaches approaches consistently fail.

Budget Rigidity

Government funding cycles and procurement procurement rules cannot accommodate the the adaptive management that mangrove mangrove restoration demands. Flexibility is Flexibility is essential for responding to environmental conditions.

Cross-Sector Coordination

Success requires alignment across forestry, forestry, marine affairs, planning, and local local government—yet institutional silos persist and slow decision-making.

Land Tenure Uncertainty

Overlapping claims between state forest, coastal zones, and customary rights create create legal barriers that discourage long-term long-term community investment in restoration.

Livelihood Integration

Communities need immediate economic benefits to sustain participation. Restoration must connect to aquaculture, ecotourism, and sustainable fisheries from day one.

WHY BUDGET FLEXIBILITY MATTERS

Seasonal Adaptation

Planting windows shift with monsoons and tidal patterns. Rigid annual Rigid annual budgets miss optimal timing, reducing survival rates by up rates by up to 40%.

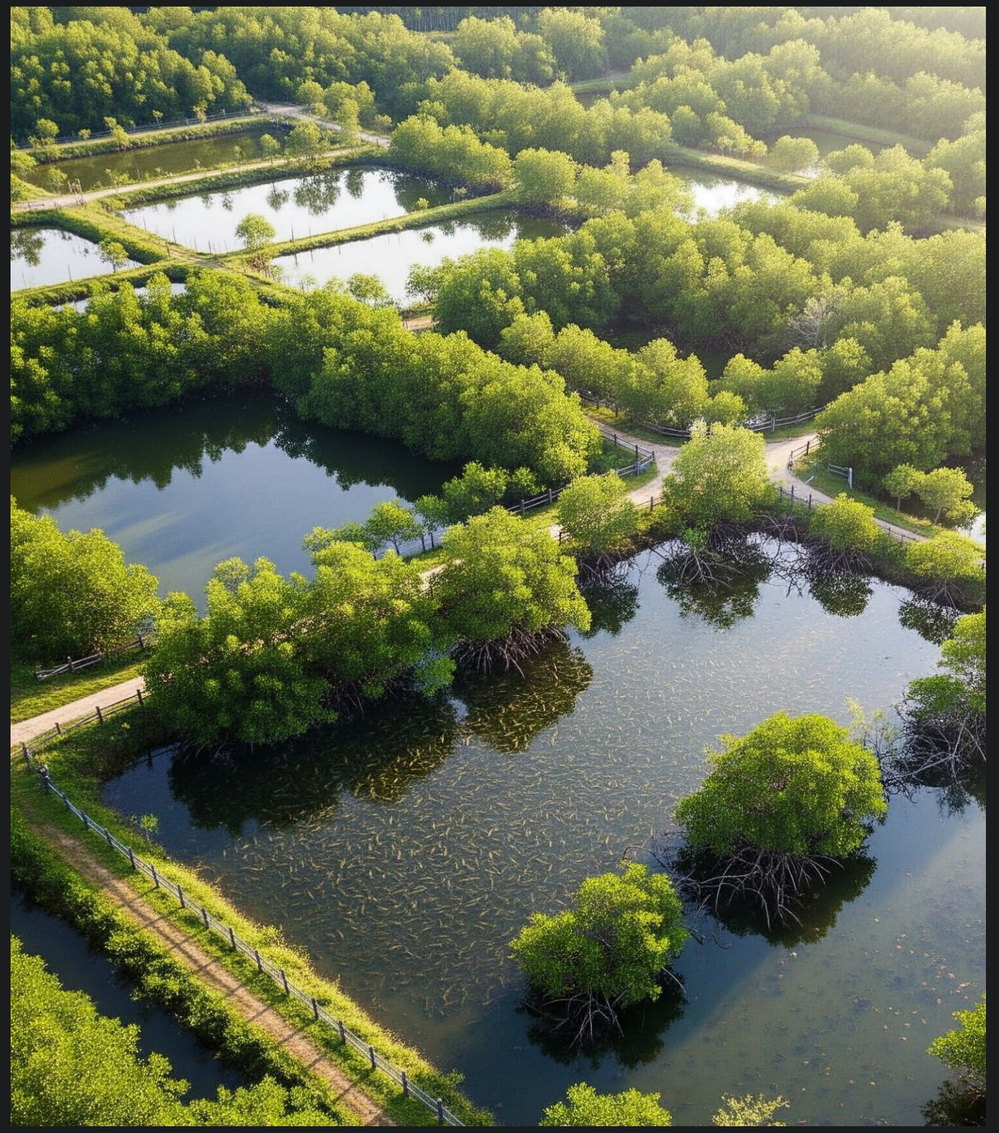
Climate Variability

Extreme weather events require rapid replanting and site adjustments. Fixed budgets cannot accommodate emergency emergency responses to typhoons or flooding.

Adaptive Learning

Field results inform technique refinement. Reallocating funds based on based on what works—versus what was planned—dramatically improves outcomes.

Traditional government procurement timelines take months. Mangrove restoration decisions must happen in weeks. This mismatch undermines even well-designed programs.



COLLABORATION: THE FOUNDATION OF SUCCESS

Government Leadership

Policy frameworks, spatial planning, technical standards, and enabling regulations

NGOs

Community mobilization, on-ground coordination, adaptive management support, advocacy

International Partners

Flexible funding mechanisms, technical expertise, knowledge exchange, and catalytic finance

Local Communities

Implementation, traditional knowledge, long-term stewardship, livelihood innovation

Research Institutions

Monitoring protocols, impact evaluation, evaluation, best practice documentation, documentation, capacity building

Essential Elements for Sustainable NbS Deployment

01

Long-Term Funding Commitment

Mangrove restoration requires 5-7 year investment horizons with adaptive budget mechanisms that respond to field conditions and learning.

02

Multi-Stakeholder Governance

Establish coordinating bodies with decision-making authority across sectors, sectors, backed by clear mandates and conflict resolution processes.

03

Community Economic Integration

Design restoration projects around sustainable livelihoods from inception—inception—ecotourism, silvofishery systems, and value-added products create products create lasting incentives.

04

Science-Based Adaptive Management

Implement rigorous monitoring systems that feed directly into management management decisions, with authority to pivot approaches based on evidence. evidence.

05

Clear Land Rights Framework

Resolve tenure questions upfront through participatory mapping and legal and legal recognition of community management rights in restoration areas. restoration areas.

06

Knowledge Sharing Systems

Document lessons learned, share across geographies, and build South-South South-South learning networks to accelerate global mangrove restoration restoration effectiveness.

Beyond Government Budgets: A Call for Innovative Finance

Indonesia's experience proves that rigid government procurement systems cannot meet the demands of complex ecosystem restoration. We need funding mechanisms that enable:

- **Rapid deployment** when ecological windows open
- **Multi-year flexibility** to adapt to field realities
- **Performance-based disbursement** tied to survival rates, not activity completion
- **Direct community access** to resources for local implementation

Blended finance, climate funds, and philanthropic partnerships offer the offer the flexibility mangrove restoration requires. We invite the global global community to co-design these mechanisms with us.

Moving Forward Together

For Donors & Finance Institutions

Design funding vehicles with built-in flexibility, long-term commitments, and streamlined approval processes that match restoration timelines.

For Governments

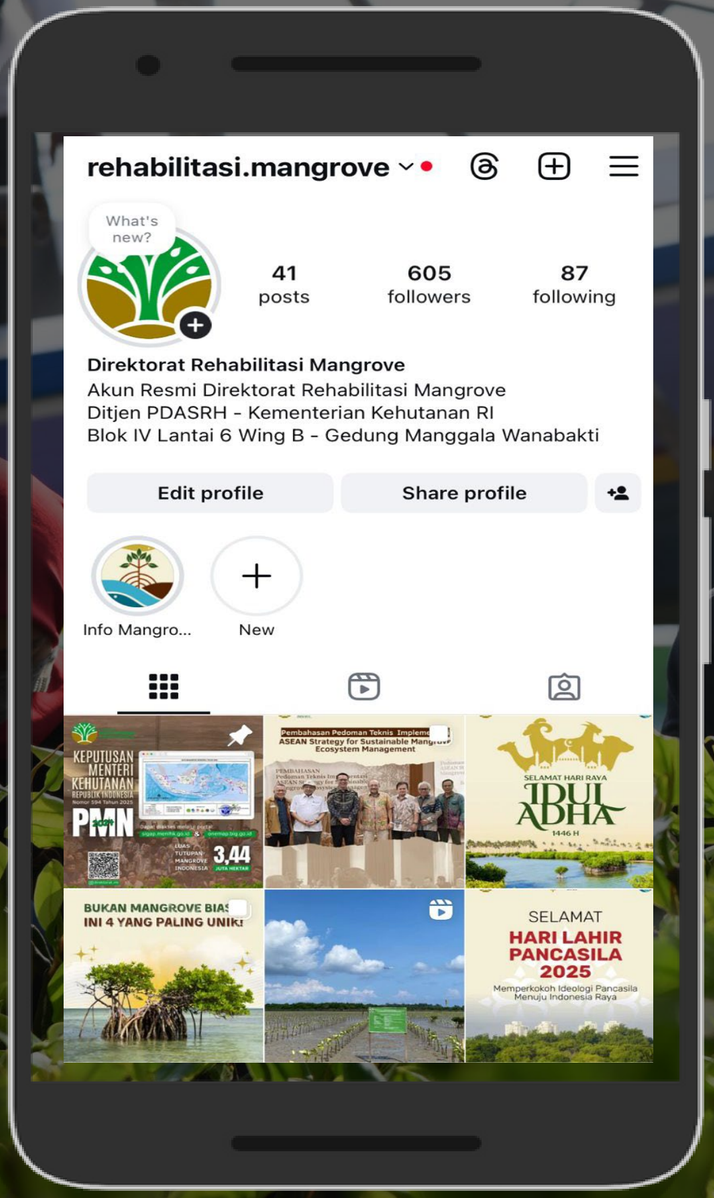
Create enabling policy frameworks, resolve land tenure issues, and establish cross-sectoral coordination mechanisms with real authority.

For Technical Partners

Share knowledge openly, support capacity building, and help communities access the latest restoration science and monitoring tools.

Indonesia's mangrove rehabilitation experience offers both inspiration and caution. **Success is possible at scale—but only through genuine collaboration, adaptive approaches, and finance models that match the complexity of nature itself.**

The Ministry of Forestry stands ready to deepen partnerships and share our learning journey. Together, we can Together, we can transform how the world approaches Nature-based Solutions.



TERIMA KASIH

rehabilitasi.mangrove