Enabling Green Growth in Indonesia's Peatlands

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Acknowledgements

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Introduction

Indonesia has achieved important economic and social progress in recent decades despite difficult conditions in the world economy. Domestic challenges have included natural disasters and the degradation of natural resources, including in peatlands, which have had impacts on economic potential and resilience. The Indonesian government increasingly recognizes the need for green growth, that is, environmentally sustainable, low carbon, and inclusive economic growth. The current five-year development plan (2020-2024) is its first Low Carbon Development Plan. Currently, the largest sources of greenhouse gas (GHG) emissions are from land-use, land-use change and forestry. Many of these emissions are linked to peatland degradation, with peatlands accounting for 40% of the total GHG emissions in Indonesia from 2010 through 2016.[1] Indonesia has committed to reduce its overall emissions by 29-41% as of 2030 under its Nationally Determined Contribution (NDC) to climate change mitigation. Peatland management and protection will play a major role in achieving this ambition.

Importance of Peatlands and Management Challenges

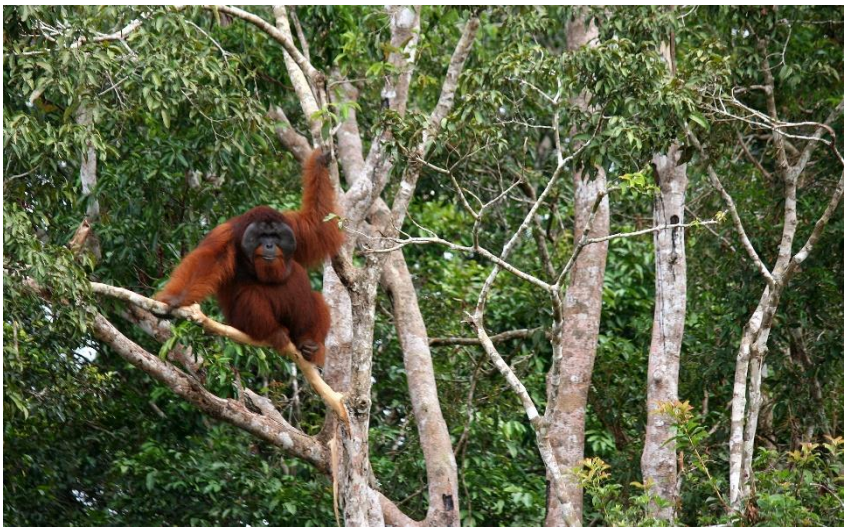

Figure 1. Orangutans are critically endangered and only found in the rainforests of Borneo and Sumatra.

Peatlands cover about 10% of Indonesia's land area, but they play a disproportionally large role in the provision of ecosystem services, particularly carbon storage and the natural regulation of water flow. Their importance for climate change mitigation stems from being the largest terrestrial carbon stores, with peatlands storing over two times more carbon than the world's forests. Water flow is a critical factor in peatland ecology; thus, management must focus on whole hydrological units, or landscapes, including adjacent areas of mineral soils. Peatlands provide a steady supply of clean water, timber, and non-timber forest products, including foods, medicines, resins, and fish. Peat swamp forests harbor high levels of biodiversity and provide attractive opportunities for the development of tourism. Indonesia's peatlands have not been fully and accurately mapped, so estimates of their extent vary widely, ranging from the official figure of approximately 15 million hectares (ha) to more than 22 million ha.[2,3] Indonesia has been estimated to contain about 36% of the world's tropical peatlands, holding some 28 gigatons (Gt) of carbon - 30% more than the amount of carbon stored in all of Indonesia's forests.[4] Partly for this reason, reducing or preventing the emissions of GHGs from peatland degradation is a vital and cost-effective option for climate change mitigation.

Since the 1980s, extensive areas of peat swamp forests have been drained for agriculture and forestry. Two types of large-scale plantation industries have expanded onto peatlands: oil palm and pulpwood plantations.[5] Government policies, promoting the rapid expansion of Indonesia's pulp and paper industry and the oil palm

Figure 2. Oil palm harvest at Desa Sungai Gelam, Jambi, with smoke ominously rising from the distant peat swamp forest.

sector, and the limited knowledge and experience regarding the special management needs of tropical peatlands, exacerbated pressures on natural forests and peatlands. As a result, the conversion of peatlands accelerated, and now plantations are present on over 6 million ha of peatlands, including smallholder activities that cover just over 3 million ha. In addition, over 2 million ha of economically unproductive drained peatlands are covered by shrubs and ferns.[6]

The crop species commonly grown in commercial plantations, and by smallholder farmers, on peat soils require drainage, which leads inexorably to peat degradation, soil decomposition, and increased fire risk. Degradation of Indonesia's peatlands has led to major fire events affecting millions of hectares of land and creating smog-haze, affecting tens of millions of people in Indonesia and neighboring countries.[7] The major fire and haze event in 2015 was estimated to have caused more than USD 16 billion in economic damages.[8,9]

Drainage also results in peatland subsidence, that is, the gradual caving in or sinking of a land area, which increases flood risks. If the current drainage-based land-use continues, large areas of Sumatra and Kalimantan will become increasingly subject to flooding due to irreversible subsidence. Recent studies suggest that over 60% of currently drained peat areas may become prone to prolonged flooding by the middle of this century if nothing is done to stop the drainage.[10, 11] This will have devastating socio-economic impacts, as these landscapes will be exposed to prolonged flooding in the wet season while also being fire prone in dry periods.

Emissions and soil subsidence may be slowed, and eventually stopped, through the restoration of the peatland eco-hydrology. This requires not only rewetting through the blocking of drainage canals, but also the establishment of a permanent vegetative cover, that includes trees, and the revitalization of the livelihoods of people living in and around the peatlands.

Policies and Regulations Affecting Peatlands

Figure 3. Burned peat swamp forest, Ex Mega Rice Area, Central Kalimantan.

The Indonesian government made it a major priority to address the peatland fire issue, including a range of new policy measures and regulations. A national Peatland Restoration Agency was established in 2016 with a mandate to restore more than 2 million ha of critically degraded, high fire-risk peatlands in the areas most affected by the last major fire event in 2015. However, millions of hectares of additional degraded peatlands are not yet covered by this mandate. The government has introduced new regulations and initiatives to

strengthen the protection and management of peatland areas, including a landscape approach based on hydrological units, a peatland land-use zoning map, peatland protection and management plans, improvements in water level management, a permanent moratorium on peatland land clearing, systems for monitoring, supervision and sanctions, and a land swap procedure.

These changes have great potential to improve peatland management outcomes, especially if taken in conjunction with measures to further strengthen the policy and legal framework as a basis for sustainable, business-based peatland development. Current policy allows limited peatland drainage within plantations. However, it is increasingly recognized that to overcome the management challenges described in the previous section, the policy needs to aim for rewetting most of Indonesia's vulnerable peatlands and transitioning away from drainage-based land-uses. Only this course of action can stabilize the ongoing degradation of peat ecosystems. Financial and fiscal incentives, as well as disincentives, are needed to attract investment and promote action to foster sustainable and productive enterprises in rewetted peatlands.

The NDC roadmap, which is meant to guide the achievement of national climate change mitigation ambitions, calls for peatland restoration and improved water management as key steps to reduce GHG emissions.[12] Indonesia can continue to strengthen its commitment to move away from the extensive drainage of peatlands and towards a more robust and comprehensive regulatory framework for their sustainable use.

Integrating Landscape, Business, and Community Based Approaches

Figure 4. A demonstration of paludiculture, where useful trees are planted in rewetted peat swamps.

With the need for a landscape-wide approach to restoration - that is, full rewetting, revegetation, and economic revitalization based on whole peatland hydrological units (as embodied in the '3-Rs' paradigm of the Peatland Restoration Agency) - an integrated landscape zoning model for the development of business-based enterprises within these landscapes is appropriate. The model is based on the restoration of degraded and fire-prone deep peat within a core protection zone, surrounded and supported by a substantial production zone on shallower peat and adjacent mineral (non-peat) soils in which local communities and businesses undertake complementary land use activities. The production zone can encompass profitable community-based and private sector forestry, agroforestry, and other enterprises that provide livelihoods for farmers as well as a reasonable return on commercial investment.

Ecological restoration with productive economic outcomes on peatlands requires alternative farming practices under wet conditions, known as paludiculture. This approach will protect the peat carbon store, reduce the risk of fires, reduce soil subsidence and thus future flooding, and provide economic development prospects including investment from the carbon sector. A range of agroforestry options are available, depending on the

management objectives and site-specific conditions such as hydrology, peat soil characteristics, current land use and land use policy, land tenure, and the priority given to conservation or protection. Over 500 indigenous peat swamp plant species with known uses have been identified, and approximately 80 of these have potential for paludiculture development.[13] It is therefore warranted to plan for a gradual and responsible phasing-out of drainage-dependent crops and the introduction of alternative, wetland crops, before soil subsidence progresses further.

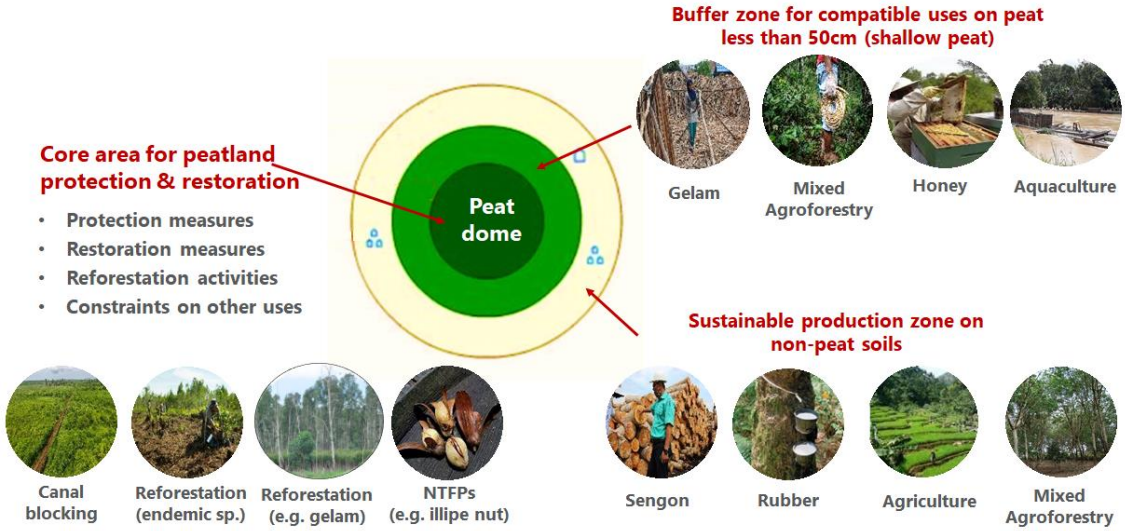

Figure 5. Landscape design and peatland landscape, protection, and development. Source: International Tropical Peatlands Center.

Improving community livelihoods on non-peat soils and on the shallow peat in buffer zones will help secure local support for protection and restoration within the deeper peat areas, which in turn will contribute to the maintenance and restoration of ecosystem services, including the carbon storage function essential to achieving Indonesia's NDC goals as well as the water regulation function that is important for climate change adaptation. This can be further advanced through the legal recognition and protection of legitimate tenurial rights, including social forestry arrangements and customary rights (*hak adat*) as well as (sustainable) utilization licenses over peatlands near villages, but also through stopping and reversing smallholder expansion into fragile deep-peat areas. Transparency about land tenure rights and claims will help to enhance stakeholder involvement and investor confidence in land-use development and peatland restoration.

Peatland Finance and Investment

The World Bank has estimated the initial cost for rewetting 2 million ha of degraded peatland to be around USD 2 billion. While some of this cost can be borne by landowners and concession holders, this restoration target does not cover even half of the most critically degraded peatlands in Indonesia. Central Kalimantan alone has nearly 1 million ha of critically degraded peatlands that are badly in need of restoration and do not fall within existing concessions.

The economic case for restoring peatlands is clear. The potential benefit in terms of avoided costs by restoring peatlands can be multifold. The benefit in terms of avoided costs from future fires is significant enough to justify upfront investment in peatlands restoration.

Investment required for Peatlands Restoration

- **Upfront cost:** Assuming the restoration costs to be around USD 1000–1500/ha, 2 million hectares of peatlands restoration in Central Kalimantan could require a financing of around USD 2 billion (World Bank)
- **Key investment areas:**
  - Restoration and revegetation costs,
  - Sustainable economic development investments,
  - Monitoring Reporting and Verification

Socio-economic benefits from Peatlands restoration

- **Avoided costs:** 2015 fires across 850,000 hectares of peatlands in Sumatra and Kalimantan resulted in USD 16 billion economic losses (~USD 19,000/ha cost)
- **Emission reductions:** Around 100-140 million tCO2/yr (excluding fires) emission reduction could come from 2 million hec of peatlands in Central Kalimantan.
- **Local economy and livelihoods boost:** Sustainable peatlands restoration could generate millions of jobs for local communities and support local economy.

Figure 6. Required investments and socio-economic benefits related to peatlands restoration in regions of Indonesia.

Given the large amount of carbon stored in peatlands, together with the widely recognized value of avoided GHG emissions, there is a substantial, but as of yet, largely unrealized business potential to access large-scale financing from carbon markets and related finance, such as international climate funds and other results-based payment schemes. A few site-based projects have already begun to demonstrate how carbon markets can be used to access finance for the restoration of Indonesian peatlands.

A blend of public and private finance is needed for investment in peatland restoration, combined with suitable business models based on payments for carbon, other ecosystem services, paludiculture on rewetted peat, and intensified production of agriculture and agroforestry on adjacent non-peat soils. The significant public benefits of protecting productive peatlands and avoiding the costs of fire, haze, floods, and GHG emissions warrants a substantial investment of public funds to rectify the problems caused by mistaken policies of the past and to encourage additional private investments in suitable business opportunities in and around restored peatlands.[14] Recently, Indonesia has seen a sharp uptake of green bonds as a financing mechanism for green or climate change-oriented projects. Additionally, sovereign bonds could be useful to finance peatlands restoration work at a large scale.

Figure 7. Daily life in an Indonesian peat swamp forest.

Conclusions and Recommendations

Figure 8. Wildlife viewing tours by boat.

Indonesia's peatlands constitute a natural asset of high ecological, economic, and cultural value. However, much of the original extent of peat swamp forests has been damaged or lost, with nearly half suffering some degree of degradation from deforestation, drainage, and fires. Millions of hectares are critically degraded and at high risk of suffering devastating fires in dry years. The costs of these recurring "disasters" to Indonesia and its neighbors are enormous, so much so that the government has recognized the need for action and has put into effect policies and actions that are beginning to halt and reverse further degradation of peatlands. In order to achieve the emission reduction targets for 2030, as set out in the NDC, Indonesia will need to focus not only on the conservation of its remaining peat swamp forests but particularly also on the restoration of degraded peatlands and sustainable use of the restored areas.

Indonesia can indeed change its development pathway, protecting its forests and peatlands, and at the same time boost the production of sustainably produced palm oil, pulp, paper and other products from plantations on mineral soils, in particular from smallholders where the largest gains in productivity can be made. The long-term social and economic benefits of such change will be substantial. Although some affected businesses and districts may bear a larger share of the burden, mitigating policies and fiscal incentives can be provided to share benefits and assist in the transition. The economic value of the avoided GHG emissions alone, if monetized (or reflected in fiscal policies linked to the NDC), would more than pay for the costs of restoration and cover at least a portion of the opportunity costs of shifting to an alternative paradigm for peatland protection and development.

Figure 9. Tundai fishing village in Central Kalimantan peat swamp forest.

Four areas where the Indonesian government can make progress with a low carbon, environmentally sustainable, and socially inclusive peatland management agenda can be highlighted:

1. Strengthening the legal regulations governing peatland land use, including harmonization between the spatial planning, forestry, agriculture, and environment sectors;
2. Creating a more comprehensive policy for the transition to landscape-scale peatland restoration and phasing out peatland drainage, including the further use of peat zoning regulations to define areas for production on rewetted peat (paludiculture);
3. Developing fiscal and other incentives for sub-national government, private sector, and communities to promote peatland protection and management;
4. Developing innovative financial mechanisms and technical assistance to support the large-scale restoration of peatlands with community-based enterprises within value chains for commodities from rewetted peat and ecosystem services.

The aspiration to make progress in all four of these areas is reflected in Indonesia's NDC Mitigation Roadmap as well as in the current National Medium-Term Development Plan (RPJMN 2020-2024).

Ultimately, the phasing out of peatland drainage is the only sustainable management approach for peatlands. This transition will require a strategic and time-bound approach in order to achieve Indonesia's development goals. It will not be easy to undertake these changes, but comprehensive policies, investments, and actions building on the recent significant progress can generate outcomes that will benefit Indonesia and enable it to achieve its NDC targets and Sustainable Development Goals (SDGs).

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