D4S Insight Report B.3

Potential of carbon emission reduction investments in plantations on tropical peatland

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(https://www.dataforsustainability.com/)

Industrial plantations cover at least 5 million hectares of SE Asian peatland, emitting over 250 Mt CO_2e/year, yet plantation land is almost never considered for carbon investment. This may be a missed opportunity. Plantation companies have the operational capacity and land mandate that many restoration organisations lack. Millions of hectares are near the flooding threshold where crop production is no longer viable and companies will be looking for alternative uses. Identifying such concession areas would be the key to unlocking this potential.

Some considerations based on our experience and insights:

What are the carbon emissions from plantations on tropical peatlands?

Despite initiatives over the last 10 years to reduce peat loss, carbon emission and subsidence, by governments and private sector in SE Asia, these drainage impacts continue to be severe. Water levels have been raised in some of the best managed plantations, but not as much as expected, in large part because current crops are not tolerant to waterlogging and water managers will prioritize avoiding flooding over reducing peat loss. While assessments differ, the minimum plantation area on peatland in the region is 5 million hectares i.e. some 25% of common peat extent estimates (that also still differ). Carbon emissions from plantations exceed 250 million tonnes (CO_2 equivalent) per year according to most studies. As long as conventional crops are grown that require drainage, the reduction potential is thought to be 30% at most (see Insight report B.1).

What are the carbon emissions from plantations on tropical peatlands?

Despite 10 years of initiatives to reduce peat drainage impacts, emissions remain severe. Industrial plantation cover at least 5 million hectares of SE Asian peatland, roughly 25% of total mapped peat extent. Carbon emissions from these areas exceed 250 Mt CO_2e/year according to most studies. Water levels have been raised in some well-managed plantations, but not as much as expected, because plantation water managers must prioritize flood avoidance over peat conservation. With conventional drainage-dependent crops, the maximum achievable emission reduction is approximately 30%.

Why are plantations not being considered for carbon investment?

The primary barriers are institutional and perceptual rather than technical. Plantation companies are seen as part of the problem, not the solution. And additionality concerns are real, a company responsible for causing emissions through drainage cannot simply claim credit for undoing them. Leakage risks exist if a company restores one area but expands elsewhere. And most investors have focused on intact forest protection or community-based restoration, overlooking the plantation sector.

Yet many of the uncertainties that deter investors from peatland restoration elsewhere are actually reduced on plantation land: companies hold legal land mandates, have operational and monitoring capacity on the ground, have largely eliminated fires through surveillance and enforcement, and community tenure issues are often less complex in thinly populated plantation landscapes.

Could plantations on peatlands be invested in for carbon emission reduction?

We propose that full restoration of certain plantations, or parts or plantations, rewetting the land to allow peat swamp forest to return and drastically reduce carbon emissions, could offer specific benefits to both plantation companies and investors (see Insight Report B.1), even though this approach may take time to develop and is not widely considered now.

What are scenarios for plantation restoration on Southeast Asia peatland?

Clearly, most peatlands now utilized for plantations can not be restored in the near future; financial dependencies on continued production are large and there is global demand for the products. However, there are areas where other factors may outweigh these short-term financial interests. Identifying potential projects may start by considering such scenarios:

<u>Scenario 1: Unproductive Land (Current or Near Future).</u> Extensive coastal peatland areas have already subsided by several metres over recent decades, bringing land surfaces near the tidal range where flooding is frequent and inevitable (see Figure 1, Insight Report A.1; Insight Report A.5). These areas already have limited or zero crop yields, and water management to reduce flooding is costly and ineffective.

For plantation companies understanding this reality, the calculus will be straightforward: **restoration will cost less than continued investment in unproductive crop systems**. Occasional flooding actually benefits rapid establishment of flood-tolerant forest types. Where tidal saltwater intrusion already occurs, mangrove restoration becomes viable. There would be substantial additional carbon capture in new forest biomass. Some restored wetland forest may eventually support commercial harvest under sustainable paludiculture models (long rotation cycles, without drainage), further reducing net restoration cost and political opposition to retiring production land.

<u>Scenario 2: Buffer Zones Along Conservation Forest.</u> Peat swamp forest adjacent to or within plantation concessions is often in poor condition (Insight Report B.2). Plantation drainage systems are not designed to maintain water levels in peripheral areas, and the lateral drainage impact extends at least 1 to 2 km from perimeter canals. This generates emissions and degrades forest and biodiversity, even in nominally 'protected' areas.

D4S recommends buffer zones of at least 1 km wide along plantation-forest boundaries, possibly in two steps: (1) the 500 m (or more) along the forest edge should be fully rewetted to support peat swamp forest regrowth; (2) the 500 m on the plantation side could have raised water levels that still permit some crop production but reduce drainage impact on the forest. We estimate that many hundreds of kilometres of such boundaries exist across SE Asia, yielding tens of thousands of hectares of restoration potential. Carbon credit may be obtained for rewetting both the plantation buffer as well as the formerly drained forest.

Scenario 3: Land Allocated for Restoration. Some areas within concessions have already been designated for conservation or restoration by government regulation or voluntary company commitments. While these alone may not meet additionality requirements for carbon credits, they add significant value when combined with Scenarios 1 and 2, creating large contiguous restoration units with enhanced ecosystem value at the landscape scale.

Addressing additionality and leakage

The core 'additionality' principle is that an entity responsible for causing emissions cannot financially benefit from reversing them. Two approaches may mitigate concerns:

- Independent restoration entity: Establishing a new, legally separate organisation to control restoration execution and benefits, distinct from the plantation company.
- Demonstrated non-viability: For areas already flooding or projected to flood within a few crop cycles, continued production is not a plausible baseline scenario. Restoration of such land is therefore additional: it would not occur without carbon finance, because the company would likely simply abandon the land in a state unsuitable for restoration.

Concerns around 'leakage', i.e. the scenario where restoring one area drives degradation elsewhere, are mitigated by several factors on plantation land:

- Several large companies have made public pledges (NDPE—No Deforestation, No Peat, No Exploitation) to not expand into new forest or peatland areas.
- Companies can demonstrate that their total emissions are decreasing, not shifting.
- Regional-scale satellite monitoring of land-use change helps manage leakage risks.

SELECTED FURTHER READING (D4S PUBLICATIONS)

Subsidence and carbon loss in drained tropical peatlands (link: Subsidence and carbon loss in drained tropical peatlands (https://bg.copernicus.org/articles/9/1053/2012/)

Extent of industrial plantations on Southeast Asian peatlands in 2010 with analysis of historical expansion and future projections (https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1757-1707.2012.01172.x)

Flooding projections from elevation and subsidence models for oil palm plantations in the Rajang Delta peatlands, Sarawak, Malaysia (https://www.deltares.nl/en/expertise/projects/flooding-projections-for-oil-palm-plantations-in-the-rajang-delta-peatlands-sarawak-malaysia)

Hydrological and economic effects of oil palm cultivation in Indonesian peatlands (https://www.ecologyandsociety.org/vol21/iss2/art52/)

Benefits of tropical peatland rewetting for subsidence reduction and forest regrowth: Results from a large-scale restoration trial (https://www.nature.com/articles/s41598-024-60462-3)

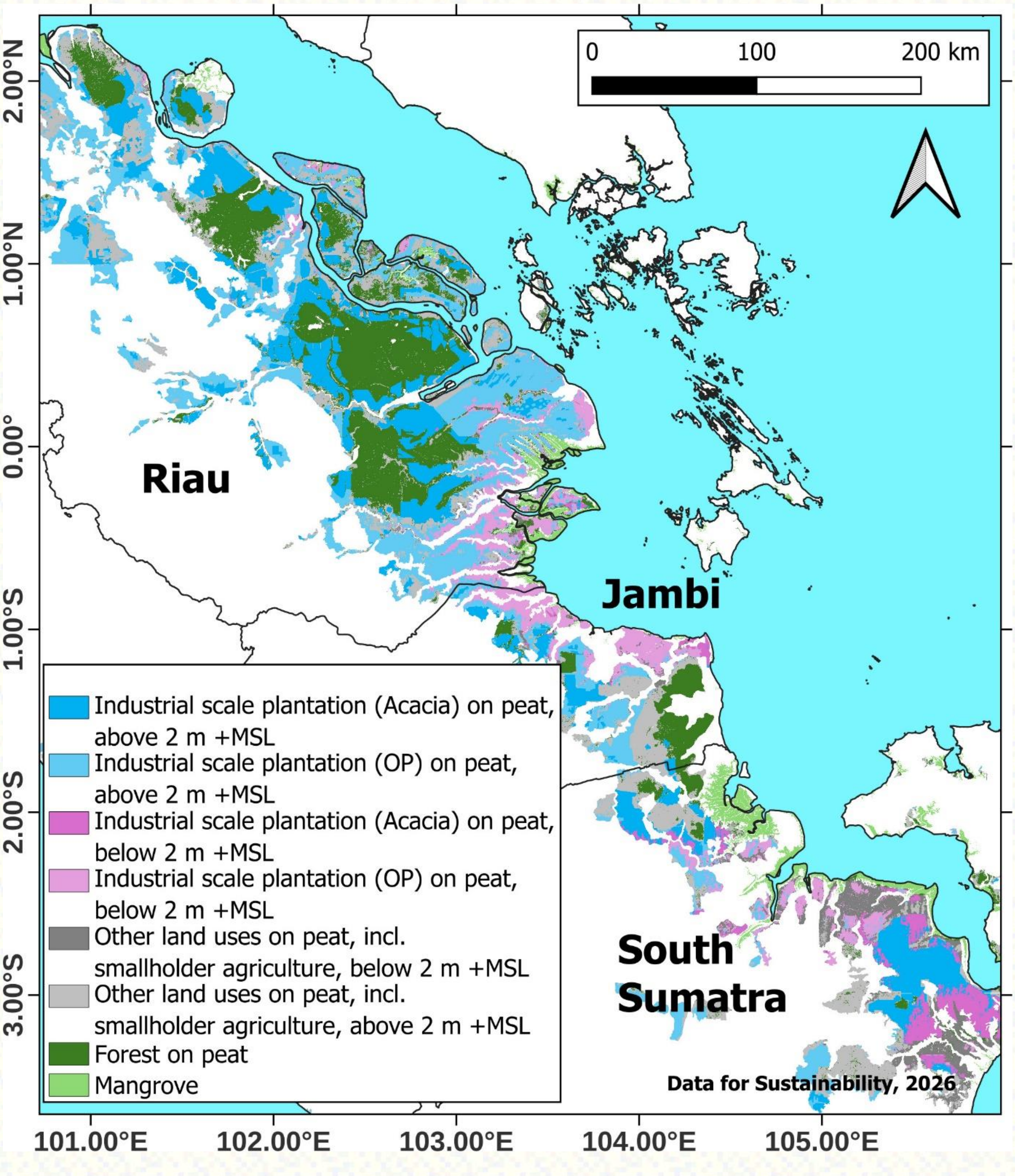

Figure 1. Map of industrial plantations on peatland in Sumatra, in relation to elevation. Notes: 1. land below 2 m +MSL, flood issues are increasingly problematic and productivity is dropping or already zero. 2. land above 2 m +MSL, potentially productive.