Abstract No: A-060

SHIFTING PARADIGMS IN SOUTHEAST ASIAN PEATLAND MANAGEMENT

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Peat swamps in SE Asia originally covered 27.1 million ha with high biodiversity forests, and until the 1980s they were hardly affected by development. SE Asian peat swamp ecosystems have a very high biodiversity with a high rate of endemism and many threatened species. Currently, outside of Papua and Brunei, there are almost no pristine peat swamp forests left in Indonesia and Malaysia. The remainder has been largely subject to selective logging as well as illegal logging activities, and less than 5% is protected for nature conservation. But even the protected areas have been largely affected by logging and many are drained by logging channels. A recent study by Miettinen *et al.,* 2016 revealed that in 2015, only 29% (4.6 Mha) from the original 15.7 million ha of peatlands in Peninsular Malaysia, Borneo and Sumatra remain covered by peat swamp forest (vs. 41% or 6.4 Mha in 2007 and 76% or 11.9 Mha in 1990). Managed land cover types (industrial plantations and smallholder dominated areas) cover 50% (7.8 Mha) of all peatlands (vs. 33% 5.2 Mha in 2007 and 11% 1.7 Mha in 1990). Industrial plantations have nearly doubled their extent since 2007 (2.3 Mha; 15%) and cover 4.3 Mha (27%) of peatlands in 2015. The majority of these are oil palm plantations (73%; 3.1 Mha) while nearly all of the rest (26%; 1.1 Mha) are pulp wood plantations.

Since the early 1990s the most significant cash crops developed in SE Asia‘s peatlands are oil palm and Acacia (for pulp-for-paper) plantations. These crops require a minimum of 50 to 60 cm drainage, which results in various environmental impacts, including soil carbon oxidation, soil compaction and subsidence, and increased fire risks. The conversion of peat swamp forests results in significant loses of biodiversity. Whereas the drained land-use of peatlands in Indonesia covers only 6% of the total national agricultural land, the peatland deforestation and peat carbon oxidation (excluding fires) contribute over 50% of the country‘s national emissions. In Malaysia, peatland degradation related emissions contribute about 25% of national emissions, but have so far not been specified as such in Malaysia‘s reports to the United Nations Framework Convention on Climate Change (UNFCCC), which mentioned only 3% of the country‘s emissions to coming from soils.

In latest (second) communication to the UNFCCC Malaysia referred to its reiterated pledge in 2009 to keep at least 50% of its forest area as forest in view of their important role in both adaptation and mitigation from soil and water protection, conservation of biological diversity and regulation of the climate system to carbon sequestration. However, in 2015, only 21.7% of the peat swamp forests remains forested in Peninsular Malaysia (with only 4.6% as pristine forest), 27% in Sarawak (with only 0.5% pristine) and 24.5% in Sabah (with only 1.8% pristine) (Miettinen *et al.,* 2016), whereas these are the key carbon stores of Malaysia.

Globally, SE Asian degraded peatlands cover less than 0.1% of the world‘s land surface, but contribute about 3% of all global anthropogenic emissions. Peat fires occur frequently, but especially so in very dry years – related to the occurrences of El Niño. In such years, peat fires may ravage through millions of hectares of degraded peatlands, and the related emissions may more than double the emissions from oxidation. The fires and smog have resulted in significant impacts on public health, agriculture, tourism, transport and other major economic sectors, and have affected millions across Indonesia, Singapore and Malaysia, as well as parts of the Philippines and Thailand. A World Bank study on forest fires in 2014 in Riau province estimated that fires caused US$935m of losses relating to lost agricultural productivity and trade. Early estimates by the Joko Widodo administration of damages of the Indonesian haze crisis in 2015 were reported at to be up to 475 trillion rupiah (US$47 billion) (Francis, 2015).

Whereas the impacts of drainage-based peatland use may still be considered by some to be acceptable in view of the high economic value of these cash-crops, there is one more issue which is generally overlooked in peatland development and management planning and policies. This is the impact of peatland subsidence. Almost all peatland areas have the base of the peat soil layer at or below the gravity drainage limit, which is determined by their relative elevation to sea and river levels. This means that the landscapes dominated by drained peat are gradually but surely subsiding to levels at which gravity drainage becomes impossible. Recent studies commissioned by Wetlands International in Malaysia and Indonesia (Hooijer *et al.,* 2015, Hooijer *et al.,* 2016), indicate that over 50% of all peatland areas that are currently under drained land-use will reach that level by the middle of this century, and over 80% towards the end of this century. The high levels and temporal patterns of precipitation in SE Asia and the size of the landscapes affected constrain the options to put in place possible mitigating measures such as used in temperate climate zone, i.e. dikes and pump-operated drainage systems. It

means that drained peat land-use in SE Asia, while profitable in the short-term, is inherently unsustainable and will lead in the medium to long-term to significant loss of land and land productivity. Current studies also indicate that now already there are substantial areas affected by increased and prolonged flooding.

To prevent further damages and loss of productivity a paradigm shift in SE Asian peat land management is required. This needs to consider:

a. Full protection and restoration of remaining natural peat swamp forest ecosystems

b. Restoration of hitherto undeveloped concession areas on peat

c. Responsible phasing out of current drainage-based land-use on peat

d. Alternative non-drained utilization options for peatland areas, including paludiculture (commercial use of rewetted peatlands using native perennial peat swamp crop species such as sagu (for starch production), jelutung (Asian rubber), Tengkawang (Illipe nut oil production, Melaleuca (pulp-for-paper) many timber species and rattan (furniture). There are over 100 native peat swamp species with a high economic potential.

e. These options may all be combined with REDD+ business schemes under national and international climate change mitigation mechanisms.

Major investments in these land-use change options are urgently required, in order to stop the disproportionately high GHG emissions from unsustainable peatland use, stop the ongoing creeping disaster of land loss, halt the loss of biodiversity, and to prevent further fire calamities like the one in 2015.

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