Chapter 6

Oil-palm estate development in Southeast Asia: consequences for peat swamp forests and livelihoods in Indonesia

In this chapter, the DPSIR analysis is applied to oil-palm development in the peat swamp forest area of Central Kalimantan, Indonesia. This is an area where the Mega Rice Project was started in the mid-1990s with the clearing of 1 million ha of peat forest for rice farms to be developed by transmigrant farmers from Java. The rice farms largely failed, and the cleared land has been given out in concessions for oil-palm estates (Colchester *et al.*, 2006).

World demand for palm oil has increased substantially in the last decade. The world's two most important producing countries, Indonesia and Malaysia, have reacted to this demand by converting considerable areas of tropical forest to oil-palm estates (Box 7). Indications of this in the decade from 1995–2005 are seen in the production figures, which rose from 5 million tonnes to 15 million tonnes in Indonesia, and from 8 million tonnes to 15 million tonnes in Malaysia. It is predicted that production will double again in the next decade.

BOX 7

Other cases of peat swamp forest loss for oil-palm development

There are several other cases of large-scale peat swamp forest loss in Southeast Asia connected with oil-palm development in the case database. For example, in Sumatra, Indonesia, in the Air Hitam Laut River basin, oil-palm development is affecting the Berbak National Park, a Ramsar site since 1991 and an important bird migration area. The Berbak National Park is a good example of the biodiversity that can be found in a peat swamp forest: 224 bird species (including the kingfisher, hornbill, and the white-winged wood duck), almost 30 mammal species (including the Sumatran tiger and the clouded leopard), 93 fish species, and 260 vegetation species (including 150 tree species and 23 palm species). The area is now prone to logging and oil-palm development. Associated developments occur as local inhabitants make use of the railway tracks (built to export logs from the area) to enter the area to produce crops or collect marketable products from the forest.

In Borneo, Malaysia, an extensive peat dome has been given the status of a national park. The area is known as the Maludam National Park. The area is a former logging concession, which implies that all valuable species of trees have systematically been removed from the area. Pressures on the area now come from illegal loggers and plans to develop oil-palm estates at the fringes of the peat dome, which will seriously affect the hydrology that is the basis of the dome (Berg *et al.*, 2004).

Large areas of peatland forests have been given to concession holders for many years, and this has seen selective felling of valuable species of trees. An oil-palm operation starts with the digging of canals to drain the area. This immediately results in a lowering of the water table and the shrinking of the peat layer by several metres.

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Fire is often used to eliminate the dead branches and leaves. The area gradually becomes accessible and roads are constructed. Once the area has been cleared, oil-palm seedlings can be planted. Once the water table is below the grass-root level, a process of oxidation starts and the peat is destroyed. In this process, CO_2 is released. The scale at which land clearing takes place is enormous, and so are the amounts of CO_2 released. The conversion of Southeast Asian peat forests is estimated to account for 6–7 percent of the total global release of CO_2 into the atmosphere (UNEP *et al.*, 2007).

Conversion of natural peat forest to oil-palm estates is initiated and implemented by stakeholders from outside the forest area, e.g. national companies, governments and international companies. Although local inhabitants may be hired to do manual work, this work is often done by outsiders. In the best of cases, the local people receive compensation for the land on which they have lived for generations being taken for estates. However, eventually, they lose access to at least part of the resources they depend on for their survival. An increase in poverty is usually the result. Impoverished local people often become involved in illegal logging activities as a livelihood response, which thus becomes another pressure on the peat forest and in itself constitutes a negative feedback loop. The logging is also facilitated by the presence of the oil-palm estates, as these provide improved transportation infrastructure through which the logging products can be taken to markets.

This case represents an example of the extension of commercial commodity agricultural into peat swamp forest wetlands that were previously used for subsistence economies. Where estates are established, the natural wetland ecosystem is transformed into a monoculture. The provisioning services of the latter are positive for those with access to the land, usually large companies, and for the state (which receives revenues from the concession holders). However, development of the estates is often undertaken in an unsustainable way, with negative impacts on ecosystem services and with pressures placed on the remaining natural environment. As a result, state changes may be irreversible, and socio-economic impacts largely negative for the local population.

FIGURE 27
AWIs in the peat forests of Southeast Asia

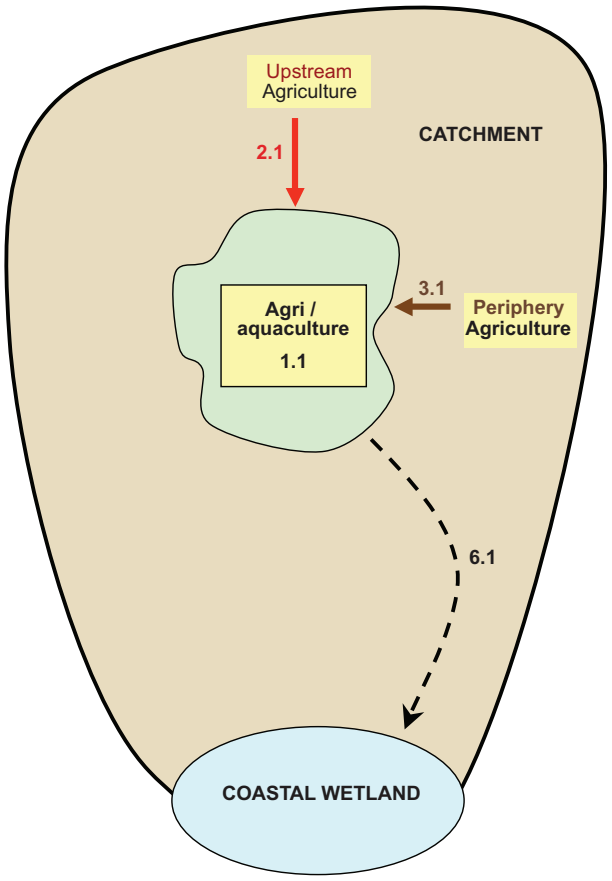


Figure 27 shows the main AWIs that occur in this type of case.

DRIVERS

The drivers that are leading to the destruction of the peat forests are global market forces. Indonesia's increasingly open economy, its export development policies, and its vast tracks of "suitable" land further enhance this driver, as increasing demand for palm oil, coupled with investment opportunities, transforms large

tracts of swamp forests in the country. The increased global demand for oil-palm products is driven by a number of uses, especially in the food industry, and the growing demand for biofuels.

National policies present a further set of drivers in that, at best, they are incapable of regulating the peat forest conversion in a more sustainable way. At worst, they facilitate the conversion to oil-palm estate. Foremost among these is the concession policy, without which oil-palm estates cannot be established, and which drastically changes the land tenure situation as entitlements are accorded to national and international companies at the expense of traditional usufruct rights of the local population. Although these concessions are supposed to be subject to environmental regulations (including environmental impact assessments [EIAs]), these are frequently weak or not enforced for various reasons.

Another driver of peat forest destruction is local poverty. The local poor who have lost access to the forest resources they used to rely upon, because of their conversion to oil-palm estates, search for new livelihoods. Local businesses offer attractive alternatives with illegal logging of remaining peat forests, thus exerting additional pressures on the forested wetland systems.

PRESSURES

The pressures stemming from the conversion of peat forest to oil-palm estates lead to a drastic transformation of the ecosystem. Foremost among these pressures are the clearing of the natural vegetation and the changing of the hydrological regime through drainage. Both have severe effects on the state of the wetlands (below). Typically, canals are dug to drain the area where the oil-palms are to be planted. Often, areas as large as 5 000 ha are developed in a single project. Because of the relatively open and light structure of peat, the effect of draining is not restricted to the area converted – a much larger area is affected by the lowering of the water table. The extent of this wider effect depends on the topography. Associated with the drainage and forest clearance are fires that have serious impacts on these peat areas, as well as regional impacts through air pollution.

Related pressures come from improved road and railway infrastructure. These improve access to the estates and neighbouring areas and facilitate further logging beyond that linked to the oil-palm development.

STATE CHANGES

Where an oil-palm estate replaces a peat swamp forest, the environmental state changes are dramatic. The hydrology of the area is changed, with the groundwater table lowered from the high and relatively constant one found in the natural peat forests to a level that allows the oil-palm trees the necessary rooting zone. This new hydrological regime has a negative effect on the natural biodiversity, and the natural forest species cannot survive. Although most of these trees on the estate itself are removed to make way for the oil-palms, the effect of peatland drainage spreads well beyond the boundaries of the estate. Overall, the biodiversity in these areas changes completely as one set of natural climax organisms is replaced by another that is human-created. Typically, the former is much more diverse than the latter.

The state changes in neighbouring areas that are not transformed into plantations but experience pressures from altered hydrological regimes are more subtle and take place at a slower rate. Nonetheless, these can be severe and extensive. In the long run, the biodiversity in these areas also suffers from a changed hydrological regime. Drainage causes water-loving species to die out, with species suited to drier environments colonizing and replacing those that survived in the wetter environment. The areas outside plantations may also have their biodiversity affected because of selective logging and harvesting of forest products made possible by the improved access associated with the oil-palm estates.

The peat soils are also affected, and this constitutes a globally important state change. This is because of the way the lower water table exposes the peat to the air and oxidation, which in turn releases CO_2 (Hooijer *et al*., 2006). Where the effects have been measured, the peat layer has decreased by several metres. The top layer changes in composition: from a mix of water, dead branches, organic material and water-loving plants, which is hardly accessible, to become a more solid, although far from firm, organic soil. Water storage and flow moderation are also affected by the changing hydrological situation and the state of the peat soils.

Overall, the original wetland system, with its diverse ecosystem and regulating services with local and global benefits, is replaced by a much less diverse ecosystem, although one which is more economically productive, at least in the short term.

IMPACTS

As is often the case with AWIs, the socio-economic impacts are diverse. The financial returns from the oil-palms benefit the plantation owners (mostly people from outside the area, often from other countries) and national treasuries. Positive socio-economic impacts at the local level are primarily limited to improved roads and rail infrastructure that open up the area and provide improved access to forest resources to local people, and to the employment and income opportunities provided by the estates.

The negative socio-economic impacts are seen most clearly where oil-palm estates have replaced other forms of land cover and land use on which entire villages and communities had long relied for their livelihoods. They are now left with fewer and less diverse resources to exploit, often at increased distances from where they live, and these generally yield lower income with less security. As a result, many people, especially the young, migrate out of the affected areas and try to make a living in the nearby urban centres.

Insecurity in terms of land tenure is also increased, and access rights to natural resources are changed. These are particularly important changes as they cut right through the dynamics of the situations described above. Typically, local people in areas where oil-palm estates are developed do not have documented titles to the land they cultivate, let alone to the forest resources they exploit or the hunting grounds they frequent. In some cases, compensation is granted, but this is never enough to start other livelihoods elsewhere.

RESPONSES

In general, in Central Kalimantan, there have been limited and rather superficial responses by the authorities to the negative changes in ecosystem services resulting from oil-palm development. Here, the emphasis has been mainly on measures to prevent forest fires in the dry season. There seems to be no attention given to the need for hydrological measures that would limit the widespread effect of drainage, even though this kind of management could help to curtail the fires.

However, a response was seen in part of the global market in early 2007. In the Netherlands, the press carried the message that Indonesian palm oil was produced unsustainably and was being used by a large electricity companies to fulfil the EU obligation that a certain percentage of energy should be produced sustainably. As a result, this company stopped buying palm oil from Indonesia and started cooperation with the World Wide Fund for Nature (WWF) to establish sustainability criteria for palm oil. Similar discussions have now entered the political domain of the EU with regard to its energy policy, which sets out targets for the increased use of biofuels within the EU to reach 5 percent of total road fuel (a policy largely driven by the need to curb CO_2 emissions in view of climate change). With examples like these from peat forest conversions to oil-palm estates, NGO lobbying has been successful in qualifying the "greenness" and sustainability of biofuels. The EU is now responding by

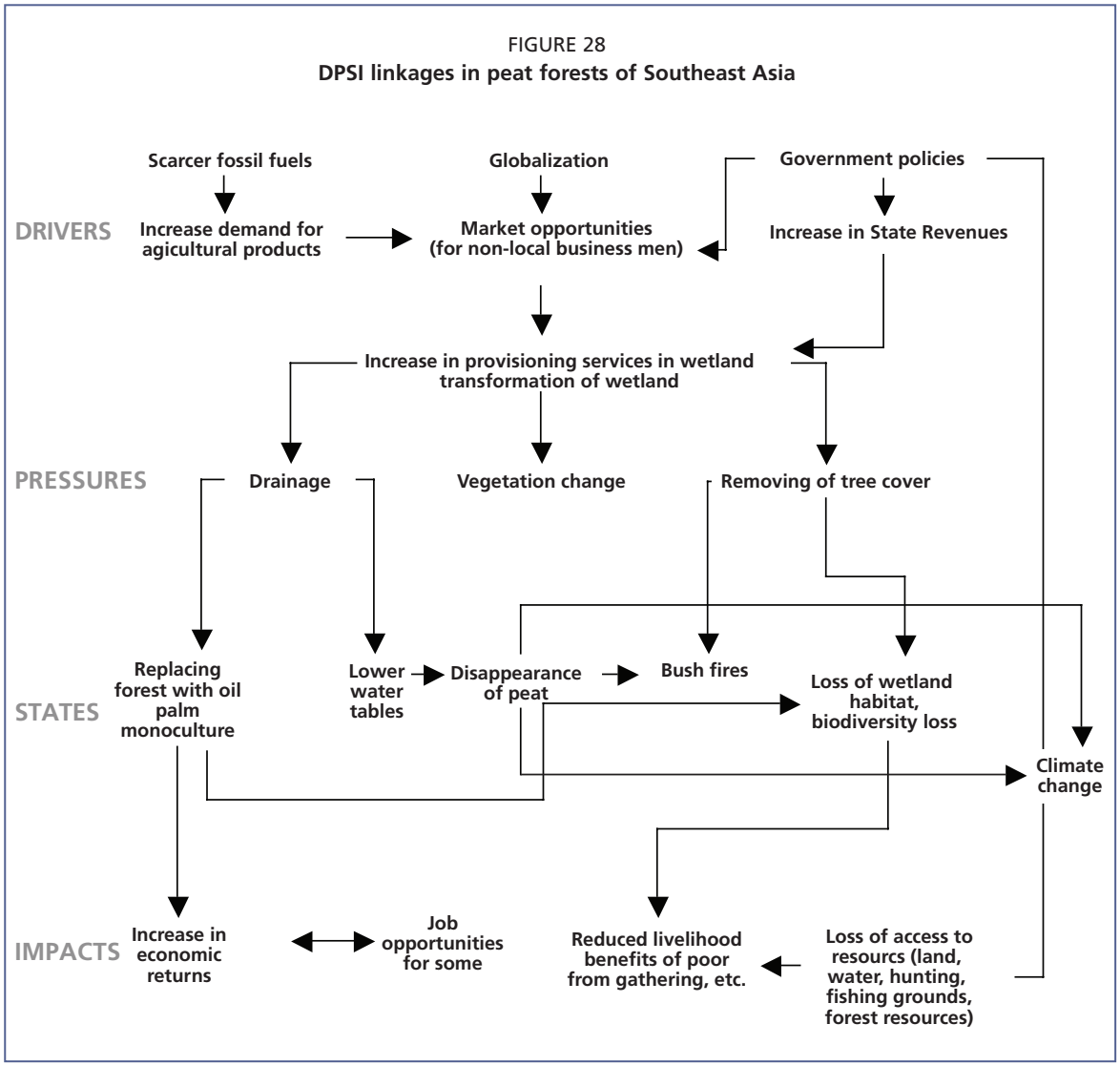
introducing a system of certification for biofuels, based on the environmental impacts of different production practices. This issue is now further debated, also in view of the extent to which biofuels may compete with global food production and security.

These responses at the global/regional market level are astute and strategic when viewed through a DPSIR perspective as they targeted direct one of the principle drivers. The effectiveness of such a response will, at a minimum, be a curbing of the exceptional growth in the global demand for palm-based fuels by restricting one major market. To what extent this will also be effective in curbing overall global demand remains to be seen.

CONCLUSIONS

The DPSIR analysis here (Figure 28) shows the linkages between the loss of peat swamp forests and global market forces, mediated by national export policies and international investment. The increasing demand for a product in one part of the world is transforming a wetland system in another continent. In this process, the sustainability of the tropical peat land system in Indonesia is threatened. Ultimately, the peat lands are destroyed; the rights of indigenous people and other local people living from in the area are neglected; and through the CO_2 released, the integrity of the global ecosystem is compromised. Addressing this set of negative AWIs to achieve a less negative result

FIGURE 28
DPSI linkages in peat forests of Southeast Asia



in terms of state changes, and also in terms of socio-economic impacts, is complex. However, a number of levels at which this can be addressed are indicated here. Attention needs to be given to the drivers of change at international level, especially the demand for biofuels and other palm oil products, and this is currently being debated in EU policies. However, local, *in situ* management addressing the hydrological regime must also be given attention if a sustainable balance between the different ecosystem services is to be achieved in these tropical peat forests. This should include a focus on minimizing hydrological changes in areas selected as suitable for transformation into oil-palm estates, the establishment and recognition of formal rights to resources prior to taking decisions on transforming an area, and on CO_2-neutral or near-neutral transformations. Finally, the development of positive drivers, in the form of carbon markets, needs to be explored as this might provide further support for the regulating services and help to achieve the balance in ecosystem services needed for long-term sustainable use of these peat forests.