PEATLANDS, CLIMATE CHANGE, POVERTY, BIOFUELS, PULP AND REDUCED EMISSIONS FROM DEFORESTATION AND DEGRADATION

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SUMMARY

Forested tropical peatlands in Southeast Asia store at least 42,000 million metric tonnes of soil carbon. Human activity and climate change threatens the stability of this large pool which has been decreasing rapidly over the last few decades as a result of deforestation, drainage and fire. This paper investigates the importance of tropical peatlands in relation to climate change and poverty issues, and looks at how specific land-use changes are contributing to this. It also identifies alternative development options. It is recommended that international action is taken to help Indonesia to improve management of the peat resources through an integrated (Bio-rights) approach of poverty reduction and peatland conservation and restoration activities. Some alternative finance mechanisms and potential risks are reviewed.

THE SCIENCE BASE

Indonesia was shocked in 2007 when it was found to be responsible for the third highest emissions of CO_2 worldwide, mainly as a result of peatland degradation, deforestation and fires (Silvius *et al.,* 2006; Hooijer *et al*., 2006, PEACE, 2007). This source of greenhouse gas emissions had until then been severely under appreciated. The new scientific evidence was met by skepticism, protests and high-level recommendations to deny this information. Others cautiously acknowledged that it was based on best available data. Indonesian Minister of Environment, Rachmat Witoelar, conceded the problem in public statements but added that the assessment of the exact extent requires further investigation. Hooijer *et al.* provide an analysis of the strengths and weaknesses of the data used and have indeed identified many areas where data should be improved significantly. The main conclusion of the analysis was that improved data will most likely provide even higher emission estimates.

Getting the facts right is a key to choosing the right actions. With all data and indications currently pointing in one direction, however, there should be sufficient cause to call for a precautionary approach or moratorium when it comes to opening up and converting remaining peat swamp forests in South-east Asia to other land uses.

SOME FACTS AND FIGURES

The tropical peat swamp forests in Southeast Asia store at least 42,000 million tonnes (Mt) of carbon, but human activity and climate change threatens the stability of this large pool that has been decreasing rapidly over the last few decades as a result of deforestation, drainage and fire. From the 27.1 million ha of peatlands in SE Asia, about 13 million ha have been drained leading to severe degradation of the peat through subsidence and oxidation. Burning of dry peat has been the main contributor to the regional haze problems and the fires, which can cover millions of hectares in one dry season, are responsible for the largest proportion of these huge CO_2 emissions. Particularly in El Niño periods the problem takes gigantic proportions. Whereas the area of degraded peatlands in SE Asia covers less than 0.1% of the global land surface, it is responsible for a total of about 2000 Mt CO_2 emissions per annum (an annual average of

635 Mt from peat oxidation and a minimum of 1400 Mt from fires, by most conservative estimates) or close to 8% of the global CO_2 emissions. (Hooijer *et al*. 2006)

CAUSES AND CONTRIBUTORS TO THE PROBLEM

Large scale peatland degradation started in Indonesia in the 1980s with the transmigration schemes in the lowlands of Sumatra and Kalimantan. Many of these development programmes on peatlands failed and a World Bank study in the early 1990s concluded that some of these were unsuitable for second stage development. This created large areas of deforested and degraded idle peatlands, with a continued drainage as a result of the canal networks that had been dug. Even though many of these areas were abandoned, the canals were kept open as they provided a means for transport. In recent years, palm oil and pulp plantations have been established relatively successfully on peat but, in the 1980s and 1990s, climate change was not yet a major issue and the CO_2 emissions resulting from these land-use practices were not considered (Box 1).

With climate change now a major policy item the situation has changed, and most people recognize that the widespread peat and forest fire problems in Indonesia create huge CO_2 emissions. This was first highlighted in Nature by Page *et al*. in 2002, who showed that peat fires in the extremely dry year of 1997 contributed 15 to 40% of global emissions. Since fires and their impacts are highly visible and noticeable, the problem is easily adopted as an emergency issue that needs to be addressed. There remains a distinct under-appreciation, however, of the impact of drainage, which is unobtrusive and invisible. Most policy and decision makers are unaware of the fact that, drainage of peatlands for growing plantation crops such as oil palm, pulp wood or rubber inevitably also contributes to peat subsidence and large CO_2 emissions.

In the case of palm oil, this is particularly bad news, as it is regarded as one of the most promising biofuels. However, palm oil production on peatlands requires drainage, leading to substantial emissions of CO_2 ranging between 50 to over 100 t ha^{-1}. The use of palm oil from one ha (3 to 6 tonnes) as biofuel compensates for only 9 to 18 tonnes CO_2 from fossil fuels. Therefore use of palm oil from peat results in about 3 to over 10 times more CO_2 emissions). This renders it unsuitable as a biofuel because, according to international standards, these should at

Box 1: The oil palm and peat CO_2 debate

There is an ongoing discussion regarding the impact of palm oil on peat in terms of greenhouse gas emissions. The Malaysian Palm Oil Council refers to a study from Melling *et al* (2005) which purports to indicate that natural peat swamp forest ecosystem has higher CO_2 emission rates than oil palm plantations (Basiron & Corley 2007; Corley 2007). Melling's study, however, compares emissions from a drained and degraded peat swamp forest, oil palm and sago plantations using the closed chamber method, showing markedly higher CO_2 emissions from the former.

The way in which Melling's data are quoted infer that they would represent the emissions of the entire ecosystem, although they only represent emissions from the peat surface, which of course would include soil oxidation and active root-respiration from the living vegetation but not the carbon intake by the vegetation canopy (or long-term sequestration in new peat). As such the data do not represent the net emissions of the systems compared.

The higher emissions detected by Melling in the degraded peat swamp forest relate to a higher biomass with consequently higher respiration rates and thus more CO_2 release from the root system. Other potential contributing factors may be a more substantial humus layer as well as the peat swamp forest had been degraded by logging and drainage.

If Melling's conclusions were to be correct, peat swamp forest could not exist. A primary peat ecosystem will generally have a higher carbon intake than outflow (unless external conditions have changed and stopped the peat formation process). Otherwise no peat could have accumulated over time. In this case, the proof is in the peat.

the very least be carbon neutral. This information has, as could be expected, received a variety of responses from the palm oil sector, with some denying the science and problem (see box 1), while others recognized the issue and have shown genuine concern for how to deal with it. It is clear that current and planned expansion of oil palm plantations on peatlands will result in the increased "contamination" of this important export product, which could result in consumer boycotts in importing countries.

An independent commission established by Essent, one of the largest green energy suppliers to the Dutch public, concluded recently that to ensure the use of palm oil for green energy will lead to reduced greenhouse gas emissions, additional criteria are needed in addition to current RSPO[1] guidelines (Dehue, 2007):

a. No palm oil from plantations on peat
b. In case of deforestation (within current RSPO criteria), a net reduction of greenhouse gas emissions should be proven.

RSPO criteria currently call for avoidance of peat, but in a non binding way. It also calls for reduced greenhouse gas emissions, but without giving any measurable indicators. It would be to the advantage of the palm oil industry if the conclusions by the Essent commission would be incorporated in RSPO criteria in its upcoming meeting in November 2007, and put into practice as soon as possible by the palm oil sector at large. This will only help to affirm the possible role of oil palm as a potentially sustainable crop. In view of its extraordinary high yields and therefore reduced land area needs compared to other oil producing crops (Basiron, 2007) oil palm could contribute to biodiversity conservation and poverty reduction.

Oil palm cultivation is only one of the contributors to the problem because, recently, large scale concessions have been granted for the establishment of pulp tree plantations of *Acacia* sp. for paper production in Sumatra. The new information published in the Peat CO_2 Report has led one of the companies (RAPP) to commission a study to identify possible impacts of drainage on tropical peatland and identify options to mitigate the problem. This constructive reaction and incorporation of science in plantation management is highly welcome, and RAPP should be commended on this initiative as it will help to clarify through independent research whether pulp tree cultivation on peat can be sustainable or not. However, since *Acacia* requires deep drainage before traditional plantation techniques can be applied on peat, indications are that pulp on peat will undoubtedly result in high CO_2 emissions, contributing to climate change. The pulp industry may want to investigate options for growing indigenous peat swamp forest tree species with appropriate qualities for pulp production that do not require drainage, although harvesting would be a major problem. Linking pulp plantation development to avoided deforestation by active conservation management of adjacent primary peat swamp forests may also help to offset some of the negative impacts.

The often hastily planned large scale developments in peatlands are generally publicly justified as being essential for poverty reduction. However, many of the developments have many negative socio-economic impacts. Many development schemes by government and the private sector have been accused of trespassing on customary *(adat*) rights. As a result of the peat fires and smog, local communities are affected by high rates of respiratory diseases, loss of crops, impacts on transport, tourism and loss of natural resources. High fire risks in degraded peatlands make them unattractive for external investors. The high failure rates of transmigration projects on peatlands, including the ex-Mega Rice Project in Central Kalimantan, have resulted in increased poverty rather

[1] Round Table for Sustainable Palm Oil

than positive developments for the poor. Poverty rates in peatland areas in Indonesia are 2 to 4 times higher than in other areas.

HOW TO DEAL WITH THE ISSUE?

Development is needed to achieve conservation

Without appropriate economic incentives it will be impossible to maintain and manage conservation areas or invest in rehabilitation of degraded peatlands. Without cash flows in poor regions, there is no local or national solution. People must have a livelihood before being able to refrain from over-exploitation of natural resources. Governments have to generate sufficient economic growth before they will be in a position to care about the environment. Incentives for short-term unsustainable development, including uncontrolled logging, remain high. Development therefore is a key to peat swamp forest conservation and the sustainable management and rehabilitation of degraded peatlands.

Considering the declining incomes from agriculture and forestry there is a pressing need to enhance alternative income opportunities to the rural populations. In the meantime it is important to ensure that their lands and resources are no longer degraded and, where agriculture on peat is practiced, it should be optimized in terms of sustainability. In this regard there is an urgent need to review local policies that require regular land clearance in order for land owners to maintain tenure (Silvius & Suryadiputra, 2005). Without sufficient revenues from the land this creates a perverse incentive to use fire (which is cheapest).

Alternative income sources from peatlands can involve a variety of options, including carbon trading, water, biodiversity and tourism. Oil palm, pulp or rubber plantations could, under certain conditions, help to promote sustainable development of deforested and degraded peatland areas but, in view of the related CO_2 emissions, such development should preferably be contemplated for non-peat areas. There are millions of hectares of *alang-alang* (deforested, abandoned grassland) landscape in Indonesia that could be used for development (Diemont *et al.,* 2003). For large scale developers these areas pose significant constraints as they are already under tenure of local people, and purchasing this land in sufficiently large blocks will bring a variety of administrative nightmares and headaches. In addition, there would be no windfall profits derived from conversion (logging) of peat swamp forests. In terms of local economic development, however, it would re-enfranchise the local owners of these idle lands in the emerging development processes and could contribute to poverty alleviation. Many small-holder oil palm developments show this benefit in situations where farmers have sufficient organization experience and capacity to negotiate and deal with the larger investors and buyers. Another option that may be contemplated (and to some extent is being investigated by RAPP in the Kampar peninsula, Riau) is the development of plantations at the fringes of the peat domes, on shallow peat (>1 m). With optimal hydrological management, impacts on the hydrology of the peat dome could be minimized. Plantations could bring an advantage as buffer zones for the deeper peat areas and high-conservation value forests by reducing access and decreasing related fire risks. Consideration should, however, also be given to the fact that the shallower peat swamp forests tend to have higher species diversity and form part of the eco-hydrological unit of the peat dome system and if affected by drainage this will impact upon other parts of the dome.

Expansion of small scale agriculture on peat should generally be avoided as it creates higher risks. Firstly, it creates perverse incentives for using fire for seasonal land clearance. Secondly, most crops which can grow relatively well on peat, such as corn, *Aloe vera*, pineapple and various kinds of vegetables, require drainage, thus resulting in (increased) CO_2 emissions. There are some exceptions, and some developments of peatlands may be integrated with carbon store conservation. Wetlands International has

been experimenting with community-based fisheries development in drainage canals that were blocked by dams for hydrological restoration. This involves natural restocking of these “fishponds” in the wet season through natural flooding, and then harvesting the fish later in the dry season. Dams are often regarded negatively by communities as they block transport options, but fisheries revenues may provide a sufficient economic incentive to encourage them to help build the dams and maintain them, thus contributing to the conservation of the carbon store. Some prospects for agricultural and tree crops that do not require drainage should also be investigated. Under the Central Kalimantan Peatlands Project, large areas of hydrologically restored degraded peatlands have been replanted with Jelutung (*Dyera* sp.), an indigenous peat swamp tree species that produces a latex used for various purposes, including the production of chewing gum. Also, other valuable local tree species have been replanted in undrained conditions. Some agricultural crops may provide prospects, albeit on not too large a scale. For example, a team of scientists at the University of Palangka Raya carried out experiments in 2007 with melons planted on drained and undrained peat and showed that yields on undrained peats can be higher than on drained peat.

New emerging innovative options

A newly emerging possibility is the payment for Reduced Emissions from Deforestation and Degradation (REDD) as currently being developed by the World Bank. Tropical Peat Forests are candidates for RED “avoided deforestation” while deforested peatlands are candidates for REDD mechanisms to prevent further degradation & emissions by drainage and resultant fires. This scheme under the BioCarbon Fund may offer, in the short term, options for various pilot schemes, including carbon fund payments to national and local governments. These would need to be based on a national baseline monitoring system and the option for payments to be made to private and community stakeholders and beneficiaries for “environmental services”. As peatlands cut across all forest management, conservation and land use (production, industrial and agricultural crops) types, maintaining the welfare of traditional local communities in peatland forests and deforested peatland is seen as a major concern in a recent World Bank peatland study. Accordingly, the World Bank peatland group indicated interest in REDD payment mechanisms, which allow payments to such groups and focus some of the pilot initiatives towards community PES and Bio-rights mechanisms (T. Herman, pers. com).

Parallel to this there are numerous private sector initiatives, which indicate a strong interest in investment in avoided emissions through peatland rehabilitation and reforestation as a means to compensate for industrial emissions elsewhere. Some investors see opportunities for trade in “Carbon Futures”. This could provide local people in peatland areas with a major opportunity for development of a new community-based public service. According to Rhett A. Buttler (www.mongabay.com; 14 Aug 2007) preserving forest and peat swamp that would otherwise be converted and collecting the resulting recurrent revenue provided by the carbon offset market may be more lucrative for landowners in some areas than conversion to oil palm. With a carbon price range of US$ 14 to US$ 22, similar level profits may be derived over a period of 25 years.

Much will depend, however on how the funding is used and how much of it can be channeled to local stakeholders. The carbon market provides a significant opportunity for a pro-poor approach, in which consideration must be given to the equitability of the development in terms of revenue sharing between investors and local stakeholders. In the case of community-focused REDD schemes the potential revenues for the local people could be substantially higher than earnings through development of peat-based plantation industries. Funding schemes that provide access of local stakeholder groups to carbon funding, e.g. through special REDD micro-financing facilities could create new economic incentives and empower stakeholders. This would increase chances of successful

development of an innovative community based environment management service sector as part of the voluntary carbon market.

Whereas Indonesia may subscribe to the "Livelihoods" REDD schemes, a view based on various successful small NGO trials, Brazil and India are very hesitant because they have experience of how a top-down managed REDD mechanism can be misused. The scaling-up of NGO led initiatives to schemes managed by government and public agencies (currently the focus of REDD discussions) is another issue in view of the many perverse incentives that will be encountered and the need for innovation, integration and "out-of-the-box" thinking. Wetlands International's experience in peat swamp forest conservation and rehabilitation in Jambi and Central Kalimantan indicates that the key to peat swamp forest protection and peatland rehabilitation lies foremost with the local communities and, without appropriate socialization of projects and community-involvement and ownership over planning, well-intended projects may lead to increased conflicts and failure at all levels. Success also requires a strong political will, vision and involvement of local authorities. In this regard, the Green Policy of the Provincial Government of Central Kalimantan and the start of the development of an integrated Master Plan for peatland management are important developments. It will be essential for this Master Planning process to take the experience gained through the Central Kalimantan Peatlands Project into account. It deserves and will require substantial and long-term international support and cooperation, and has great potential as a pilot for the other key peat provinces of Indonesia.

Bio-rights

The option for a community-based service sector catering to the emerging carbon market would provide substantial opportunity for linking climate change mitigation to poverty reduction. It also enhances options for other types of strategies or combinations, particularly relevant to countries with no substantial agricultural subsidies, for instance the development of innovative financial instruments such as Bio-rights (Silvius *et al.* 2002). The Bio-rights approach involves establishment of business contracts, providing micro-credits for sustainable development in exchange for the conservation or rehabilitation of globally important biodiversity or environmental values. The business partners are "the global community" (represented by a broker, e.g. NGO or bank) and a local partner, e.g. a local community or a major community-based stakeholder group. The local (community) business partner will pay interest over the micro-credit not in the form of money, but in terms of biodiversity conservation services – defined by mutually agreed environmental or biodiversity related indicators. An indicator frequently used by Wetlands International is, for example, the survival rate of seedlings 5 years after planting. The micro-credit level is linked to the opportunity costs of sustainable use and conservation of the natural resource base and biodiversity. As such, the Bio-rights approach removes the incentive for unsustainable development and allows the public value of key biodiversity wetland/peatland areas to be transferred over time to local stakeholders as a direct economic benefit. The incentive can be increased by allowing the credit itself to be repaid through such services, enabling the development of community-based revolving funds for sustainable development. This will trigger community-based monitoring, as the whole community will stand to lose if the business is unsuccessful.

The Bio-rights approach can of course also include such indicators as carbon store conservation and carbon sequestration, as well as the maintenance of wider ecosystem services including water management and biodiversity values. As the micro-credit levels in the Bio-rights approach are directly related to the opportunity costs of sustainable development and conservation, the approach does not require economic valuation of biodiversity or the ecosystem services that are maintained. This distinguishes it from Payments for Environmental Service (PES). Bio-rights schemes are already operational in the buffer zones of the Berbak National Park in Jambi, Sumatra and are also used in

many other community-based wetland restoration projects in Indonesia, such as in the Tsunami hit region of Aceh (involving sustainable coastal development and mangrove reforestation) (See www.bio-rights.org).

Economic valuation

Evidence has been accumulating that, in many cases, natural peatland habitats generate marked economic benefits, which exceed those obtained from habitat conversion. Also, non-marketed ecosystem services do have economic value:

- Economic costs associated with damage to ecosystem services can be substantial: for example, the damage of the 1997 Borneo fires to timber, tourism, transport, agriculture, and other benefits derived from or linked to the forests is estimated at $4.5 billion in addition to the actual cost of fighting the fires (Tacconi 2003).
- Significant investments are often needed to restore or maintain non-marketed ecosystem services: e.g. the costs of flood prevention in down-stream areas.

Various methods have been developed to estimate both the market and non-marketed value of ecosystem services, either by directly asking people to state their strength of preference for a proposed change (e.g. “willingness-to pay” for enjoyment of a nature reserve) or by indirect comparison with actual, observed market-based information (e.g. by assessing the costs of travel to a nature reserve, or the costs of substituting the natural water purification function by sewage treatment plants).

The techniques for monetizing ecosystem functions are generally under-developed. Some ecosystem functions cannot be valued, because their precise contribution is not known and indeed unknowable until they cease to function. Other functions cannot be monetized because there is nothing equivalent to be put in their place: intrinsic values are by definition without price. Consequently, any weighting can only be partial and whole ranges of values, benefits or disadvantages escape monetary evaluation. Studies valuing multiple functions and uses and studies, which seek to capture the 'before and after' states as environmental changes take place, are rare. By and large it is the latter types of analyses that are most important as aids to more rational decision taking in ecosystem conservation versus development situations involving different stakeholders (local, national and global). Aggregate (global scale) estimates of ecosystem values are problematic, given the fact that only 'marginal' values are consistent with conventional decision-aiding tools such as economic cost-benefit analysis. Despite these difficulties, valuation data are useful in decision-making by highlighting tradeoffs.

Valuation studies in industrialized countries focus on recreational and existence values held by urban consumers (travel cost models, contingent valuation). In developing countries, on the other hand, ecosystem values related to production and subsistence remain relatively important, although this is changing in regions characterized by rapid urbanization and income growth. In general, valuation data provide support for the hypothesis that net ecosystem service values diminishes with biodiversity and ecosystem loss.

Risk management

Carbon financing requires long-term commitments from all stakeholders and management frameworks that provide buyers with sufficient guarantees that their investments – represented by the preserved and rehabilitated sub- and above-soil carbon store – are safe. This will require more than the usual five year plans, and commitments must be binding well over legislative periods of current elected authorities.

Also, for carbon projects that are based on business deals at the local community level long-term commitments are needed. For instance, investment in reforestation of community owned buffer zones adjacent to protected areas, need contracts that are also binding on future generations. This poses considerable new challenges, as it is unpredictable what incentives or disincentives may arise in the future, that may tip the balance and will change priorities of local stakeholders.

Current policy debates in Indonesia move in the direction to develop concessions for periods of one hundred years instead of the current 20 years. Other options, particularly for land under private tenure, include the purchase of land which subsequently could then be given a permanent conservation status.

Many other risks need to be assessed in relation to selling and buying of avoided emissions from peatlands, including the risk of fires – particularly during the recurring El Niño events. These may need to be covered by newly developed structural assurances through new government policies and legislation, and perhaps involving also new insurances catering for this sector.

Current developments of REDD and private sector initiatives are pushed hard to be ready by December 2007 for launching during the UNFCCC CoP 13 in Bali. The question arises, however, if these ideas and initiatives have been sufficiently matured and thought through. Immature ideas and projects will lead to failures and disappointments and can discredit and endanger this newly emerging sector, affect carbon price and create risks that so far have not been part and parcel of community- and government-based natural resource management planning. It is very important that any voluntary carbon credit scheme adheres to the same set of standards and criteria. For tropical peatlands, with their special eco-hydrological character and management requirements, as well as their complex social and economic setting, these have not yet been developed. It is very doubtful whether this can be achieved before December 2007. Pilot schemes will be needed to develop these, and therefore there is a strong need for coordination and sharing of lessons learned between all projects and efforts that relate to peat CO_2 management and the promise this holds for poverty reduction, biodiversity conservation and climate change mitigation.

Indonesia and UNFCCC CoP 13

UNFCCC CoP 13 is expected to become a crucial milestone with regard to the discussion of rewarding reduced emissions from deforestation and degradation (REDD). Also outside of the official discussion, many groups are expected to launch new initiatives for voluntary carbon credit schemes.

Indonesia as host of this important meeting will be in an excellent position to launch ideas and plans for the REDD agenda. The huge, but only recently recognized, CO_2 emissions from peatland deforestation and degradation, represents one of the single largest and concentrated sources of greenhouse gas emissions globally. Whereas deforestation in general covers hundreds of millions of ha worldwide, the peat issue is confined mainly to the Indonesian peat swamps. Its linkage to poverty issues and biodiversity loss ties it to two other globally recognised priorities.

It is now widely recognized that the peat issue is part and parcel of the REDD agenda. This creates a strong basis for international cooperation and support. There are many signals of strong interest to assist from both the donor community as well as private sector, and many initiatives are being developed as we speak. A new market is emerging that can be supplied by a community-based service sector. It will create significant opportunities for local community development as well as private sector investments. However, the first steps for creating an enabling policy environment for these

developments and support will have to come from the Indonesian Government. Voluntary carbon initiatives will require certain guarantees that the investments will not be in vain and can be efficiently channeled to where they can be most effective. A first and strong signal of political interest and will has been delivered by Presidential Instruction No 2, 2007, regarding the rehabilitation of the ex-mega rice area in Central Kalimantan. To deal with the issue of leakage, a moratorium on the conversion of remaining peat swamp forests would be in order. For effective development of the REDD market long-term commitments are needed backed up by policies and legislation. The ball is in the court of Indonesia.

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