

Ecosystem Services of Southeast Asia: Major Threats and Opportunities



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**By Alexandra Morel, DPhil Candidate
Environmental Change Institute**

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Executive Summary

- There are major external pressures driving the degradation of the forest resources of Southeast Asia, namely: **rapid population and economic growth**. This has been accomplished through exploitation of the region's **rich mineral, petroleum and forest resources and a favourable climate for agricultural commodity production, such as oil palm, rubber and coffee**.
- There is still uncertainty as to what fraction of **global emissions from land use change** can be attributed to Southeast Asia, but estimates range from **25-31 percent**.
- **Modelling of business as usual deforestation** between 1980 and 2050 in Southeast Asia (including all ASEAN countries) **predicts total conversion of natural forest** to agricultural land, forest plantation and other non-forested uses **before 2050**.
- In Indonesia, nationally endorsed development plans drove deforestation rates to increase from **0.6 mha/year to 1.6 mha/year in just two decades**.
- Illegal logging remains a major challenge for the Indonesian government, with an estimate of the economic loss being **US\$4 billion** annually. This activity is occurring in all manner of forest areas, even national parks
- Some illegal timber is smuggled from Indonesia across the Malaysian border as well. The scale of this can be estimated by Malaysia's annual processing capacity of **40 million m³/year compared to an annual timber production of 22 million m³/year**.
- Forest governance in Malaysia appears to be among the most robust of the region; however there are still cases of logging concessions provided as political favours.
- PNG's economy is **dominated by its mining sector** with the financial returns of logging seemingly unsustainable, with an average log price of US\$60 per cubic meter (US\$23 below production costs) in 2005. **Although the PNG government still realises annual revenues of US\$30 million from the sector from a direct tax on log exports**.
- One example of an integrated conservation and development project in the region is an effort by the Grand Perfect timber consortium, called the Planted Forests Project. This project will combine several types of land use in one **490,000 ha** area, including: **conservation, timber plantation and community subsistence**.
- In terms of ecosystem services for the region, little is understood of the contribution of the region's forest to the global hydrologic cycle due to its maritime environment and influence by a series of monsoons. Significant research has been performed on its carbon emissions from land use (including peat drainage) and air pollution from out of control forest fires. Finally, the richness of

biodiversity in this region is recognised though not known fully, although the question remains how to begin to quantify its value.

- Carbon emissions from, Malaysia and Indonesia were estimated to have released **309.9 Tg C¹** from land cover change, compared to 465.1 Tg C for all ASEAN countries. In addition, carbon densities in Indonesia have been shown to be decreasing due to increasing rates of degradation severely impacting its forests' ability to store carbon in the future.
- Southeast Asia is home to the majority of global peatland, though across the tropics, **70 Pg C** in total is estimated to be stored in these soils. This constitutes **two percent** of carbon stored in soils globally and **20 percent** of carbon found in peat soils worldwide.
- In a study by Hirano et al (2007) of gas exchange over a **drained peatland**, these areas were found to be a significant net source of carbon to the atmosphere; on the order of **0.6 kg C/m²/year** to **0.31 kg C/m²/year**. The high end in the range of values was due to an ENSO event.
- The Global Fire Partnership estimates that **1,400 Mt C** are released each year by forest fires in Indonesia, which are becoming more frequent as degraded forests are increasingly susceptible to ENSO drought events.
- During the 1997-98 El Nino season, large-scale forest fires in Indonesia burned **11.6 mha** and released **1.45 Gt C**, valued at **US\$3.6 billion** on the current carbon market. The costs of this fire for regional economic activity were initially estimated to be **US\$4.5 billion**, though revised estimates put the number closer to **US\$2.3 billion**.
- Southeast Asia houses four of the world's 25 biodiversity hotspots, due to its high incidence of endemism, as well as being the home of the endangered orang utan, Sumatran tiger, elephant and rhinoceros.
- In an ecosystem service valuation exercise for Leuser National Park, Indonesia, calculations for total economic valuation were made for three scenarios: deforestation (business as usual), conservation and selective use. The relative values found to be in the deforestation scenario were **US\$7.0 billion**, in the conservation scenario **US\$9.5 billion** and the selective use scenario **US\$9.1 billion** over a 30-year time frame.

Conclusions: There is scope for determining ecosystem services for this region; although the most obvious issue to address is carbon emission from land use change and peatland drainage. More research is needed regarding the contribution of the region's forests to local and global precipitation and the importance of its biodiversity for its forests' functional integrity.

¹ Estimated from an assumed average carbon stock of 200 MgC/ha for Asian moist tropical forest taken from Houghton and Hackler (1999).



Introduction: Natural Resources and Land Use Change in Southeast Asia

There are major external pressures driving the degradation of the forest resources of Southeast Asia. Rapid population and economic growth, estimated at 2.3 percent/year and 4-7 percent/year respectively, are cited as drivers of deforestation in ASEAN² countries ((WB) 2002). The region is rich in mineral, petroleum and forest resources as well as having a favourable climate for agricultural commodity production (e.g. oil palm, rubber, coffee etc.)

Indonesia is a nation of 17,508 islands (only 6,000 inhabited) with a total land area of 1.9 million km². It is home to ten percent of the world's tropical rainforest. Four thousand tree species have been identified of which only 120 are commercially viable. Oil, gas and agricultural commodities, including forestry, are the country's major exports contributing the most to GDP.

Malaysia consists of eleven states situated on Peninsular Malaysia and two on the island of Borneo (Sabah and Sarawak). The economy of Malaysia is most dependent on industrial exports; although agricultural commodities constitute about 8 percent of GDP (e.g. palm oil, rubber, timber etc). About 80 percent of their forest is Dipterocarp with Sarawak being the major forest producing state. In addition to

² Associate of Southeast Asian Nations (ASEAN) is comprised of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. Note: Papua New Guinea is not included in these statistics.

commercial logging, Malaysia's forests also suffer pressure due to fuelwood needs (Hammonds 1997).

Papua New Guinea shares its landmass with Indonesia's eastern most state, Papua and is located 150 km north of Australia. Mineral extraction, including oil and gas, constitute 70 percent of national exports, 30 percent of government tax revenue and 25 percent of GDP. For 2004, the mineral sector was responsible for 53 percent of total exports (Tologo 2006). Hence, forestry is not the most significant export revenue, being the third agricultural export after oil palm and coffee ((FT) 2006). In contrast to Indonesia and Malaysia described above, PNG's forests are extremely diverse with few commercially profitable tree species³; nevertheless it is one of the four main suppliers of tropical timber in the region.

Land use change over the last few centuries has resulted in significant carbon emissions with 33 percent of global CO₂ emissions from 1850-1998 being from forested land. Southeast Asia has undergone dramatic shifts in land use over the last three centuries, with total agricultural land increasing by 1,275 percent between 1700-1980 (Meyer 1996). Even more rapid change has occurred since 1980. In fact, historic and current land use changes in Southeast Asia appear to dominate its impact as a net source of a carbon. The process-based Terrestrial Ecosystem Model (TEM) estimated that between 1860 and 1990, Southeast Asia released **18.1 Pg C**, about 60 percent of carbon emission for the whole region (29.0 PgC) during that era (Tian et al. 2003). There is still uncertainty as to what fraction of global emissions from land use change can be attributed to Southeast Asia with estimates of **25-31 percent** (Esser 1995, Houghton and Hackler 1999). Also, the influence of CO₂ fertilisation and climate variability appear to be a significant factor in the region's carbon emissions, with net carbon exchange (NCE) oscillating considerably from year to year (Tian et al. 2003). Modelling of business as usual deforestation between 1980 and 2050 in Southeast Asia (including all ASEAN countries) predicts total conversion of natural forest to agricultural land, forest plantation and other non-forested uses before 2050, which would have serious implications for regional carbon emissions (Phat et al. 2004).

Forest Governance and Major Threats

Indonesia

All natural forests in Indonesia's territories are owned by the national government, which has the power to issue either temporary (20-25 year) concessions or permanent rights to companies. Generally local communities, otherwise dependent on these areas, have been allowed little input in this process. Before the end of President Suharto's 30-year reign, Indonesia established a National Forest Action Plan (NFAP) that provided a number of targets for a more sustainable forestry sector. One such target was to increase the forestry sector's use of timber harvested from industrial tree estates (HTI) instead of natural forest, with a goal of fifty percent of timber extraction to be from natural forests by 2020 (Hammonds 1997). This target is far from being

³ It is estimated to house " 5 percent of the world's biodiversity on only 1 percent of its land area" (Sekhran 1996).

met; with land use change decisions appearing to be more influenced by a Ministerial decree from 1981. This policy designated 20-30 mha of forestland to be “Conversion Forests”, which effectively encouraged several decades of rapid land use change starting in the mid-1980s. The policy was supportive of the establishment of large-scale timber and oil palm plantations as well as transmigration settlements. In this period, deforestation rates increased from **0.6 mha/year to 1.6 mha/year** in just two decades (MoFEC 1997). The one mha ‘Mega Rice Project’ began in 1995 and entailed draining a huge swath of peatland for rice cultivation. This project was later abandoned following its large-scale burning during the 1997-98 fires (Murdiyarso and Adiningsih 2007).

In general, since the shift from President Suharto’s New Order policies the country’s governance has shifted to a system of decentralisation. This transition saw an increase in forestry related conflicts most often to do with land rights and compensation payments. While the total number of violent conflicts appear to have subsided since the years 2000-2003, recommendations from a study done by the Centre for International Forestry Research (CIFOR) and the Forest Watch Institute (FWI) suggest that an improved means of mediation between forest users and a more reliable compensation system should be put in place (Wulan et al. 2004). With land not always being acquired transparently, setting fires has been used as a means of voicing displeasure over land disputes (Murdiyarso and Adiningsih 2007).

There continues to be great debate concerning who are the major agents of deforestation in Indonesia. Blame has been placed heavily on smallholder slash and burn agriculturalists or on large-scale government development projects, timber companies and *forest frontier farming*⁴. Basically, there is no consensus as to who is responsible because there has yet to be a formal survey made of agricultural practices and the relative number of actors in each category (Sunderlin 1997). Even the term *smallholder conversion* is problematic, as Dick (1991) noted it was being used interchangeably for small-scale *traditional shifting cultivation* (considered less destructive) and resettling migrants, characterised by larger-scale and shorter fallow rotations.

Illegal logging is rampant in Indonesia. The government estimates the economic loss due to illegal logging at **US\$4 billion** annually (EIA and Telapak 2007). This logging is occurring in all manner of forest areas, even national parks. For instance, lowland forest in Protected Areas of Kalimantan (Indonesian Borneo) have undergone severe deforestation between 1985 and 2002, estimated at 56 percent (Curran et al. 2004). Also, a recent report commissioned by the United Nations Environment Programme stated that 37 out of 41 national parks in Indonesia were victim to illegal logging (Nellemann et al. 2007). While the Indonesian government struggles with curbing this problem, some illegal timber is smuggled across the Malaysian border as well. The scale of this can be estimated by Malaysia’s annual processing capacity of 40 million m³/year compared to an annual timber production of 22 million m³/year (Valentinus and Doherty 2005).

Papua is home to the remaining frontier forest of Indonesia and Southeast Asia; however its forests are being plundered illegally as well. President Yudhoyono has

⁴ This can also be described as industrial agriculture and large-scale timber production.

responded with military action and issued a Presidential Instruction on the Eradication of Illegal Logging (Inpres) for coordination between 18 government agencies to address this problem. The initial results of these efforts have showed some slowing down of wood processing in states of Indonesia, Malaysia and China, which are having greater difficulty sourcing cheap logs; although neither endeavour has targeted the high-level perpetrators of this logging via criminal trials (EIA and Telapak 2007).

Malaysia

Malaysian forest governance must be considered within its National Vision 2020, a strategy for attaining greater industrialisation, which includes improved economic development of the indigenous. In 1991, Malaysia released a New Development Policy, under which successive Industrial Master Plans (IMPs) have been published every ten years. In terms of agriculture, previous IMPs have outlined the necessity to increase value-added processing for the export of wood-based products in addition to providing raw timber materials at a competitive price. The dominant policy on forests is called the National Forestry Policy (NFP); though mainly the states of Peninsular Malaysia are within its remit. Sabah and Sarawak have their own forest policies, modelled after the NFP (Traffic 2004).

Under the Federal Constitution each state has authority over its own territorial forest. The Federal Government only has the power to provide technical assistance, research and advice. Its administrative authority extends to trade policies, including regulation of imports and exports (JOANGOHutan 2006). Permanent Forest Estates (PFE) are designated by each state and can be classified as Permanent Reserved Forests (PRF). These are further assigned a degree of protection including: national and state parks or wildlife sanctuaries where commercial logging is strictly forbidden (Traffic 2004).

The Forestry Department of Peninsular Malaysia, the Forest Research Institute Malaysia (FRIM) (both under the Ministry of Natural Resources and Environment (MNRE)) and the Malaysian Timber Industry Board (MTIB) (under the Ministry of Plantation Industries and Commodities (MPIC)) administer the NFP in Peninsular Malaysia. The Sabah Forestry Department manages its state's forestry and performs its own forestry research, while the MTIB still has jurisdiction over Sabah's downstream timber industry. Sarawak's forests are managed by the Sarawak Forestry Corporation (SFC), including its conservation, within which research is undertaken by the Applied Forest Science Unit. In addition, there are national policies on biodiversity (1998), environment, conservation and agriculture. Most of these policies are more concerned with land use planning than forest management, except for the Environmental Quality Act of 1974 (Traffic 2004).

The definition of illegal logging for state governments relates to the granting of official permission and rent payment. The forest resources are treated as the property of each state, therefore permits require extraction companies to develop plans for long-term forest management units (FMUs)⁵, reduced impact logging (RIL), cutting limits, log tracking from harvesting to the mill and locally beneficial road building. Apparently, only Sabah includes all of these under Sustainable Forest Management Licence Agreements (SFMLA), which can be revoked if not followed (Traffic 2004).

⁵ Under SFM guidelines, FMUs are expected to set aside some portion of their land for community use.

Despite a federal policy to improve the economic livelihood of the indigenous (a.k.a. Orang Asli) and the recognition of their right to access forests for their subsistence, these groups are rarely approached or informed of awarded logging permits in their lands; sometimes with violent consequences. (JOANGO Hutan 2006).

Malaysia has also been active in certification of sustainable forest management, by developing criteria and indicators based on the guidelines endorsed by the ITTO for the Malaysian Timber Certification Council (MTCC) (Traffic 2004). This scheme has had some difficulty getting off the ground as its proponents struggle with indigenous groups' recalcitrance to cooperate due to lack of trust. Also, it has yet to be recognised internationally to the same degree as the Forestry Stewardship Council (FSC) certification scheme. Nevertheless, it is evidence of the domestic industry's attempt to spearhead environmentally sustainable reforms of the sector (Shahwahid 2004).

Forest governance in Malaysia appears to be among the most robust of the region; however through researching logging permits in Sabah and Sarawak, Ross came across the practice of selling discounted logging concessions by politicians to family members (Ross 2001). Further he found in Sabah that logging concessions were awarded in exchange for political support during elections (JOANGO Hutan 2006). Malaysia has also come under fire for the alleged smuggling of Indonesian timber across its borders, in spite of an Indonesian government ban of log exports (Traffic 2004).

Papua New Guinea

The forestry sector in PNG has little to no forest plantation with most activity involving harvesting of natural forest resources. The main timber extraction companies are Malaysian, with un-processed logs shipped to Japan, Korea and China. There is little to no timber processing in PNG itself ((FT) 2006). The financial returns of logging in PNG do not appear to be sustainable, with an average log price of US\$60 per cubic meter (US\$23 below production costs) in 2005. Although somehow the PNG government is realising annual revenues of US\$30 million from the sector through a tax directly on log exports, none of which appears to be reinvested in the affected communities ((FT) 2006).

Almost all of the forested land in PNG is recognised by customary rights and are not implicitly government property; therefore companies interested in attaining concessions to log must negotiate with local communities directly (Hammonds 1997). While ministers within the government claim that there is no illegal logging in the country, a recent thorough review of the sector, commissioned by the government, shows little compliance with national forestry regulations. In fact, in a subsequent report published by Forest Trends, almost all logging activities were found to be illegal because they did not: adequately benefit land-owners, positively impact local living standards, generate revenue for the government to improve public services, have a system of permits or licenses regulated by the government, exhibit any intention to maintain sustainable timber yields and have transparent profit reporting (according to official figures the logging sector posted a financial loss of US\$25 million in 2005) ((FT) 2006). Even though the PNG government was supportive of this extensive legal review of the sector, it has not exhibited political will to address the problem.

Types and Values of Different Land Uses by Country

Table 1 below outlines the extent and per hectare returns of various forest types in Indonesia, Malaysia and Papua New Guinea. However the distribution of these economic returns is not equal. In the case of Malaysia, the poorest in the country are those dependent on forests, indicating the profits of this sector are remaining in the hands of elites (JOANGO Hutan 2006).

Table 2 presents a brief look at the major exports contributing to each country's GDP, where possible their respective land extent is presented in terms of percent of total land area. As these numbers were derived from several different sources, there are some obvious discrepancies. You can see from these tables what a difference in contribution timber, palm oil, rubber and mining make. Papua New Guinea is clearly more dependent on its precious metals than its forestry, whereas figures reported for Indonesia indicate a much smaller contribution to GDP from timber than would be expected.