Inappropriate land use in the coastal Tripa peat swamps on the West coast of Aceh

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ABSTRACT

The three remaining coastal peat swamps of Aceh's West coast (Tripa, Kluet and Trumon-Singkil) were impacted by the 2004 tsunami disaster, and the later earthquake in Nias, but acted as an efficient buffer zone, protecting local people and providing local livelihoods. In Tripa, however, the ongoing conversion to palm oil estates has catastrophic consequences for the Aceh reconstruction process and future Tsunami preparedness. This paper examines the value of this unique ecosystem, and the impact of palm-oil conversion on local people, climate change and biodiversity.

Given what is known of the long-term effects of converting peatland to mono-culture oil palm plantations the paper provides substantial evidence that the current palm-oil conversion is extremely short-sighted. It directly threatens the livelihoods of local communities, it contributes to climate change, and it drives a unique biotope to extinction. At the same time, it provides little or no long-term improvement in livelihoods in the area. The paper concludes that the current coastal peatswamp forest conversion into oil palm concessions undermines the whole reconstruction process, by destroying an invaluable and irreplaceable buffer zone, and by reducing the resilience of local communities to cope with extreme events, such as the Tsunami.

Key words

Disaster, livelihood, orangutan, peat, palm oil, carbon.

1. INTRODUCTION

The three remaining coastal peat swamps of Aceh's West coast; Tripa (62,000ha), Kluet (18,000ha) and Trumon-Singkil (150,000ha), cover a total combined area of circa. 230,000 hectares. During the 1990's, five large oil palm concessions (of between 5,000 – 13,000 ha each) were granted by the central government in Tripa, accompanied by transmigration schemes to provide labour. The Tripa swamp subsequently suffered the wholesale removal of large tracts of forest and the construction of numerous drainage canals. Due to the Aceh conflict, however, only a portion of these estates were actually planted with palms and most were left abandoned for several years, resulting in considerable natural regeneration. Because of this, Tripa was able to serve as an efficient buffer zone against the 2004 tsunami disaster, protecting local people living inland of the still forested and regenerating areas and contributing to local livelihoods.

2. TRIPA VALUE

2.1 Tripa is crucial for local livelihood

Tripa is an essential freshwater reservoir and provides important fish breeding grounds. Fresh fish is a major part of the diet and the main source of protein for the local people. Tripa also supplies timber for construction and firewood, and non-timber forest products, such as honey and medicinal plants. In fact, as demonstrated for tropical forest ecosystems generally (Larson, 2007), Tripa's forests enhance human resilience to disasters, by providing alternative livelihoods during unusually difficult times.

The Tripa peat swamp forest also provides the optimal climatic conditions for agriculture (including oil palm) in nearby surrounding areas, since it exerts a major influence on both the quantity and frequency of rainfall in the area (Binnie & Partners, 1986; IWACO, 1993; Oldeman et. al., 1979). As a result, the palm oil yields in this region are among the highest recorded anywhere.

In 2004, Tripa effectively protected the coastline and communities further inland from the Tsunami. Very few casualties were recorded behind the protective forests of the coastal peat swamp buffer zone. Furthermore, Tripa also protects these same communities from flooding, as the peat swamps control and regulate the flow of rain and river water to the coast.

Figure 1. Location of the 3 remaining coastal peat swamp forests of Aceh Province, with Leuser Ecosystem conservation area in dark green

2.2. Tripa contributes to mitigate climate change

Assessment of Tripa's carbon stocks (Agus and Wahdini, 2008; Wahyunto, Ritung and Subagjo, 2003) have found that Tripa is composed of three peat domes that reach more than five meters deep in several places. The total amount of carbon in the peat itself (circa. 1,300 tonnes/ha) far outweighs the quantities stored above ground, in the trees and other biomass (circa. 110 tonnes/ha; Agus and Wahdini, 2008, see Hairiah, 2001). The total amount of carbon in Tripa's peat layer is between 50 and 100 million tons, constituting the largest unprotected carbon store in Aceh. This carbon store is the result of thousands of years of the gradual accumulation of organic material in the swamps, where the anaerobic conditions prevent decomposition.

2.3. Tripa hosts unique and critically important biodiversity

Tripa is part of the Leuser Ecosystem (Figure 1), world renowned for its unique biodiversity, and which includes a UNESCO World Heritage Site. The Tripa swamp forests support the highest densities in the world of the critically endangered Sumatran orangutan (*Pongo abelii),* a distinct species from its Bornean relative. Furthermore, the exceptionally high densities found in these coastal swamps have facilitated the development of a unique "culture" of tool use among the orangutans there, found nowhere else in the wild (van Schaik et. al. 2003). Of the remaining 6,600 Sumatran orangutans in the world, more than 4% - around 280 – live in Tripa (Wich et. al., 2008).

Tripa is a major opportunity for conservation. If allowed to regenerate it could potentially support more than 1,000 Sumatran orangutans, or circa 20% if the entire world population of the species. In recognition of the critical role it plays in orangutan conservation Tripa is listed as a priority conservation site by the Great Apes Survival Program (GRASP), a joint UNEP and UNESCO program endorsed by Indonesia.

Several other protected primate species are also found in Tripa, including the Siamang, the white-handed gibbon and Thomas' langur. Other endangered species present include Sumatran tigers, sun bears, estuarine crocodiles, reticulated pythons, giant soft-shelled turtles and a number of swamp specialist birds, such as Storms' stork, the white-winged wood duck and the masked finfoot. The vegetation and flora of Tripa is also considered to be exceptionally diverse, in line with the remaining other, similar peat swamps found elsewhere in Sumatra (Laumonier, 1997).

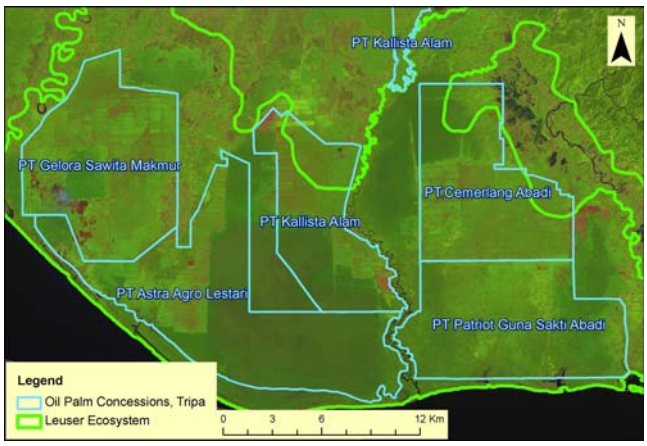

Figure 2. Locations of the oil palm concessions on Tripa (Satellite image is SPOT 4, scene 259-342, 2006; courtesy of Aceh Forest and Envrionment Project)

3. DESTRUCTION OF TRIPA BY OIL PALM PLANTATIONS

Since the devastating Tsunami of December 2004, as a result of the subsequent peace accord in Aceh and the post-tsunami reconstruction process, four of the major oil palm estates located in Tripa have resumed their operations. In 2007, PT Astra Agro Lestari, a subsidiary of UK registered Jardines Matheson Holdings Ltd, took over one of the concessions. This concession is both the closest to the coast

and the one that hosts most of the environmental services still provided by Tripa, such as the deepest peat, the largest remaining orangutan population (and of other wildlife species), the most significant fish stocks, and a natural forest barrier against future disasters (Figure 2).

Despite a 2007 Moratorium on Forest Logging in Aceh, that prohibits all forest logging, including within oil palm concessions, the destruction of the remaining forests in these concessions continues unabated. A comprehensive report on the situation and value of Tripa (PanEco, 2008) found that in July 2008, at least 60% of the original forest had already been destroyed, and that the conversion process was still intensifying.

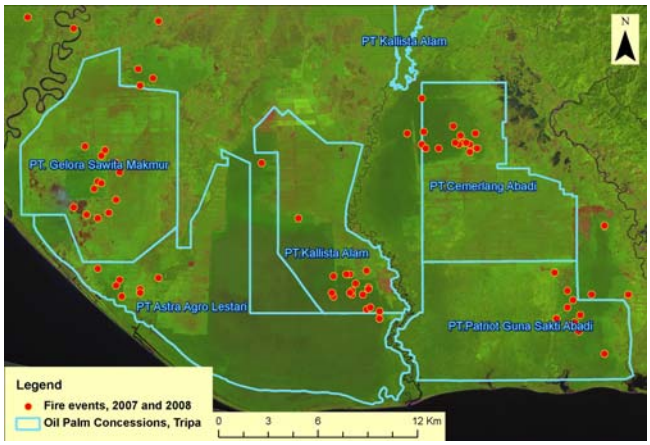

Figure 3. Peat fires in Tripa during 2007 and 2008. All of the concessions are implicated.

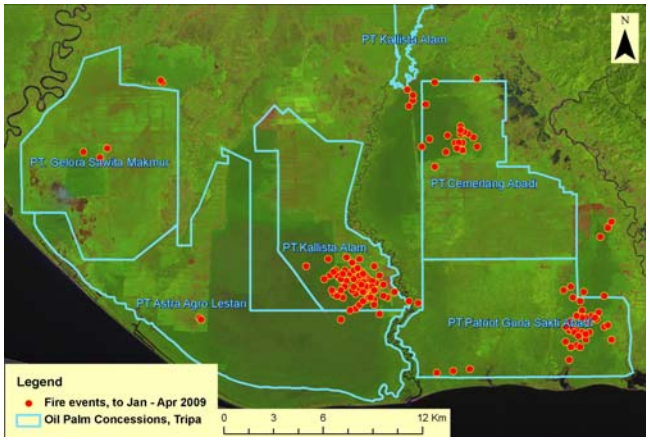

Figure 4. Peat burnt on Tripa between January and end of April 2009, with a large concentration in the PT Kallista Alam concession in April itself.

In addition, numerous drainage canals were being excavated by heavy machinery, resulting in the drying and oxidation of the surface layers of the peat. The peat itself was also being burned (Figure 3) in blatent contravention of legislation governing the burning of forests and peatlands. These fires or "hotspots" are nowadays easily detected by satellites and published on the internet (see NASA/University of Maryland, 2002). Fires are clearly evident in all of the concessions, but towards the end of 2008 mostly occurred in areas claimed by PT Astra Agro Lestari (see Serambi 2008; Kompas 2008). As recently as April 2009 numerous new fires were still being detected (Figure 4). On this occasion PT Astra Agro Lestari was again implicated, along with PT Kallista Alam. Furthermore, it is clear from the distribution of hotspots that fires almost exclusively occur in locations within the concessions that are either undergoing deforestation or are already cleared.

4. IMPACT OF TRIPA DESTRUCTION

4.1. Local people

Local livelihoods are being lost. The destruction of the Tripa peat swamp forest has direct consequences for the food security of the local rural communities, especially by devastating the valuable fish stocks, the main source of protein for people in this region, along with numerous other forest products (Paneco, 2008a). It will also have indirect consequences. Clearing and draining peat land reduces humidity and raises temperatures, leading to an exceedingly dry and hot local climate (Figure 4), that no longer provides the optimum temperatures, humidity and rainfall for agriculture on nearby, surrounding mineral soils. This will reduce agricultural productivity, including oil palm yields, in nearby estates.

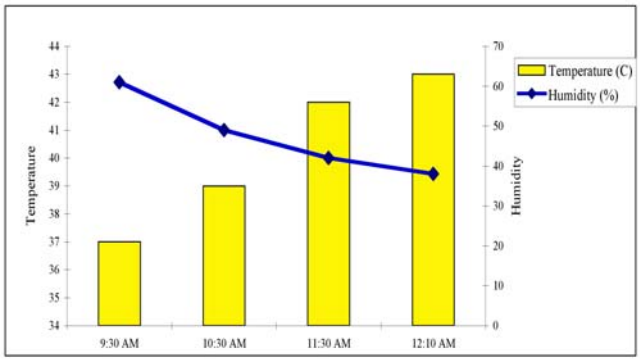

Figure 4. Increased temperatures and reduced humidity are the result in logged areas, Nov 2007

Removal of the forests and destruction of the swamps dramatically reduces the water retention capacity of the peat domes and their ability to store and regulate water flow, resulting in a marked increase in both the frequency and severity of flooding.

The vulnerability of local communities to future tsunami like disasters is also increased. The wave dissipating effect of the coastal forest buffer zone is lost when the trees are

removed. The very ground itself is lowered as a result of subsidence caused by oxidation of the newly dried peat. Subsidence of this nature on peat lands converted to palm oil plantations normally averages around 5cm per year (Page et. al., 2002). This will eventually lead to the destruction of all the oil palm plantations in the long-term, as a result of salt water intrusion from the ocean, and current predictions of rising sea levels over the coming decades, due to global climate change (IPCC, 2007).

Logging work in these concessions is normally carried out by non-residents, brought in from elsewhere, including as far as North Sumatra province, and who typically work for less than US$100 a month. Furthermore, any local people employed on the estates tend to be given mostly unskilled work that is similarly poorly paid. This scenario does not give them the possibility to escape poverty. On the contrary, it traps them in low paid unskilled work, and by taking over almost the entire land area, the estates directly prevent alternative land uses and any options for alternative incomes.

4.2. Climate change

Huge amounts of carbon will be released on Tripa in only thirty years (Figure 5).

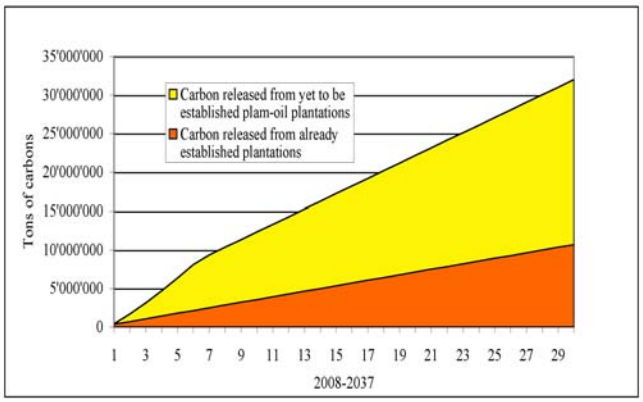

Figure 5. Forecast carbon released in Tripa

Most of the carbon currently stored above ground (i.e., in the trees and other biomass) will be lost within just 7 years, by 2014, if recent deforestation rates persist (PanEco, 2008). The carbon that is stored below the ground, in the peat itself, the result of gradual accumulation over countless millennia, will be lost in less than a few decades, due to the combination of peat fires and peat oxidation.

Emissions from peat fires can release from 50 to as much as 300 tonnes of carbon per hectare (Page et. al., 2000; Siegert et. al., 2002). Similarly alarming are the oxidation emissions that result from simply draining and drying the peat. CO^2 released in this way could be as high as 73 tonnes per hectare per year, equivalent to 20 tonnes of carbon per hectare per year (Hooijer et. al., 2006).

4.3. Biodiversity

The unique biodiversity that is wholly dependent on these peat swamp forests for its existence, will not be able to survive. The result will be the local extinction of many swamp specialist species, and the death of circa 280 or so Sumatran orangutans. A few of these may survive, e.g. as captured infants that survive the death of their mothers, but the vast majority will be killed, either directly (shooting, burning etc) or indirectly through malnutrition and starvation. They, and the vast majority of the other species currently surviving in Tripa simply cannot survive in mono-culture oil palm plantations, which are well known for the very low levels of biodiversity that they can actually support.

5. CONCLUSION

The conversion of the Tripa coastal peat swamp forest to oil palm plantations seriously undermines the whole post-tsunami reconstruction process by destroying an essential coastal buffer zone and by weakening the resilience of the local communities to cope with extreme events, such as the 2004 Tsunami itself. The palm oil plantations also contribute directly to climate change by releasing huge quantities of carbon and drive Tripa's unique biodiversity to extinction.

There are many Indonesian policies and laws to protect Tripa from destruction (Paneco, 2008) and alternative development scenarios do exist that would be of far greater long-term benefit to the local communities. Options include developing wildlife based eco-tourism, providing alternative opportunities for agriculture on fallow land, and carbon trading.

The crisis is particularly acute in Tripa, but similar trends to those reported here can also be found affecting both the Kluet swamps and the Trumon-Singkil swamps, where illegal logging, fires, fragmentation and encroachment due to new roads, and conversion to oil palm estates are all occurring.

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7. REFERENCES

Agus, F., and Wahdini, W., (2008). Assessment of carbon stock of peat land at Tripa, Nagan Raya district, Nanggroe

Darussalam Province of Indonesia, Indonesian Centre for Agricultural Land Resources Research and Development.

Binnie & Partners, (1986), *Inventory of Water Resources Schemes – Volume 2 – Existing Situation*. Aceh Design Unit – Provincial Water Resources Development Plan, Binnie and Partners Ltd. With Hunting Technical Survey Ltd. and Hunting Surveys Ltd. – Ministry of Public Work, General Directorate of Water Resources Development, Directorate of Planning and Programming, Jakarta.

Hairiah, K., Sitompul, S.M., van Noordwijk, M. and Palm, C., (2001). Methods for sampling carbon stocks above and below ground. ASB Lecture Note 4B. ICRAF. Dec. 2001, p32.

Hooijer, A., Silvius, M., Wosten, H. and Page, S. (2006). *PEAT-CO2, Assessment of CO2 emissions from drained peatlands in SE Asia*. Delft Hydraulics report Q3943.

IPCC, (2007). Climate change 2007 synthesis report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. *IPCC*, Geneva, Switzerland. pp 104.

IWACO. (1993). Study of water resources for allocation of water supply for D. I. Aceh Province – Kabupaten Aceh Barat Daya.

Kompas newspaper 03 November (2008). Hundreds of hectares of oil palm estates in Aceh burned.

Larson, A.M. and Ribot, J. (2007). The poverty of forest policy: double standards on an uneven playing field. *Sustainability Science* 2(2).

Laumonier Y., (1997), *The vegetation and physiography of Sumatra*, Kluwer Academic.

NASA/University of Maryland, 2002. MODIS Hotspot / Active Fire Detections. Data set. MODIS Rapid Response Project, NASA/GSFC [producer], University of Maryland, Fire Information for Resource Management System [distributors]. Available online [http://maps.geog.umd.edu]

Oldeman, L.R., Las I., and Darwis S. N, (1979), *An agroclimatic map of Sumatra*, Contributions Central, Research Institute for Agriculture, Bogor 52 (1979): 35

Page, S. E., Rieley, J. O., Böhm, H.-D. V., Siegert F. and Muhamad, N. Z. (2000) Impact of the 1997 fires on the peatlands of Central Kalimantan, Indonesia, in: Proceedings of the 11th International Peat Congress, Quebec, Canada. International Peat Society, 962 – 970.

Page, S. E., Siegert, F., Rieley, J. O., Boehm, H.-D. V., Jaya, A. and Limin, S. (2002) The amount of carbon released from peat and forest fires in Indonesia during 1997, *Nature*, 420: 61 – 65.

PanEco, (2008). How palm-oil plantations at Tripa increase disaster risk, contribute to climate change and drive a unique Sumatran-orangutan population to extinction. Value of Tripa peatswamp forest, Aceh, Sumatra, Indonesia. PanEco Foundation.

PanEco, (2008a). The dark side of a green fuel. PanEco Foundation. www.paneco.ch

Serambi Newspaper 02 November (2008). Excess burning of oil palm plantation Astra Agro Lestari: RAWA TRIPA DESTROYED.

Siegert, F., Boehm, H.-D. V., Rieley, J. O., Page, S. E., Jauhiainen, J., Vasander, H. and Jaya, A. (2002) Peat fires in Central Kalimantan , Indonesia: Fire impacts and carbon release. In: J.O. Rieley, and S. E. Page, with B. Setiadi, (Eds.), Peatlands for People: Natural Resource Functions and Sustainable Management, *Proceedings of the International Symposium on Tropical Peatland*, 22-23 August 2001, Jakarta, Indonesia. BPPT and Indonesian Peat Association, 142 – 154.

Van Schaik, C. P., Ancrenaz, M., Borgen, G., Galdikas, B.M.F., Knott, C.D., Singleton, I., Suzuki, A., Utami, S., and Merrill, M. (2003). Orangutan Cultures and the Evolution of Material Culture. *Science* 299: 102-105

Wahyunto, Ritung S., and Subagjo H. (2003). *Map of peatland Distribution Area and Carbon Content in Sumatra*. Wetlands International-Indonesia Program and Wildlife Habitat Canada (WHC)

Wich, S.A., Meijaard, E., Marshall, A., Husson, S., Ancrenaz, M., Lacy, R., van Schaik, C.P., Sugardjito, J., Simorangkir, T., Traylor-Holzer, K., Doughty, M., Supriatna, J., Dennis, R., Gumal, M., Knott, C.D., and Singleton, I., (2008). Distribution and conservation status of the orang-utan (*Pongo spp*.) on Borneo and Sumatra: how many remain? Fauna & Flora International, *Oryx* 42(3), 329–339.