



Human livelihoods, ecosystem services and the habitat of the Sumatran orangutan: rapid assessment in Batang Toru and Tripa

Project title: Human livelihoods, ecosystem services and the habitat of the Sumatran orangutan: rapid assessment in Batang Toru and Tripa

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Timeframe: 1 April 2010 to 28 February 2011

Funding partner: United Nations Environment Programme through PanEco

Amount: USD 56 500

Location: Tripa, Aceh and Batang Toru, North Sumatra

Partners: PanEco and Yayasan Ekosistem Lestari

The World Agroforestry Centre (ICRAF), in collaboration with PanEco and Yayasan Ekosistem Lestari, conducted a rapid assessment of carbon stock and carried out spatial, livelihoods and cost-benefit analyses for orangutan habitat at the two sites. We used Rapid Analysis of Carbon Stock Assessment (RaCSA) to assess the carbon stock (above and below ground) at plot level and calculated land cover for carbon stock at landscape level. We calculated net present value (NPV) of important crop/tree commodities in Tripa and Batang Toru and analysed the costs and benefits of each commodity. To find solutions for better management at the two study sites, a FALLOW¹ model was used, which generated several possible scenarios.



Tripa peat swamp forest (photo: Elok Mulyoutami)

The assessment was conducted via several stages.

A. Land use and human livelihood system:

Current land use, available maps and datasets, socio-economic context, local ecological knowledge, major habitat types and their human use, profitability



B. Quantifying carbon stocks and tree diversity:

Quantifying plot-level above- and belowground C stocks and scaling up to land use system; quantifying landscape level changes in C stocks



C. Land use change and consequences for emissions:

Interpreting satellite imagery, testing accuracy against groundtruthing data, quantifying landscape level changes in C stock



D. Opportunity cost analysis of recorded land use change:

Combining data on profitability and C stocks of land use alternatives with actual rates of historical change to derive a \$/tCO₂e opportunity costs



E. Scenario analysis of baseline and project impacts : Using a dynamic land use model to predict (ex ante) the additionality of C storage and net change in rural income for various interventions, stocks, OU habitat and human livelihood



F. Predicting orangutan response to corridor options: Using a basic metapopulation/dispersal model to predict (ex ante) the additionality of various orangutan conservation efforts



G. Syntehsis on tradeoffs and potential for synergy:

Combining the various lines of argument as input to local negotiations

¹van Noordwijk 2002; Suyamto et al. 2009

Selected findings

- Eco-certification of rubber may in future allow farmers to get better prices.
- The three primary threats to orangutan conservation in Batang Toru are the logging concession, the planned gold mining operations and immigrants who open up forest for new farms and are reported to be opportunistic hunters of orangutan.
- The smallholder oil palm sector is now driving land-use change in Tripa and may be the greatest potential threat to the orangutan.
- The aboveground carbon stock estimate for undisturbed forest in Tripa was similar to that in Batang Toru (averages of 246 and 243 t/ha, respectively). Most of the forest in Tripa, however, is disturbed, with an average aboveground carbon stock of 122 t/ha.
- Lowland peat swamps in Tripa have an average depth of 3.2 m, with average belowground carbon stock of 1350 t/ha. Soil-based carbon stock in Batang Toru ranged 32–58 t/ha for the top 15 cm.
- Undisturbed forest in Batang Toru contained many tree species supplying orangutan food.
- Analysis of opportunity costs of avoided emissions in Tripa and Batang Toru showed that the cost between natural forest and oil palm was slightly over 10 USD/tCO_{2e}.
- In Batang Toru, the dominant change, and the highest emission contributor, was from undisturbed forest to disturbed forest, which reflected logging and other timber extraction activities. The opportunity cost for logging activity from natural forest was 8.27 USD/tCO_{2e} for all the periods of analysis.
- Forest in Tripa decreased dramatically to more profitable but low-carbon stocks, that is, oil palm (both plantations and smallholder plots), while annual crops and agroforest remain constant. In Tripa, forest conversion to oil palm plantations produced high average annual emissions.
- A number of activities that enhance emissions also increase the number of people who can obtain income. When such effects are included at the landscape level, opportunity costs could increase to 15 USD/tCO_{2e} for comprehensive emission reduction scenarios, while they could be 5 USD/tCO_{2e} for limited activity, with

lower relevance for biodiversity conservation. The FALLOW model also indicated that about 60% of the income opportunities that might be lost in Tripa if oil palm expansion was restricted could be absorbed by other land-use activities.

- Orangutan populations are likely slow to respond to ecological restoration owing to their low birth and dispersal rates. Further examination of the corridor scenarios explored how attractive such options could be from a conservation perspective, with a potential gain of 10–200 individuals in the area over 30 years.

References

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- van Noordwijk M. 2002. Scaling trade-offs between crop productivity, carbon stocks and biodiversity in shifting cultivation landscape mosaics: the FALLOW model. *Ecological Modelling* 149: 113–126.
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'Lokan' catcher in Kuala Semayam (photo: Elok Mulyoutami)