ASB Partnership for the Tropical Forest Margins

Policybriefs 16

Reducing emissions from deforestation, inside and outside the 'forest'

New data from Indonesia suggests that one-third of greenhouse gas emissions from deforestation originate from areas not officially defined as 'forest'.

Accounting for carbon in the whole landscape and Reducing Emissions from All Land Uses (REALU) can be more effective in reducing emissions.

Main findings

1. One third of Indonesia's forest emissions (total of 0.6 Gt carbon per year) occur outside institutionally defined forests, and are not accounted for under the current national policy for Reducing Emissions from Deforestation and forest Degradation (REDD+).

2. If current emission levels continue according to business as usual, there will be no forest left by 2063.

3. Carbon stocks outside of institutional forests are more at risk than those inside, and may be depleted by 2032. This is partly due to emissions leakage from protected forests.

4. If carbon emissions from outside the institutional forest are accounted for, it becomes clear that there are no net emission reductions in Indonesia.

Implications

- Current REDD+ approaches in Indonesia may not reduce net $C0_2$ emissions
- An approach for Reducing Emissions from All Land Uses (REALU) can more effectively reduce net emissions, and ensure more locally-appropriate reduction activities
- A REALU approach can overcome unclear forest definitions and help capture leakage of emissions between sectors

Photo © D. Harja

Key Concepts

Time limit on business as usual

Emissions from forests are recognised as an important component of the global carbon balance, with just three forest-rich countries (Indonesia, Brazil and Democratic Republic of Congo), responsible for more than half these emissions globally. Deforestation has stopped in many countries because there are simply no forests left. The ratio of remaining carbon stock and current carbon emission rates shows how many years business as usual can continue before forests are gone and carbon stocks are entirely depleted. This can be referred to as the "time limit" on business as usual.

The time limit on Indonesia's changing above-ground carbon stocks was analysed according to different forest definitions

The word forest has multiple meanings. On one hand it refers to woody vegetation with a minimum tree height and cover. On the other, it refers to an institutional regime known as *kawasan hutan* in Indonesia. Earlier analyses have shown that these two classifications don't match and that there is forest with trees, forest without trees, non-forest with trees and non-forest without trees (see ASB PolicyBrief 15: *If we cannot define it, we cannot save it*). The above-ground time limit on Indonesia's changing carbon stocks was analysed according to different forest definitions. The results reveal some serious concerns for the current REDD+ approaches in Indonesia, particularly as trees outside the institutional forest are not currently considered.

Indonesia: the leader in emissions

Indonesia is likely the global leader in land-based, or terrestrial carbon emissions, with approximately equal emission rates from above-ground carbon stock (mostly trees) and below-ground carbon (mostly peatlands). Peatlands, which make up about 10% of Indonesia, are incredibly rich in carbon. These areas store about 10 times more carbon below-ground than above-ground. In comparison, mineral soils typically store about half of the above-ground stocks. Due to these large stocks, the time limit on below-ground carbon is longer than for above-ground stocks.

Emission estimates for Indonesia and its time limit

For the periods 1990–2000 and 2000–2005, the average loss of above-ground carbon stock was found to be consistently 0.6 Gt per year, with about two-thirds of the emissions taking place inside, and one-third outside, of the *kawasan hutan* (this does not include peat emissions). These new estimates are higher than the data that was used for Indonesia's national communications on greenhouse gas emissions. It also differs in detail owing to differences in methodology and in the imagery used for the land-cover change maps. Due to these differences, the aboveground time limit for Indonesia as a whole decreased from 73 to 63 years, calculated at the start of the two measurement periods (both translating to the year 2063 as the time limit). These results strongly underline the need for realistic international and national approaches in order to slow down deforestation rates. The time limit for peatland emissions is measured in hundreds of years. The time limit for overall emissions can be segregated into *kawasan hutan* and non-*kawasan hutan*. Results for the 2000–2005 period are 73 and 32 years respectively. These numbers indicate that carbon stocks in the forest outside the *kawasan hutan* are more at risk than those inside, and that current emission levels could potentially be sustained for a policy-relevant period of 20 years.

A thought experiment on REDD+ ...

Suppose that from now on the Indonesian Government is able to effectively protect all of the *kawasan hutan* and reduce its emission rate to zero. Would this mean that total emissions from Indonesia would be reduced? Not necessarily, because the causes of carbon stock loss would shift and affect the trees outside the forest. However, the time limit for trees outside of

Figure 1 - Losses of C stock in above ground vegetation implies CO_2 emissions

Recent analysis of satellite imagery for all of Indonesia is revealing that areas outside the institutional forest are producing one-third of the country's emissions. Proportional to area, as much carbon is lost outside as inside the institutional forest, and carbon stocks are lost at a greater rate outside the forest.

Forest use class (% of area)	1990-2000	2000-2005	1990-2000	2000-2005	1990-2000	2000-2005
	tC ha^{-1} yr^{-1}		% $year^{-1}$		% of total emission	
Protected/conserved (26.7%)	1.55	2.01	0.65	0.90	16	20
Production (31.8%)	3.29	3.28	1.60	1.80	41	39
Convertible (9.6%)	2.95	3.07	1.59	1.87	11	11
Non-forest (31.9%)	2.63	2.57	2.73	3.33	32	30
Total	**2.58**	**2.69**	**1.45**	**1.70**		

Source: ALLREDDI project, 2010

the forest is less than what has been calculated to date, and would be accelerated by a higher total emission rate. How much time would be left for trees outside forests, if REDD+ leaves them out?

...or the actual current policy?

This was not in fact a thought experiment. It is the actual REDD policy of the Government of Indonesia, supported by all relevant agencies in the international arena. All current policy is focused on the institutional forest and on enhancing the control of central forest authorities over what happens there. We know that leakage is one of the biggest issues in REDD; protecting forest in one place may lead to a shift of emissions to other forests. So far, attention has only been given to leakage within the institutional forest category. International accounting rules for leakage in other emission reduction schemes suggest that potential leakage is subtracted from predicted net emission reduction and that analysis of past estimates and measurements can be used to correct this. Our estimate of the time limit outside institutional forest can help us predict the net emission reductions Indonesia can claim, for example in a first hypothetical five-year accounting period. The answer is zero net emission reductions which is contrary to many expectations.

Leakage potential to non-forest

At the current overall emission rate of 0.6 Gt per year, the time limit for tree-based vegetation in Indonesia outside the institutional forest is 6.4 years; more than a five-year accounting period. It is therefore technically possible for net emission rates from tree-based vegetation in Indonesia to remain at the level of 0.6 Gt per year for more than five years, even if all *kawasan hutan* is 100% protected.

Implications

This result is shocking, considering the overall objective of REDD+ is to create net emission reductions. What can we do about it? From a carbon accounting perspective the answer is simple: do whole-landscape carbon accounting the way researchers in this study did and evidence of current emissions both inside and outside the *kawasan hutan* will emerge. The answer is not simple at the institutional level. The effectiveness of forest policies inside the *kawasan hutan* is not as clear as many would hope, but outside the *kawasan hutan* the Ministry of Forestry has no formal mandate. If effectiveness of REDD+ depends to such a degree on what happens outside of the *kawasan hutan*, policy development and intended resource sharing will have to drastically change from what is currently being proposed.

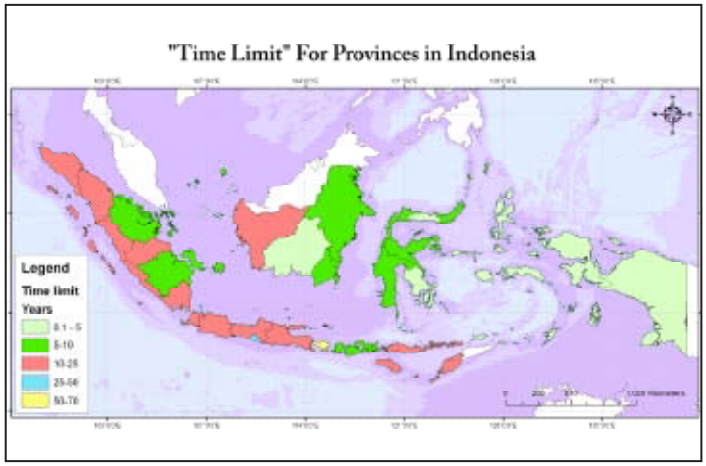
The alternative approach: Reducing Emissions from All Land Use

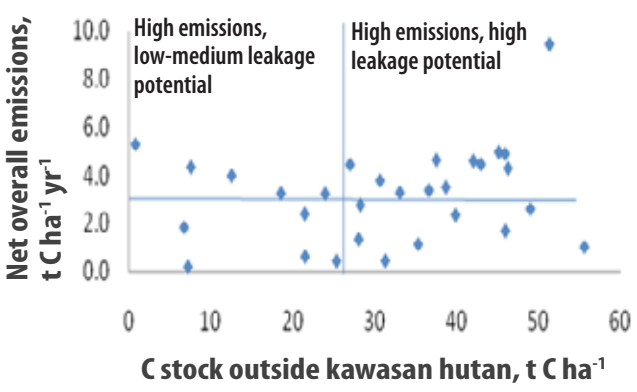
The ASB Partnership for the Tropical Forest Margins is calling for an approach for Reducing Emissions from All Land Use (REALU) based on the principle that emission reduction needs to be evaluated across the whole landscape. We now have data to show how important this is for above-ground tree-based carbon stocks. The data for below-ground stocks (peatlands) is being developed, however it is already clear that for Indonesia, peatland emissions have been poorly handled in a REDD+ framework with a limited forest definition.

Uncertainty in our data

Details of our calculations are subject to errors and uncertainty. Because both emission and carbon stock figures are derived from the same look-up table for typical carbon stocks per land-cover class, the stock/emission ratios are not very sensitive to uncertainty in this table. The pixel-level reliability of the image interpretation is > 80% for nearly all land cover classes and in the aggregated-level data at district scale we expect this type of classification error to have evened out. The national scale data are largely insensitive to classification error but sensitive to any bias in the estimation.

Figures 2 and 3 - Geographic variation in time limit of business as usual emissions under a scenario where all *kawasan hutan* is protected but emissions shift to other woody vegetation. (Where the time limit is > 5 years, leakage can be 100% for a 5-year commitment period.)





Indonesia: the leader in emission reduction

Indonesia is not only a leader in emissions from terrestrial carbon stocks, it has also shown political leadership to reduce emissions. Its Nationally Appropriate Mitigation Action (NAMA) plan targets net national emissions from various sectors including sustainable peatland management, reduction in rate of deforestation and land degradation, and development of carbon sequestration projects in forestry and agriculture, and commits to voluntarily reduce emissions 26% below the 2020 business as usual projections[1].

Because the NAMA includes emissions from land uses outside of the forest, it is in effect a whole-landscape approach to carbon accounting. However, Indonesia has not clarified the relationship between NAMA and REDD+.

It may be more effective to reframe the debate to talk about REALU rather than developing separate rules and institutions to implement NAMAs and REDD+.

It may also be a more effective way to relate locally-appropriate mitigation actions (LAMAs) to NAMAs, and negotiate shared responsibility for reduction between districts, provinces and sectors.

Next steps

The data presented here is currently undergoing peer review and while the details may still change, the conclusions do not.

REDD+ design in Indonesia (and similar conditions elsewhere) may require a serious rethinking. It may also bring the international REDD+ design back to the drawing board, particularly in light of arguments for a comprehensive approach to emission reduction from agriculture.

Two challenges stand out:

1) how to make emission reduction from forests possible in the absence of clear concepts of what a forest actually is, and

2) how to level the playing field for trees and carbon stocks in agricultural soils and have them recognized as partly avoidable sources of emissions that merit attention.

A whole-landscape approach can help reduce transaction costs of multiple and overlapping rules with gaps in between. It can also ensure that developing countries begin to meet the goals of emission reduction and fair incentives for effective stewardship of terrestrial vegetation.

There are more trees on the farm in the foreground than in the forest in the background, around Lake Toba in Sumatra, Indonesia. Photo © M. van Noordwijk

The ASB Partnership for the Tropical Forest Margins is working to raise productivity and income of rural households in the humid tropics without increasing deforestation or undermining essential environmental services.

ASB is a consortium of over 90 international and national-level partners with an ecoregional focus on the forest-agriculture margins in the humid tropics, with benchmark sites in the western Amazon basin of Brazil and Peru, the Congo Basin forest in Cameroon, southern Philippines, northern Thailand, and the island of Sumatra in Indonesia.

The ASB Policybriefs series aims to deliver relevant, concise reading to key people whose decisions will make a difference to poverty reduction and environmental protection in the humid tropics.

This work was undertaken as part of the project Reducing Emissions from All Land Uses (REALU) with generous funding by NORAD, the Norwegian Development Agency. The views expressed in this brief are not those of the funder.

Further Reading

[1] Witoelar, Rachmat. 30 January 2010. "Indonesia Voluntary Mitigation Actions". Letter to UNFCCC. Available at: http://unfccc.int/files/meetings/application/pdf/indonesiacphaccord_app2.pdf

van Noordwijk M, Minang PA, Dewi S, Hall J, Rantala S. 2009. Reducing Emissions from All Land Uses (REALU): The Case for a whole landscape approach. *ASB PolicyBrief 13*. ASB Partnership for the Tropical Forest Margins, Nairobi, Kenya. Available at: www.asb.cgiar.org

van Noordwijk M and Minang PA. 2009. "If we cannot define it, we cannot save it" *ASB PolicyBrief 15.* ASB Partnership for the Tropical Forest Margins, Nairobi, Kenya. Available at: www.asb.cgiar.org

Correct citation

Ekadinata A; van Noordwijk M; Dewi S and Minang P A. 2010. "Reducing emissions from deforestation, inside and outside the 'forest'". *ASB PolicyBrief 16.* ASB Partnership for the Tropical Forest Margins, Nairobi, Kenya. Available at: www.asb.cgiar.org

Cover photo

Peatland areas in Sumatra, Indonesia, are being rapidly converted to oil palm plantations. Many of the emissions from this land use change are not considered under Indonesia's current REDD policy. *Photo by V. Meadu.*

Contact us:
ASB Partnership for the Tropical Forest Margins,
P.O. Box 30677 - 00100 Nairobi, Kenya
Tel. +254 20 7224000
Email: asb@cgiar.org
http://www.asb.cgiar.org

ASB Partnership for the Tropical Forest Margins

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Norad