OPPORTUNITIES FOR REDUCING EMISSIONS FROM ALL LAND USES IN INDONESIA

POLICY ANALYSIS AND CASE STUDIES

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ASB Partnership for the Tropical Forest Margins

While the international community has embraced the Reducing Emissions from Deforestation and forest Degradation (REDD-plus), the role played by land outside the forest in storing carbon and reducing emissions, has not been sufficiently addressed.

The project, 'Architecture of REALU: Reducing Emissions from All Land Uses' pays specific attention to the interactions between forest carbon stocks, other carbon stocks affected by land use, the major drivers of land-use and forest change, and the livelihoods of the hundreds of millions of people whose actions shape these changes.

A broad-based approach to carbon management can lead to greater emissions reductions and larger benefits for local people.

This project is implemented by the ASB Partnership for the Tropical Forest Margins in collaboration with local and international research partners in eight countries: Indonesia, Philippines, China, Nepal, Vietnam, Cameroon, Peru and Tanzania.

ASB is the only global partnership devoted entirely to research on the tropical forest margins. ASB's goal is to raise the productivity and income of rural households in the humid tropics without increasing deforestation or undermining essential environmental services.

The research in Indonesia was led by ASB and the World Agroforestry Centre (ICRAF) in coordination with the Indonesia Soil Research Institute (ISRI).

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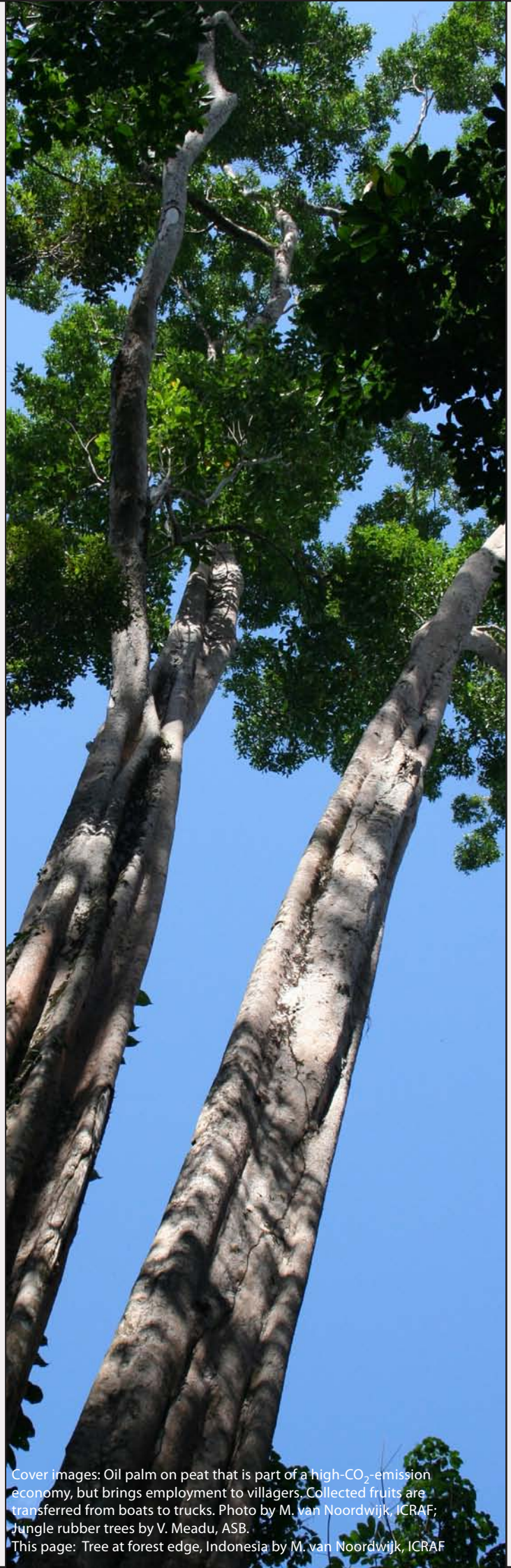


Cover images: Oil palm on peat that is part of a high-CO_2-emission economy, but brings employment to villagers. Collected fruits are transferred from boats to trucks. Photo by M. van Noordwijk, ICRAF; Jungle rubber trees by V. Meadu, ASB.
This page: Tree at forest edge, Indonesia by M. van Noordwijk, ICRAF

Abstract

As a contribution to the wider debate on emission reduction from agriculture, forestry and other land uses in developing countries, this report explores the possibilities in Indonesia of broadening the current REDD+ category to include all land use and land-use changes.

This report provides an overview at two levels: the national debate in Indonesia and a compilation of case studies of specific landscapes where the local context shapes the debate.

At the case study sites there is a chance to change current land-use practices in order to establish higher carbon stock landscapes—while also providing for human livelihoods—if appropriate incentives can be derived from international co-investment and policy instruments.

Opportunities for reducing greenhouse gas emissions from Indonesia exist across all sectors of the economy and across a wide geographic area. However, in the international discussion so far, only two aspects have been recognised: actions in the energy and industrial sector that can obtain support from the Clean Development Mechanism (CDM); and efforts to reduce emissions from deforestation and degradation (REDD$^+$). In theory, afforestation/reforestation following the Clean Development Mechanism's afforestation/reforestation (A/R-CDM) rules can be supported, but in practice no single project in Indonesia has passed the screening filters and been submitted to the 'designated national authority' as an essential step towards international submission, review and approval.

All activity in enhancing tree-based carbon stocks has remained in the voluntary domain. A substantial part of Indonesia's emissions derive from peatlands, some of which are within, and others outside of, the formal, government institutional 'forest' category and many other areas have contested status. Peatlands themselves need to be managed as hydrological entities if emissions are to be controlled and reduced.

Other aspects of land use on the edge of the REDD$^+$ debate are the agroforests and tree-based land-use systems managed by farmers across Indonesia. While this vegetation usually meets international standards to be considered 'forest', the institutional interpretation of forest in Indonesia implies loss of sovereignty for communities and farmers across the country and so they prefer naming their systems 'gardens'. The partial mismatch between the new international objective of emission reduction and the existing forest management institutions is part of the reason why efforts to 'reduce emissions from all land uses', or REALU, is an alternative worth exploring.

At the national scale, three discussions have evolved, with little cross-reference so far.

1) REDD$^+$ efforts, that received a boost in 2007 in the lead-up to the 13th Conference of Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) in Bali with the reports of the Indonesian Forest Climate Alliance;

2) The private sector and its trial-and-error approach to learning from emerging new standards for 'footprint' in international trade; and

3) The pioneer commitments from Indonesia in the nationally appropriate mitigation actions (NAMA) arena, that found at least some recognition in the otherwise disappointing outcome of the 15th COP of the UNFCCC in Copenhagen in December 2009.

The site-level studies reported here are of landscapes in Sumatra and Kalimantan that cross the spectrum from forest conservation through recognition of agroforest management and restocking of trees in the landscape and peatland management to conversion to oil palm production. The most positive example of the consequences of the REDD$^+$ debate has been the recognition of village

(agro)forest management in a long-term Alternatives to Slash and Burn: Partnership for the Tropical Forest Margins (ASB) research location in Jambi, Sumatra, which will hopefully act as a beacon for many others to follow. Most of the other case studies reveal that there would indeed be opportunities to reduce emissions, while enhancing local livelihoods, but that such opportunities require new ways of thinking about, and planning of, land use.

The case studies also reveal an inadequacy in the currently dominant 'payment for ecosystem services', or PES, paradigm. In the network of landscapes in Indonesia where experiments with this approach take place, water rather than carbon or biodiversity has been the primary issue, but in all cases success has depended on the building of trust—rather than clean buyer-seller financial relationships—between the external and local stakeholders.

A language of co-investment, sharing of risks and benefits and enhancement of reciprocity and responsibility has been the basis for success, not that of a market place. Appropriate ways for blending financial incentives with a broader approach based on 'rights' and 'recognition' are yet to evolve and gain the type of external interest that the PES paradigm has generated.

Glossary

AFOLU	Agriculture, forestry and other land uses
ALLREDDI	Accountability and local level initiative to reduce emission from deforestation and degradation in Indonesia (http://www.worldagroforestrycentre.org/sea/ALLREDDI)
CDM	Clean development mechanism
CER	Certified emission reductions
COP	Conference of parties
GAMA	Globally appropriate mitigation actions
Kawasan Hutan	Forest domain in Indonesia, subject to forestry law
LAAMA	Locally appropriate adaptation and mitigation actions
LDC	Least-developed country
LULUCF	Land use, land-use change and forestry
MRV	Monitoring, reporting and verification
NAMA	Nationally appropriate mitigation action
RED (EU)	European Union's renewable energy directive
RED	Reducing emissions from deforestation
REDD	Reducing emissions from deforestation and forest degradation
REDD+	Reducing emissions from deforestation and forest degradation plus forest restoration
REDD++	REALU: reducing emissions from all land uses
REDD-plus	Reducing emissions from deforestation in developing countries, including conservation
RSPO	Roundtable on sustainable palm oil
UNFCCC	United Nations framework convention on climate change

Table of Contents

1. REDD+ debate in Indonesia: salient questions, legitimate and credible approaches?

The shift from an absolute 'avoided deforestation' terminology to the more modest 'reducing emissions from deforestation and degradation' (REDD) in the lead up to COP 13 in 2007 made the concept significantly more palatable and interesting for the governments of forest-rich developing countries. Expectations of substantial international funding outside of the onerous CDM mechanism increased the enthusiasm. In Indonesia, a consortium of international and national partners explored the issues and tried to extract lessons from all preceding efforts to influence forest policy and practice in Indonesia (IFCA 2007, van Noordwijk et al. 2008). The 'Bali Roadmap' put REDD firmly on the international agenda, with a two-year period for experimenting and learning up to the COP 15, when a binding international agreement was expected. During 2008 and 2009, however, there were signs that the initial enthusiasm had waned and that some 'sticky' issues had emerged that cast doubt on the way the widely supported goal of 'reducing emissions' could actually be reached by the institutions and mechanisms that had come to dominate the discussion. The REDD issue appeared to follow the ignorance/hope/hype/crash/reality stages that, for example, the biofuel issue went through as well. Such a cycle, in which the expectations are initially raised unrealistically high seems to be hard to avoid if public attention is necessary, but if the hype climbs too high and the subsequent crash is too deep it may be hard to reach a realistic, moderately positive overall outcome. In that sense, there probably is 'path dependence', where the way an eventual compromise is attained does matter.

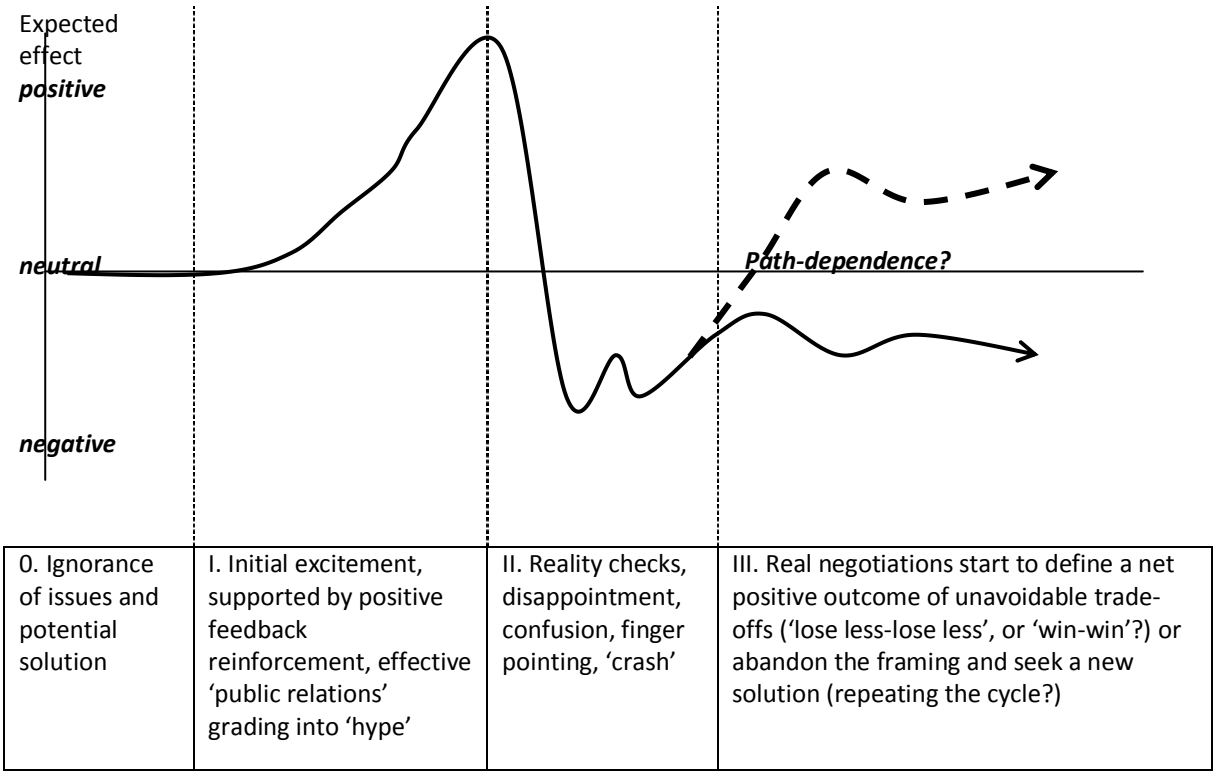


Figure 1. Stages in typical 'issue cycle' of environmental policy

Where is the REDD issue in public debate? A simple hope/hype-versus-realism ranking method for information available in the public domain compares the total number of website links reported by Google to the number of links of more scholarly nature that are captured by Google Scholar. As yardsticks we use the ratio for words such as 'hope' and 'hype' on the low end and 'realistic' or 'analysis' on the high end. Results (Table 1) suggests that REDD is still closer to the hope/hype stage than other associated terms but that there is, relatively speaking, more 'realistic' evidence for it than for key words such as '*Jatropha*' , 'policy' and 'free and prior informed consent'.

Table 1. Ranking of the term REDD and associates on the ratio of the number of website links listed by the Google and Google Scholar search engines (data from 25 July 2010)

		Google Scholar	Google	Google Scholar as % of Google
1	Paris Hilton	4,220	37,400,000	0.01
2	free prior informed consent	297	140,000	0.21
3	policy	3,190,000	1,160,000,000	0.28
4	police	1,100,000	360,000,000	0.31
5	Indonesia	1,050,000	341,000,000	0.31
6	Jatropha	19,000	6,140,000	0.31
7	hype	108,000	28,900,000	0.37
8	hope	2,960,000	587,000,000	0.50
9	**REDD**	**45,700**	**7,300,000**	**0.63**
10	climate	1,130,000	171,000,000	0.66
11	CDM	125,000	18,200,000	0.69
12	forest	2,190,000	253,000,000	0.87
13	Norway	1,430,000	162,000,000	0.88
14	economy	2,420,000	267,000,000	0.91
15	science	7,930,000	784,000,000	1.01
16	UNFCCC	26,800	1,810,000	1.48
17	human rights	993,000	64,400,000	1.54
18	climate change	1,130,000	71,800,000	1.57
19	conservation	2,170,000	134,000,000	1.62
20	biofuel	57,100	3,340,000	1.71
21	carbon	3,630,000	176,000,000	2.06
22	IPCC	120,000	4,460,000	2.69
23	physics	3,670,000	135,000,000	2.72
24	realistic	1,700,000	60,200,000	2.82
25	forestry	1,570,000	53,200,000	2.95
26	chemistry	4,750,000	137,000,000	3.47
27	biology	3,920,000	96,700,000	4.05
28	agroforestry	140,000	3,370,000	4.15
29	biodiversity	777,000	17,400,000	4.47
30	oil palm	67,700	1,410,000	4.80
31	experiment	6,350,000	121,000,000	5.25

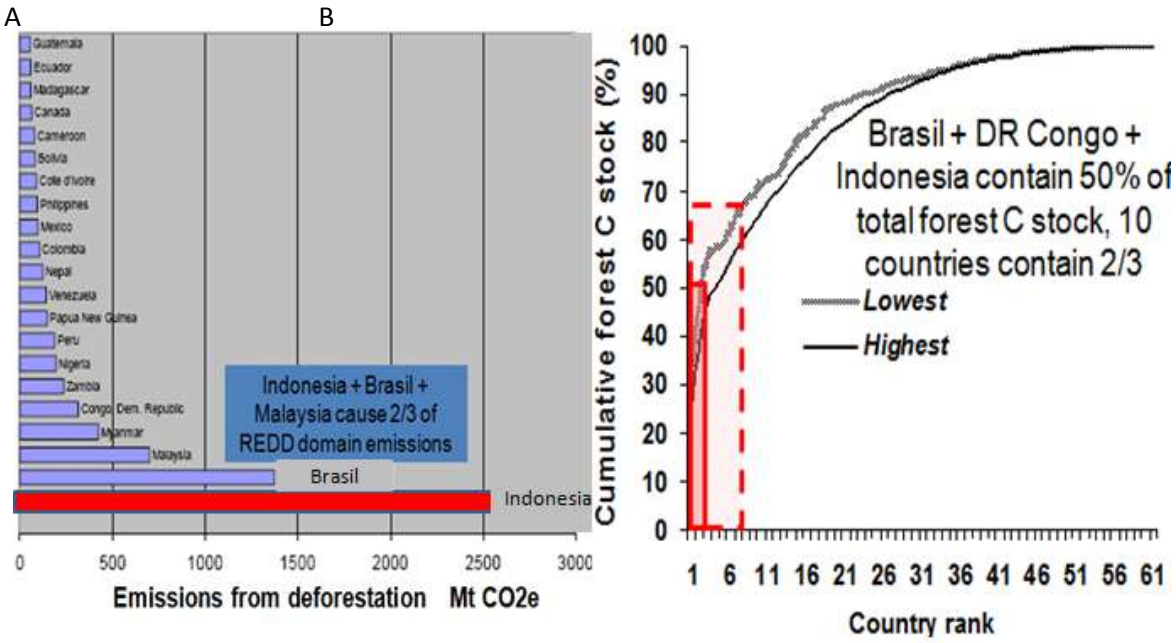


Figure 2. A) Estimates of current emission levels from forest and peat at national scale; B) cumulative total forest carbon stock (excluding peat) by ranked countries

While there is uncertainty over the emission data of all countries, Indonesia is in the top three with respect to emissions from land-use change ('deforestation') as well as aboveground forest carbon-stock (Figure 2). The fact that the top three emitters are responsible for two thirds of total emissions, while ten countries contain two thirds of total stock (and potential for emissions), suggest that the UNFCCC pathway to seek consensus among more than 170 countries, desirable as it is, may be more complicated than necessary to make substantive progress and that early action by some of the larger stakeholders may be needed to avoid deadlock. In a survey of REDD pilots (Cerbu et al. 2009) in early 2009, Indonesia was found to top the list with 34 initiatives (Figure. 3). When we relate the number of REDD pilots to either national forest carbon-stock or reported loss of forest cover, however, both relate to the number of REDD pilots with a power function with coefficient 0.42, suggesting that spread and 'fairness' concepts prevail; if REDD pilots would be proportional to emission opportunity, a power of 1 would be expected.

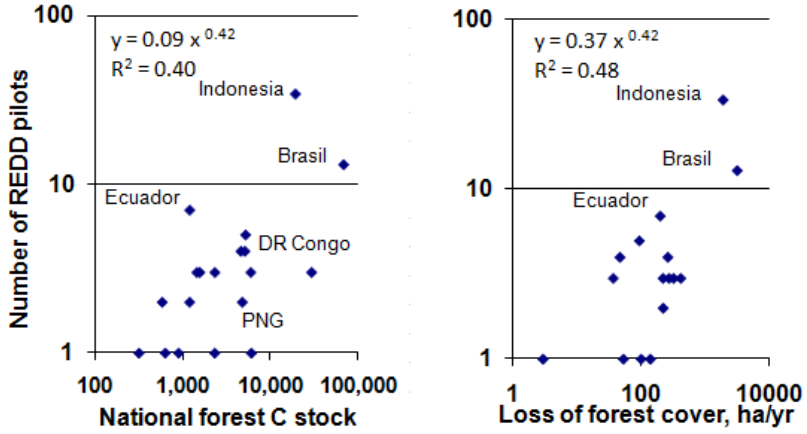


Figure 3. Number of 2009 REDD pilots in relation to forest carbon-stocks. Source: Cerbu et al. 2009

A number of issues have emerged, internationally and specifically for Indonesia, that dampened the initial enthusiasm and led to discussions on 'safeguards', clarification of operational mechanisms, political debate and strategic positioning for tough negotiations.

1. In the absence of internationally agreed rules on how 'baselines' will be set, the *additionality* of efforts across the various forest categories remained unclear. The potential application of REDD in Indonesia across different forest-policy categories remained contested: because 'conservation' and 'watershed protection' forests are, in theory, free from deforestation and forest degradation, the focus would be on the management of 'production' forest and the reconsideration of planned deforestation in 'conversion' forest. In practice, however, the protection and conservation forests still require additional effort to be effectively conserved and a large share of the initial REDD pilots were initiated by conservation NGOs which saw opportunities to broaden their funding base. The concessionaires in the production forest areas emphasised the relevance of continuity of employment and economic benefits and tried to improve their bargaining position to obtain a share of the expected funding. Decisions on 'conversion' forest are already partially out of the hands of Indonesia's forestry authorities and they see little benefit in making this a priority category.

2. International environmental NGOs and countries supporting similar agendas in the international negotiations, realised that REDD funds would not stop the conversion of natural forest to plantations for the pulp and paper industry and started to doubt that the broad 'forest definition' used so far was appropriate for the REDD domain. International negotiators did not see ways to clarify this issue and the definition used by the UNFCCC CDM executive board provided the default. As that definition hinges on the concept 'tree', a follow-up debate has now emerged around the definition of 'tree', especially whether or not woody perennials such as palms and bamboos can be included. A consequence of the current definition is that oil palm plantations, like short-rotation industrial timber plantations, are included in the concept and clear-felling followed by replant cannot therefore be considered to be 'deforestation'. This appears to be counter-intuitive and against the expectations of external stakeholders. The consequences of multiple interpretations of the definition of 'forest' and its consequences for the scope of REDD+ thus tend to break up the broad coalition of stakeholders initially supporting the idea (all for their own reasons and with their, partially incompatible, expectations).

3. Linked to the issues of definition and scope are the 'forest outside of forest' and 'forests without trees' issues (Figure 4). An objectively observable definition based on vegetation with a stated tree crown cover, is blended in the UNFCCC CDM 'forest' definition with a concept that implicitly refers to 'forest institutions' in the clause on 'temporarily unstocked' forests. A strict interpretation of the latter implies that deforestation rates in Indonesia are virtually zero, while it excludes all government-designated 'institutional forest' (*kawasan hutan*[1]) from eligibility under A/R-CDM rules (see van Noordwijk et al. 2008). On the other hand, a considerable fraction of land outside of the *kawasan hutan* meets the crown cover definition of forest and, more importantly, stores considerable amounts of carbon. As it is outside of the institutional mandate of the Ministry of Forestry, however, there is a built-in tension when the Ministry is seen as the default and primary implementer of REDD^{+} policies and financial incentives.

[1] As all common English translations of *kawasan hutan* carry additional meaning, we use the original Indonesian term throughout this document

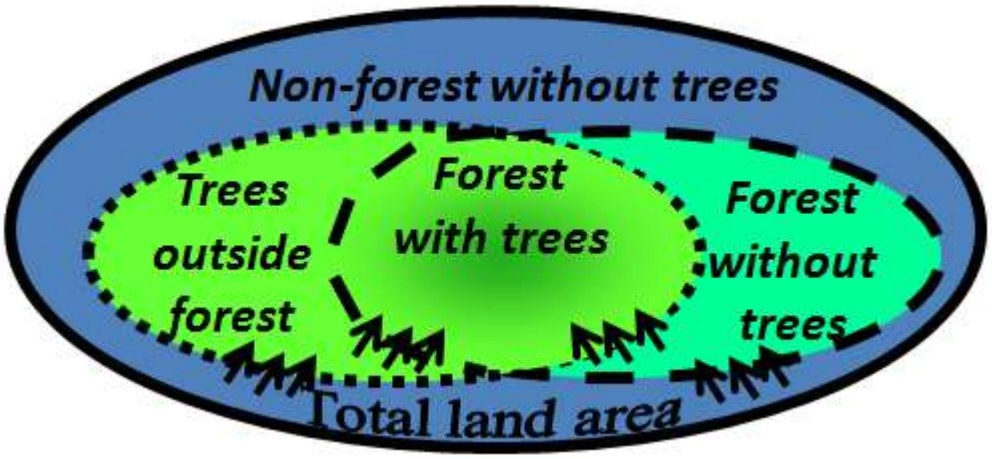


Figure 4. Four classes of land based on a combination of an institutional forest concept and the physical presence of trees (van Noordwijk and Minang 2009)

4. Legal procedures been completed for only a small part of the *kawasan hutan* of Indonesia to verify whether or not it can be considered to be 'state forest lands'. A substantial area remains contested in historical local claims that pre-date the government's indication of the land as 'forest zone'. Discrepancies between the Agrarian Law and Forestry Law remain unresolved and a pragmatic approach to conflict resolution that focuses on negotiating use rights tends to prevail. Expectations of substantial financial incentives for REDD$^+$ have, however, added to the stakes. On the other hand, attention for the issue in the international arena has induced forestry authorities interested in REDD$^+$ funding to be more receptive to the relevance of negotiated arrangements with local communities.

5. A substantial part (perhaps as much as 50%) of Indonesia's emissions have derived from belowground carbon stores in the form of peat, rather than from aboveground woody vegetation. A considerable part of the peatlands still have sufficient tree cover to qualify as forest and many are still part of the *kawasan hutan* but, different from forests on mineral soils, the impacts of conversion—high emission levels—are felt for many decades. The use of a cut-off debate for historical deforestation thus excludes current emissions from the scope of REDD$^+$, even though the emissions are avoidable (for example, by restoring wetter conditions). Equally important is that peat domes should be understood as hydrological entities that need to be managed as a whole, rather than assuming that separate regimes can be implemented on forest and non-forest parts of the dome. The tropical peatland issue, however, is mostly relevant for Indonesia (and Malaysia) and does not have the broad political support that 'forests' have; efforts to include peat alongside forest in the scope of the REDD$^+$ mechanisms have not had success, but the recent Letter of Intent between the Norwegian and Indonesian governments mentions the two words, stepping over the hurdle that has not yet been cleared internationally. Reducing peatland emissions is attractive to investors, because it appears to be a 'low hanging fruit' owing to relatively low opportunity and implementation costs and relatively concentrated areas with not-too-many local stakeholders, and is seen as undermining REDD$^+$ elsewhere.

6. Issues of peatland management, forest-outside-forest and *kawasan hutan* come together at the level of local land-use planning and economic development strategies under the mandate of district (regency) and provincial governments. Early interest of provincial governments, especially those of NAD (Aceh) and Papua, to engage in the international REDD arena were not deemed to be appropriate by central forest authorities. Harmonisation of forest classification and land-use plans has not been completed in the two provinces with the highest track records of emissions: Riau and Central Kalimantan. The relationship

between central forest authorities and provincial/district government has not yet been resolved, with the Ministry of Forestry seeing its 18 'forest management units' across the country as the primary REDD$^+$ implementing agency rather than directly sharing responsibility and funds with local government entities outside of their control.

7. Expectations of future profits to be made in attracting international market-based carbon finance have provided space for entrepreneurs to approach local governments and, in a number of cases, obtain signed agreements that future investment should pass through specific private sector agents. Terms such as 'wild West' and 'carbon cowboys' have been coined and concerns expressed that local governments sign (and are paid for doing so) for something that is beyond their understanding and legal reach.

8. From the early discussions in the Indonesia Forest Climate Alliance (IFCA), the expectation has been that the piloting phase will be funded through bilateral and multilateral (especially UN-REDD) public sources but that modalities would be needed to access the potentially much larger 'carbon market' that includes private sector agents' compliance to national emission reduction commitments in their home countries. Such funding has remained controversial on two sides: it is seen as diluting efforts to achieve a low-carbon-flux economy in the industrialised economies that need to bring their real emissions down rather than obtaining relatively cheap 'rights to emit'. On the receiving end, the developing countries don't want to 'chew dirty money' and obtain funds that will only displace emissions rather than contribute to global emission reduction. There are some signs of 'additionality' in the negotiating positions for a post-2012 regime by the European Union (20% emission reduction with current rules, 30% if more flexible mechanisms for reducing emissions from land-use change can be included). Overall, the 'market-based' funds are not yet forthcoming, apart from 'toe-dippers' (small scale investments to learn how it can be done). International agreements on rights to pollute are needed before tradable emission-reduction certificates emerge.

9. With current REDD$^+$ pilots largely confined to bilateral funding (UN-REDD is still starting up in Indonesia), the Ministry of Forestry is in a key position to be involved in all efforts and is aiming for a 'controlling stake' in all projects. Its track record for handling finance, especially in the context of the 'reforestation fund', however, and in relating to local stakeholders has not been up to the standards that current investors apply. A considerable increase in the transparency, internal control and external auditing is deemed necessary, although this adds to the transaction costs and reduces flexible management opportunities.

10. The need for transparency, disclosure and full reporting on financial flows combines with the need for monitoring of carbon stocks and emission rates to quantify the levels of emission reduction actually achieved. In the international negotiations, these issues are referred to as 'MRV systems' (Monitoring, Reporting and Verification), with ongoing debate on the appropriate distance from government agencies that is necessary, especially for verification. There is a growing consensus that the reporting for REDD$^+$ must be consistent with the Intergovernmental Panel on Climate Change (IPCC) procedures for national communications on greenhouse gas emissions, which involve the mandates of multiple ministries. Issues of mandate and responsibility are yet to be satisfactorily dealt with.

None of the above ten points is an insurmountable blockade to effective REDD$^+$ effort in Indonesia but in combination these issues have cooled off the initial high (and hyped) expectations and have emphasised the challenges of separating the deforestation/degradation issues from the rest of the landscape and perspectives on economic development (Figure 5). Each of the ten points is the starting point for salient questions on how to form a trusted REDD$^+$ framework.

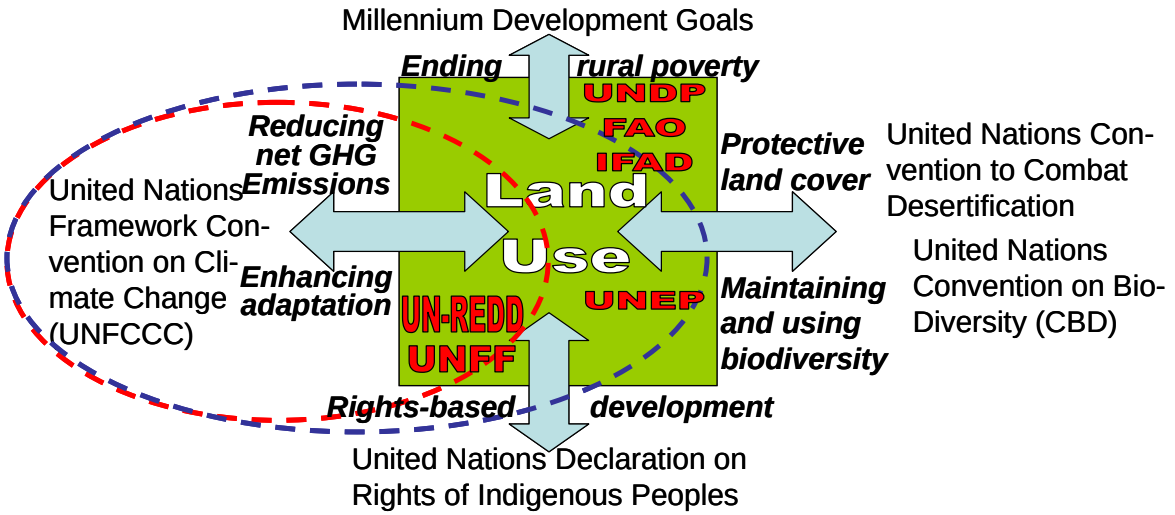


Figure 5. Part of the complexity of the ways 'forest' interacts with other land use and the multiple goals of the various international conventions and declarations

The key problem to be addressed by REALU

The current framing of the efforts to reduce emissions from deforestation and degradation refer to a partial accounting of land-use change, without clarity on cross-sector links and rights other than those of forestry authorities. Negotiation processes to add safeguards will likely slow and complicate implementation. A more comprehensive and rights-based approach[2] to land use, such as the suggested REALU framework (figures 6 and 7) embedding REDD efforts, is likely to be more effective.

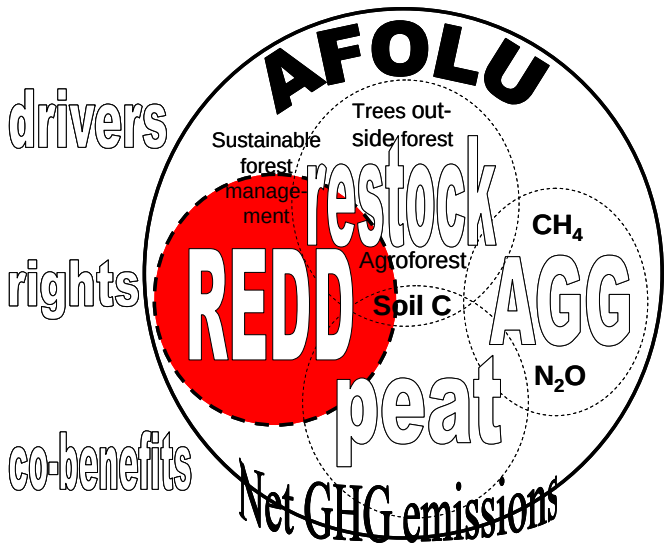


Figure 6. Relating REDD$^+$ to emissions from all land use

[2] A rights-based approach to development is a conceptual framework for the process of human development that is normatively based on international human rights standards and operationally directed to promoting and protecting human rights. See http://www.unhchr.ch/development/approaches.html.

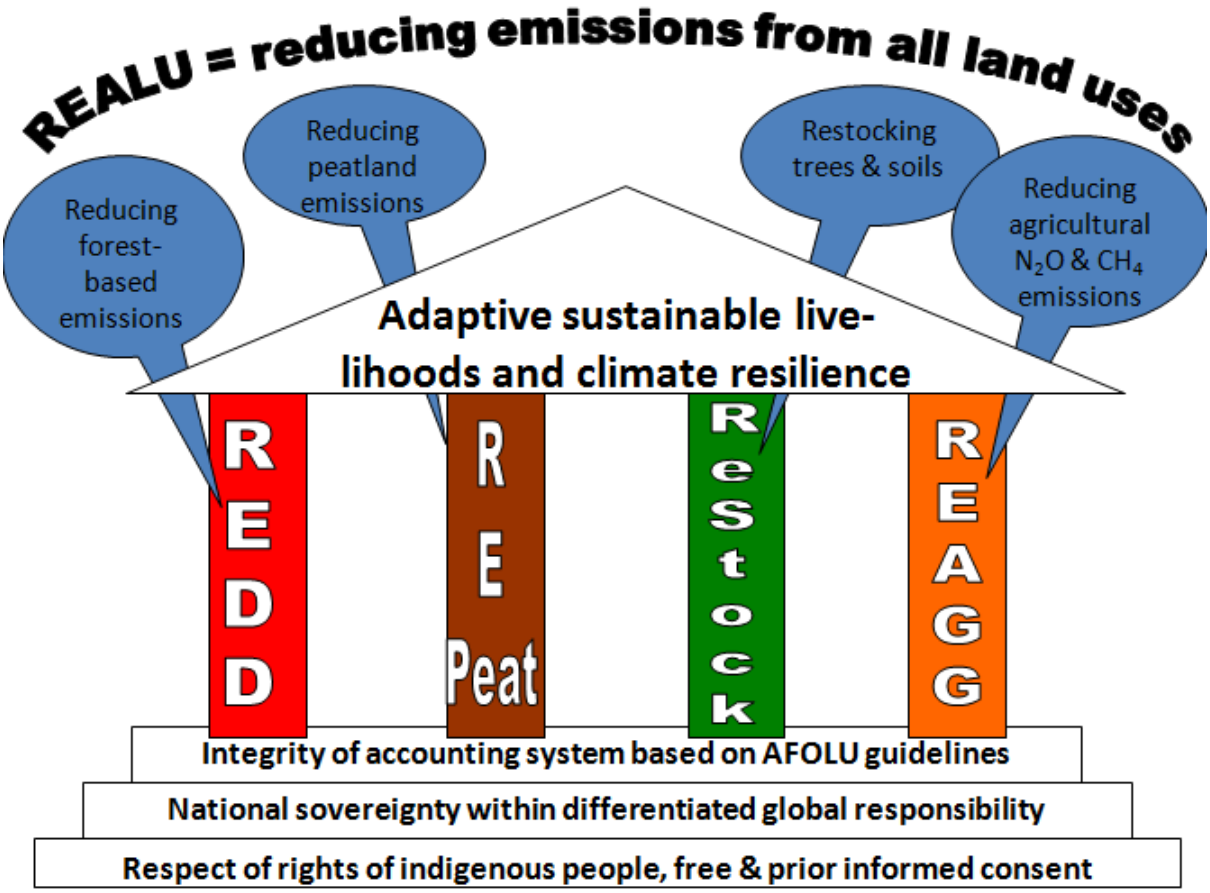


Figure 7. Outline of a possible architecture of international agreements to reduce emissions from all land uses, based on a number of 'pillars', a strong foundation in key principles and targeting to support adaptive and sustainable livelihoods and climate resilience

Embedding the REDD efforts in a holistic, terrestrial carbon-accounting scheme and within globally consistent approaches to the rights of indigenous people and local stakeholders is needed. Furthermore, such an approach allows options for different countries with different land use and soil types.

REALU architecture objectives

The international REALU architecture project of which REALU Indonesia is a subset, has two modules.

A. **REDD policy module**: Analysis, strategy and policy development for reduced emissions from deforestation and forest degradation in relation to agriculture and other land uses in developing country landscapes.

B. **Demonstration and methodology module**: Demonstration and 'on the ground' methodology for rural development with reduced deforestation and forest degradation in developing countries as part of comprehensive emission reduction.

Goal: To strengthen the ability of developing countries to develop and implement effective strategies for reducing emissions from deforestation and degradation within a context of rural development, national sovereignty, respect for indigenous rights and integrity of a global greenhouse gas accounting system.

Impact target: Fair and efficient financial co-investment in effective approaches to reduce greenhouse gas emissions from land use in tropical countries including, but not restricted to, deforestation and forest degradation, as part of the post-Kyoto UNFCCC regime, leading to reductions of global emissions, enhancement of resilience to climate change and respect for rights of local stakeholders.

Outcome target: Acceptance by the negotiating parties at COP 15 of a broad framework for dealing with greenhouse gas emissions from any land use, acknowledging cross-sectoral links and leakage and embracing REDD as one of its pillars. Formulation and acceptance of plans for 'high carbon-stock rural development', including forest protection, in response to global co-investment in clean development.

Project objectives

- Explore the relationships between efforts to reduce emissions from deforestation and forest degradation in developing countries, rural poverty, livelihood strategies and other land-use options, their greenhouse gas emission profiles and 'carbon rights'.
- Enrich global debate on REDD with the results of this analysis.
- Explore in five countries how a broader approach to reducing emissions from any land use can facilitate the protection of natural forest in the national context as well as reducing net emissions and poverty and respecting rights and resource access.
- Explore how a 'rights-based approach' can operate by the nesting of rights and responsibilities in implementing agencies, nations and local authorities.

The interactions between REDD and the other pillars of specific carbon accounting need further attention.

REPeat: This pillar will be designed with the three countries from which come 10% of current global emissions that derive from tropical peatland use and conversion. It is widely seen as the 'lowest hanging fruit' for emission reduction because the opportunity and implementation costs are low (<1 USD/tCO_2e and 3 USD/ tCO_2e, respectively). Strangely enough, the low costs have been used as an argument not to do it ('flooding the market'). The fuzziness of the 'forest' definition may allow all peatlands (including those without tree cover and in agricultural use) to be included in REDD, but the fact that only a few countries are involved leads to low support for the issue and a sense that it may undermine funding for 'real' forest issues. Recognising REPeat as a parallel pillar can clear the way for REDD.

ReStock: The failed efforts to bring reforestation/afforestation into the Clean Development Mechanism demonstrate that a re-design is needed for a pillar that supports restocking the landscape with trees and soil carbon. The absence of this pillar leads to concerns of countries with low current forest cover (drier tropics; earlier deforestation) that they are left out of the discussion and potential benefits of investment in emission reduction.

REAGG: The emissions of non-CO_2 greenhouse gasses methane (CH_4) and nitrous oxide (N_2O) deal with smaller fluxes, but more powerful greenhouse gasses. Emission levels depend on management (overall efficiency of nitrogen use, feed quality in animal husbandry) that involve some trade-offs and interactions with REDD. Where agricultural intensification reduces pressure on forest conversion (and this issue has been debated at length, leading to recognition of the conditions in which it can do so), its emission enhancement needs to be subtracted from the emission reduction achieved by avoided deforestation. Rather than having to do this as a leakage part of a REDD pillar, it would be easier if it were handled in a separate REAGG pillar.

Right from the start, two perspectives have been articulated.

1) Start with REDD and gradually bring in the rest of AFOLU aspects over time.

2) Start with comprehensive AFOLU with REDD as one of its first pillars. Arguments as perceived at the start of REALU-I are listed in Table 2. By engaging with the debate at national and local level we tried to test the relevance of the various positions on this issue, keeping an open eye for additional issues.

Table 2. Simple characterisation of the debate between 'REDD first' and 'AFOLU' advocates, that needs to be further articulated and contextualised

	Start with REDD and bring in other AFOLU aspects over time	Start with comprehensive AFOLU with REDD as one of the first 'pillars'
Complexity	Achieving political agreement is more than complex enough on a technically simple issue; any disagreement between scientists can and will be used to stall negotiated solutions; we need to keep it simple (KISS principle) and follow up on the REDD path	Whole-system carbon stock accounting is in fact simpler and less open to complex boundary delineations on the fuzzy forest definition; easily measurable quantities rather than words need to be the basis for rules and emission reduction policies
Co-benefits	Trust needs to be built through 'early action' modes that have clear benefits, such as the biodiversity value and other environmental services of natural forest protected; less clear-cut cases, including plantation forestry, need to be left for later consideration because stakeholders currently differ in perspective	The main benefit of early action on REALU is that the total emission reduction commitments can get closer to what is needed to avoid dangerous climate change (the famous 2^{o}C warming threshold); both Annex-B and non-Annex-B countries will need to evolve towards comprehensive carbon and greenhouse gas accounting, using AFOLU standards
Overall emission reduction targets	Exclude early emission reduction options (such as peatland emissions) that would be too easy and cheap, flooding the market for carbon credits and undermining real change	Once total emission reduction targets are set, broadening the scope of allowable emission reduction will be seen as 'diluting' efforts; avoiding easy emission reduction options with a 'market flooding' argument shows global negotiators are not taking emissions and climate change seriously
Political platform	As long as the few countries with the highest current emissions from deforestation and degradation are on board, REDD can start; other aspects of AFOLU need more countries to agree	All tropical countries can potentially benefit from REALU rules; creating a political platform is thus much easier; REDD alone leads to jealousy and filibuster

In the implementation of REALU in Indonesia, the synergy with other components of the portfolio of activities of the World Agroforestry Centre (ICRAF) Southeast Asia Program and ASB Indonesia has been maximized. The results reported here derive from efforts funded from various sources in addition to the NORAD funds. The various sections of the report will indicate the funding streams.

Table 3. Emerging questions on REDD+ in the context of Indonesia and potential answers in the context of whole-landscape carbon accounting or REALU efforts

Emerging questions on REDD$^+$ in the context of Indonesia	Potential relationship with a broader 'landscape carbon accounting' approach
1. What are historical and projected emission characteristics of forest-policy classes with different degrees of current protection? What is the formal (*de jure)* and actual (*de facto)* additionality across planned and unplanned, controlled and non-controlled emissions?	Empirical analysis of changes in carbon stock can start with all vegetation and land-use types and explore the degree to which forest classification by function matters, relative to other 'drivers'
2. How does current debate on the operational international definition of 'forest' as determinant of the scope of REDD $^+$ (and of the types of woody perennial that are considered to be a 'tree' in this context) interact with the data for Indonesia?	The implications of different operational interpretations of 'forest' and associated scope to REDD$^+$ can be assessed from the data, along with consequences for possible emission displacement and leakage
3. How can we reduce the current mismatch between woody vegetation meeting the international definition of 'forest' and existing 'forest' institutions disjuncture over 'trees outside forest' and 'forest without trees'?	Changes in woody vegetation on land not classified as forest are salient in the relationship between REDD$^+$ activities and their effectiveness on national scale emission reduction
4. How can the unresolved legality of state ownership claims over Indonesia's forest zone and its consequences for contest between state and local communities (some of which refer to 'indigenous' status) be addressed in deriving fair and efficient REDD$^+$ mechanisms and benefit-sharing arrangements?	Inclusion of lands outside of the institutional mandate of forest authorities may assist in defining benefit sharing for the contested parts of the forest zone
5. How can peatland emissions beyond the scope of 'forest' be integrated in an effective REDD$^+$ schemes?	The hydrological integrity of peat domes and the consequences for emissions is probably best handled in a whole-landscape context
6. How does REDD$^+$ interact with broader issues of regional development and land-use planning and how can the lack of harmonisation between provincial and national land-use plans, especially for the two provinces with the highest emissions, be addressed?	REDD$^+$ will have to be an integral part of high-carbon-stock/low-carbon-flux development strategies that link land use to livelihoods
7. How can the opportunistic behaviour of early entrepreneurs and investors be controlled, especially interacting with local governments that have limited understanding of the issues and of the emerging and legal cross-scale arrangements on REDD$^+$ in Indonesia?	Capacity building for local government and public sector debate needs to balance opportunity and private sector initiative

Emerging questions on REDD+ in the context of Indonesia	Potential relationship with a broader 'landscape carbon accounting' approach
8. What is the public acceptance of emission displacement via carbon markets rather than contributions to net global emission reduction via targeted funds?	Transparency on the source of international funding and its relationship to global emissions is needed to maintain moral support by stakeholders who see global emission reduction as urgent. Partial solutions are suspect
9. How can the lack of trust in the financial management of REDD+ funding streams through the Ministry of Forestry be acknowledged and dealt with?	Broad and public debate on financial incentives and transparency is needed beyond the current forest stakeholders to ensure institutional sustainability
10. What is the relationship between MRV for REDD+ and the broader approach to national communications on greenhouse gas emissions?	For the carbon stock and emission accounting a whole-landscape AFOLU approach is mandated for REDD+. Monitoring and reporting on incentives and co-benefits needs to be comprehensive and cannot be restricted to 'forest' as such

2. National-level analyses

2.1 Three interlocking debates: NAMA, REDD+ and trade

NAMA and efforts to REDD were both agreed as part of the Bali Action Plan[3] at the COP 13 of the UNFCCC in Bali in December 2007. Subsequent discussion has added a 'plus' to REDD for restoring forest carbon stocks but left the relationships between NAMA and REDD+ unclear in the emerging national REDD strategies. In practice, a third relation emerged (Figure 8) between global consumers and the areas of origin of the commodities they buy: concerns about 'footprint' and emissions embedded in trade (EET). Awareness of the links between Amazon cattle ranching and deforestation (the 'hamburger connection' of the 1980s) were mirrored in the concerns about the role oil palm plantations played in deforestation in Southeast Asia. The wave of interest in biofuel and the EU policies targeting 10% substitution of liquid fuels by biofuel sparked concerns about the emission profile of palm oil. After initial denial and rebuttals, the industry started on a path towards 'self-regulation' within the framework of the Roundtable on Sustainable Palm Oil (RSPO). In a number of well-published withdrawals from existing contracts, oil palm processing companies tried to dissociate themselves from oil palm plantations with a record of fresh deforestation. In the short term at least, this may have lead to more 'change of behaviour' than REDD$^+$ or NAMA debates. However, it is important to note that attribution issues among these three approaches have not been sorted out and that impact assessment of any of the three is difficult without understanding their interaction.

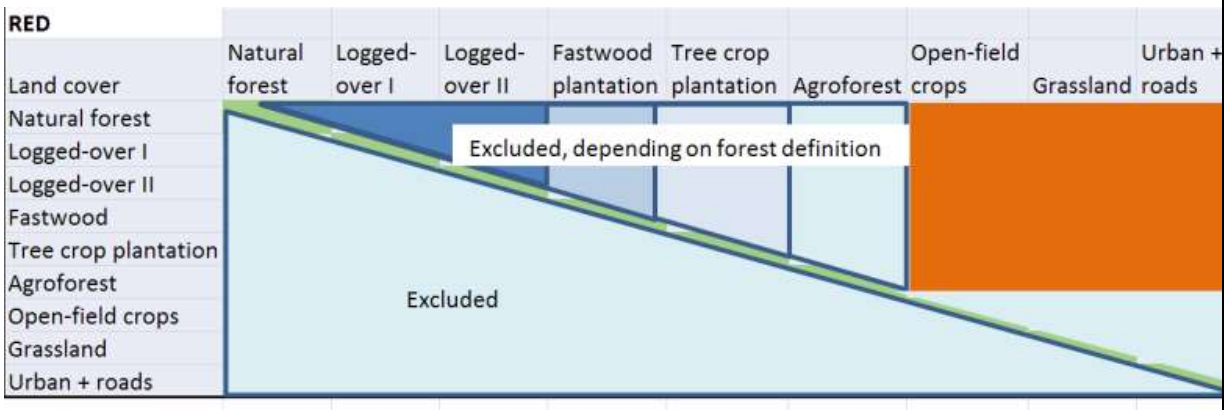
Figure 8. Three interlocking debates and emerging mechanisms related to land use: the REDD$^+$ via the forest; the NAMA through all emissions; and world markets through concerns about the 'emissions embedded in trade' and considerations of 'footprint'

[3] 'Bali Action Plan', Decision 1/CP.13, Addendum to the Report of the Conference of the Parties, Bali, December 2007, p. 3. http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3.

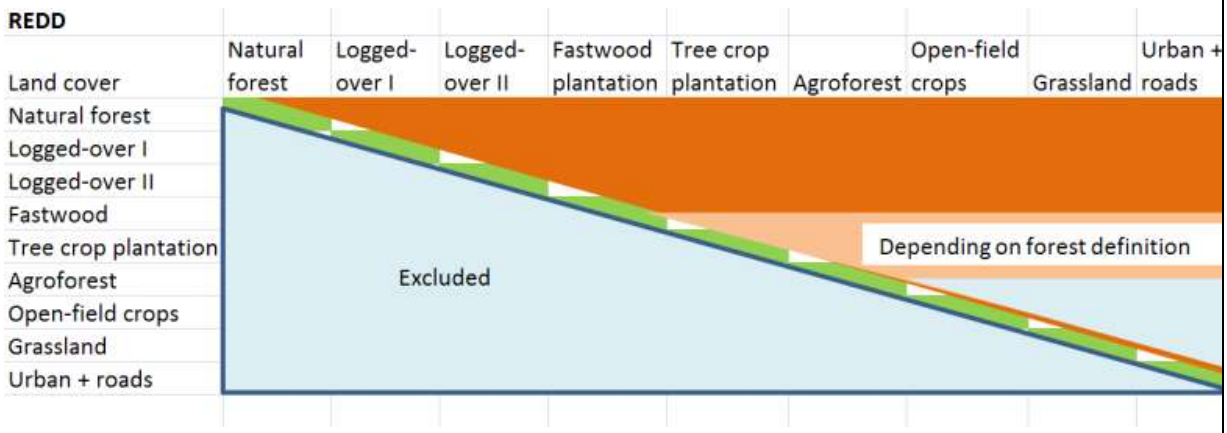
Figure 9. Schematic representation of the 'top-down' global regulation versus 'bottom-up' trade-based relationships between global citizens and land-use decisions in tropical forest margins and associated issues

A simple way to differentiate the various alternative definitions is to consider the part of a land-use change matrix that is included in measuring emissions under RED, REDD and REDD+ accounting regimes (Figure 10).

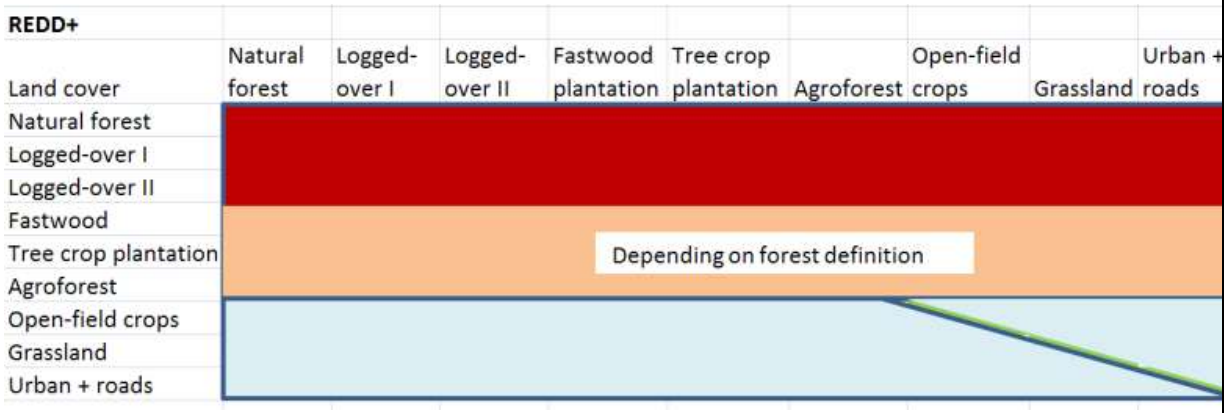
RED = Reducing emissions from (gross) deforestation: only changes from 'forest' to 'non-forest' land-cover types are included and details very much depend on the operational definition of 'forest'



REDD = RED plus (forest) degradation or the shift to lower carbon-stock densities *within* the forest; details very much depend on the operational definition of 'forest'



REDD^{+} = REDD plus restocking within and towards 'forest' ; in some versions REDD^{+} will also include peatlands regardless of their forest status ; details still depend on operational definition of 'forest'



REDD^{++} = REALU = REDD^{+} plus all transitions in land cover that affect carbon storage, whether peatland or mineral soil, trees-outside-forest, agroforest, plantations or natural forest. It does not depend on the operational definition of 'forest'

Figure 10. Schematic representation of RED, REDD, REDD+ and REDD++ (= REALU) accounting rules in a land-use-change matrix that contributes emission (or sequestration)

The relative impact of accounting rules and operational forest definition depends on the actual pattern of change. Results for three provinces in Indonesia suggest (Figure 10) that partial accounting for emissions can lead to over- as well as under-estimates of real net emissions, without

consistency across provinces. Whole-landscape carbon accounting appears to be the only 'simple' solution.

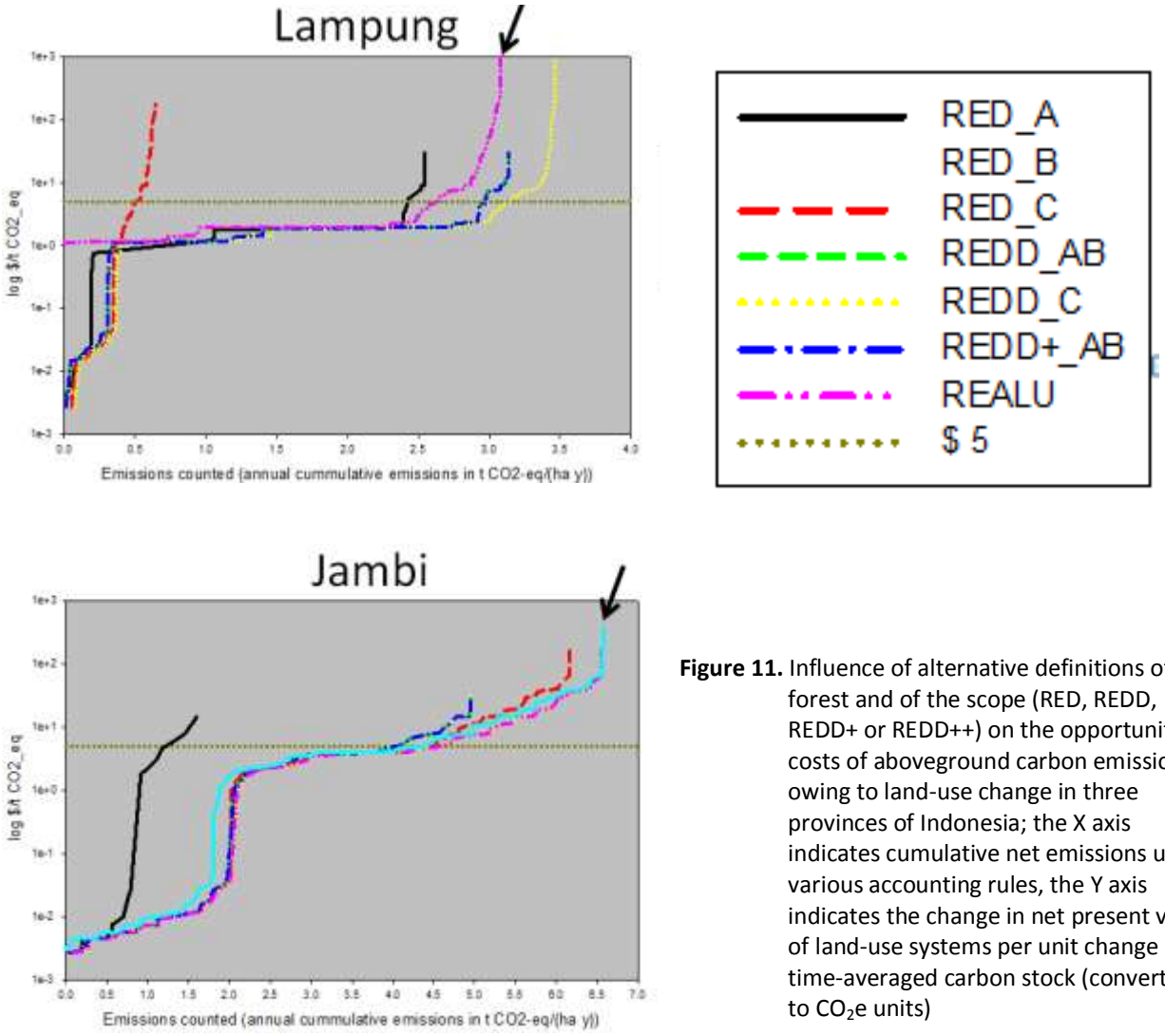


Figure 11. Influence of alternative definitions of forest and of the scope (RED, REDD, REDD+ or REDD++) on the opportunity costs of aboveground carbon emissions owing to land-use change in three provinces of Indonesia; the X axis indicates cumulative net emissions under various accounting rules, the Y axis indicates the change in net present value of land-use systems per unit change in time-averaged carbon stock (converted to CO_2e units)

2.2 GAMA–NAMA–LAAMA

Indonesia is a global leader on NAMA thanks to its bid to deal with 26% emission reduction as a unilateral NAMA, with a further 15% emission reduction depending on external investment (bi/multilateral NAMA). At this point of the international climate change negotiations, however, the sum of NAMAs falls seriously short of what would be Globally Appropriate Mitigation Action (GAMA) and further negotiations are needed to increase the commitments of major historical, current and future emitters. At the same time, the way Indonesia's NAMA can be achieved by Locally Appropriate Adaptation and Mitigation Actions (LAAMA) is not clear, both in its sectoral (energy use, transport, agriculture, forestry and other land uses) and geographical (islands, provinces, districts, forest management units) composition. It seems likely, however, that reducing peatland emissions can (and will have to) be a major part of the NAMA. We will explore some of the underlying issues and uncertainty.

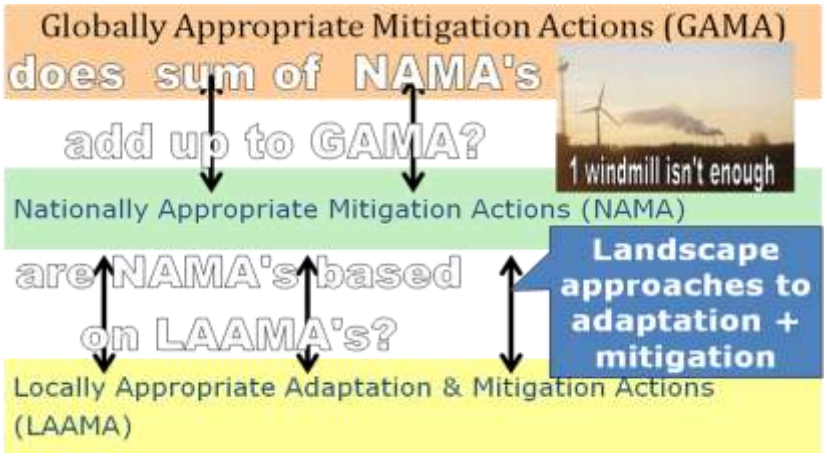


Figure 12. Schematic representation of NAMA and the way it is related to what would be globally appropriate mitigation actions and locally appropriate actions that support both mitigation and adaptation

The unilateral NAMA commitment from Indonesia involves a 2% growth of net emissions relative to 2005. With additional international funding the expected emission level will end up halfway between the 2000 and 2005 level and (depending on the emission scenario for India and Russia) close to the position of third global emitter, with per capita emissions approximately at par with the EU countries. Within the 'business as usual' scenario there is considerable scope for more than proportional emission reduction in the peatland and forest sectors, to allow growth of energy consumption (fossil-fuel-based emissions) for economic growth.

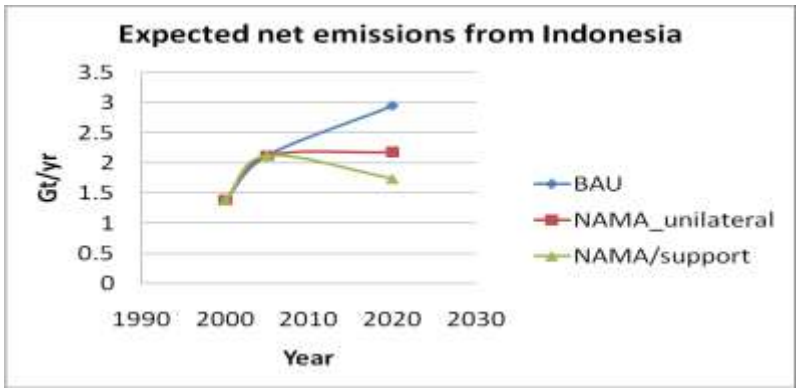


Figure 13. Indonesia's NAMA commitment as declared in October 2009 and formally submitted as part of the Copenhagen Agreement

Table 4. Indonesia's NAMA.

Year	Total emissions Gt CO_2e/year		
2000	1.38		
2005	2.12		
2020	Business as usual (BAU) scenario 2.95	NAMA_1 (BAU: 26%) 2.18	NAMA_2 (BAU: 41%) 1.74

Source: Dewan Nasional Perubaan Iklim

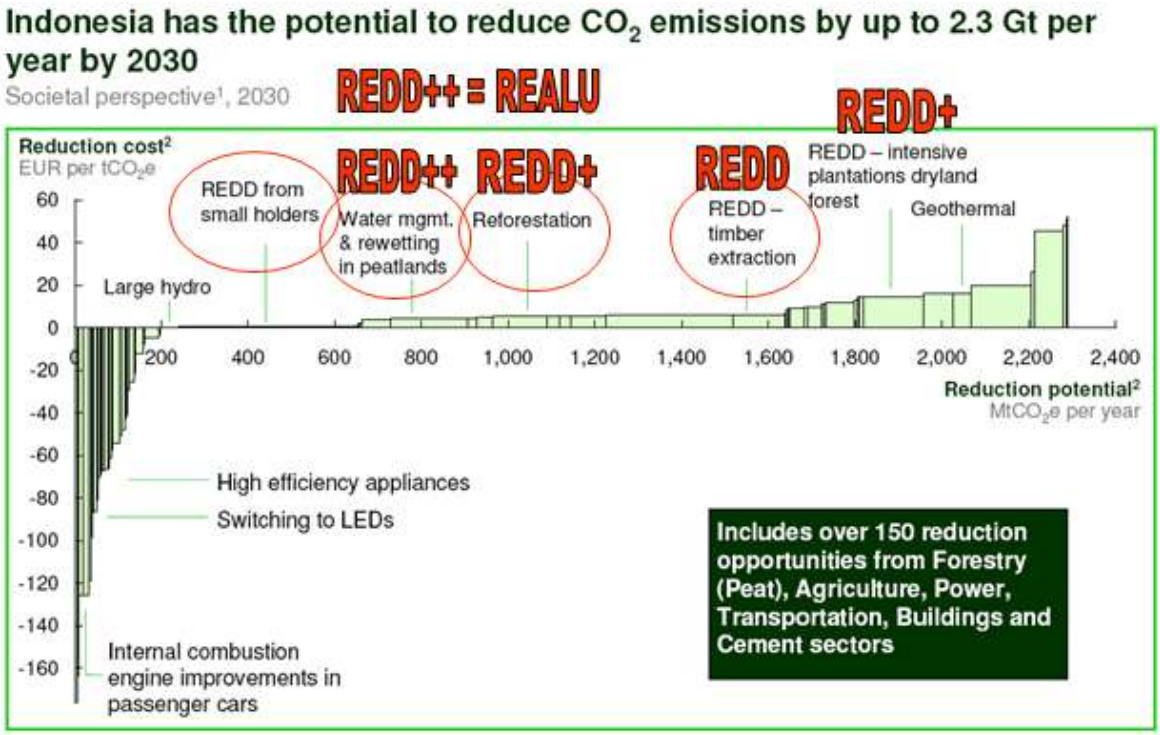


Figure 14. Opportunity costs of emission reduction across all sectors in Indonesia as discussed by the Indonesian Climate Change Board, with indications of the part that would comply with RED, REDD, REDD+ or REDD+/REALU rules for including land-use emission. NB: Implementation and transaction costs are not yet included in these calculations

Indonesia's NAMA commitment was defined on the basis of an analysis of the abatement opportunities Indonesia has: approximately 0.2 $GtCO_2e$/yr of emission reduction is deemed feasible at negative cost (for example, increasing technical efficiency); a further 0.45 $GtCO_2e$/yr at virtually zero opportunity costs (Indonesia's NAMA-1) ; further emission reduction, up to the 41% of the bilaterally supported NAMA 1+2 is deemed feasible at an opportunity cost of about 5 USD/CO_2e.

Although there have been discussions how this NAMA can be achieved by setting targets for the different emission types and sectors of Indonesia, the geographic dimension of subnational LAMAs has not yet been explored in sufficient detail.

Data on changes in woody vegetation across all land uses are needed to support a NAMA/ LAMA debate. In the context of NAMA, the REDD+ options as currently discussed are a 'subnational' approach. As is now recognised, for all subnational approaches to emission reduction, the issues of leakage and permanence are important and require careful consideration of the way 'emission displacement' could happen.

2.3 Reducing emissions from deforestation inside and outside 'forest'?[4]

New data for Indonesia suggest that one-third of tree-based emissions originate outside institutional forest and that no emission reduction from Indonesia can be claimed unless all woody vegetation outside the forest is included in the REDD+ (or REALU) regime.

Main findings

1. One-third of Indonesia's forest emissions (total of 0.6 Gt carbon per year) occur outside institutional forest, which is beyond the reach of current national REDD+ policy.
2. Current emission levels reach a 'time limit' in approximately 2063 when there will be no forest left if 'business as usual' continues.
3. Time limits (ratio of stock and emission rate) are approximately 32 and 73 years, respectively, for trees outside and inside institutional forest.
4. Emissions avoided from institutional forest can readily shift to other woody vegetation. Unless all current trees are accounted for, no emission reduction can be claimed from efforts that only concentrate on the institutional forest in Indonesia, as current REDD policies do.

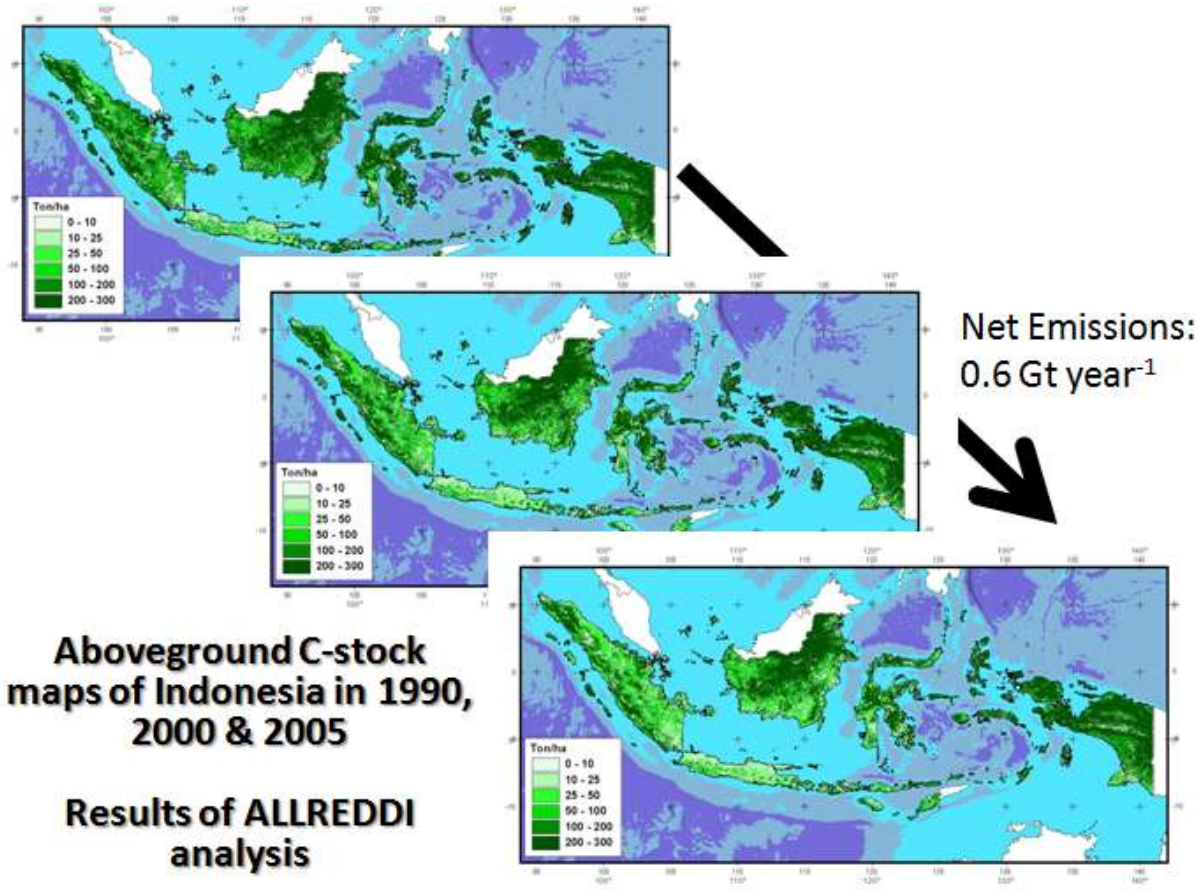


Figure 15. Wall-to-wall image analysis for Indonesia for the years 1990, 2000 and 2005 can now be interpreted in aboveground carbon stock terms. Source: ALLREDDI 2010 (http://www.worldagroforestrycentre.org/sea/ALLREDDI)

[4] These results are the basis of ASB Policy Briefs 16 (Ekadinata et al. 2010)

Time limit on business as usual: running out of carbon stock

Emissions from forests are recognised as an important component of the global carbon balance, with three forest-rich countries responsible for more than half of the world's total emissions. Deforestation has stopped in many countries because there is no forest left. The ratio of remaining carbon stock and current carbon emission rates shows us how many years 'business as usual' can continue before the stock is entirely depleted. We call this the 'time limit' on business as usual.

Indonesia the leader in emissions

Indonesia is likely the global leader in terrestrial carbon emissions, with approximately equal emission rates for aboveground carbon stock (mostly trees) and belowground carbon (mostly peat). Belowground carbon stocks in pre-human conditions were higher than those aboveground (in the roughly 10% of the country that is peat they are, on average, 10 times higher per unit area, while on mineral soils they are about half the aboveground value). The time limit on belowground carbon stocks is larger than that for aboveground stocks.

Losses of carbon stock in aboveground vegetation implies CO_2 emissions

Recent analysis of satellite imagery for all of Indonesia is providing new insight into where the main emissions have occurred. Proportional to area, as much is lost outside as inside the 'institutional' forest, which means that the one-third of the country that is not considered 'forest' was the source of one-third of carbon loss. Carbon stock losses expressed as percent per year are highest outside the forest.

Table 5. Indonesia's forest loss by land-use category. Source: ALLREDDI 2010 (http://www.worldagroforestrycentre.org/sea/ALLREDDI)

Forest use class (% of area)	1990–2000	2000–2005	1990–2000	2000–2005	1990–2000	2000–2005
	tC/(ha yr)		%/yr		% 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		

Not seeing the trees for the forest?

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 (in Indonesia: *kawasan hutan*). 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'. New data of Indonesia-wide change in carbon stocks can now be analysed for aboveground time limit for Indonesia as a whole, for both 'institutional forest' and for 'trees outside the institutional forest'. The results have major implications for current REDD+ approaches in Indonesia and will need to be seriously considered by all involved.

Emission estimates for Indonesia and its time limit

For the periods 1990–2000 and 2000–2005, the average loss of aboveground 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 data that have been used for Indonesia's national communications on greenhouse gas emissions, but differ in detail owing to differences in methodology and in the imagery used for the land-cover-change maps. 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). The high rates of emission will thus not quickly fizzle out and realistic international and national approaches are needed if the rates are to be slowed. 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 reflect that carbon stocks in the forest outside the *kawasan hutan* are more at risk than those inside and that current emissions can potentially be sustained for a policy-relevant period of 20 years.

A thought experiment on REDD+

These data also allow us to do a thought experiment. 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 could be deflected to the trees outside the forest. But this would not last forever because the time limit for trees outside of the forest would be less than what has been calculated so far and it would have to support the higher total emission rate. How long could it last?

Or the actual current policy?

Before we provide the answer, we need to consider the significance of this thought experiment. It is not something that researchers invented. It is actually the main REDD policy of the Government of Indonesia, supported by all relevant agencies in the international arena, and not challenged by the world's main forest research agencies and REDD experts. All current policy is focussed 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 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 in this prediction of the net emission reduction Indonesia can claim in, for example, a first five-year accounting period (in fact, we don't yet have agreements on the length of accounting periods of a REDD+ regime). What would this be? The answer is zero, which is shocking to all REDD+ designers and contrary to many expectations.

Leakage potential to non-forest

The time limit for the tree-based vegetation of Indonesia outside the institutional forest to support the current overall emission rate of 0.6 Gt per year is 6.4 years, which is more than a five-year accounting period. So it is 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 we could be certain that all *kawasan hutan* is 100% protected.

Loss of agroforest

Specific data for the 'agroforest' category of land use suggest a 3.4% per year loss rate in the period 2000–2005 that tops the average loss rate for the 'non-forest' land-use category. Most of the loss of agroforest involves a shift to monoculture of tree crops.

Table 6. Change in agroforest in Indonesia, 1990–2005

	1990	2000	2005
Agroforest (Mha*)	21.04	19.45	16.32
Agroforest on peat (Mha)	0.47	0.65	0.33
Total (Mha)	21.51	20.10	16.66
Total (% of Indonesia's land area)	11.6%	10.8%	9.0%
Loss %/year		0.78	3.4

*Mha = millions of hectare. Source: ALLREDDI 2010 (http://www.worldagroforestrycentre.org/sea/ALLREDDI)

So what?

Shocking? We think it is. 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.

Subnational variation in time limits

The 'time limit' as well as recent emissions vary across Indonesia. Provinces where the time limit is less than five years (where at least some REDD emission reduction can be claimed without considering non-forest areas, if spatial displacement of emissions within the forest can be excluded) while emissions are above average are Kalimantan Tengah, Gorontalo, Sulawesi Tenggara, Maluku, Maluku Utara.