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REDD from an integrated perspective: considering overall climate change mitigation, biodiversity conservation and equity issues

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REDD from an integrated perspective

Considering overall climate change mitigation, biodiversity conservation and equity issues

Lars Schmidt

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Abbreviations

AAUs	Assigned Amount Units
Annex-I countries	Countries listed in Annex-I of the UNFCCC
AR4	4th Assessment Report of the IPCC (2007)
AWG-KP	Ad-hoc Working Group - Kyoto Protocol
AWG-LCA	Ad-hoc Working Group on Long Term Cooperative Action
BAU	business as usual
CAN	Climate Action Network
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CfRN	Coalition for Rainforest Nations
COP	Conference of the Parties
DNA	Designated National Authorities
EAs	Emission Allowances
ETS	Emission Trading Scheme
EU ETS	Emission Trading Scheme of the European Union
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FIF	Forest Investment Fund
FLEGT	Forest Law Enforcement, Governance and Trade
GHG	Greenhouse gases
IGOs	Intergovernmental Organisations
JI	Joint Implementation
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LULUCF	Land-Use, Land-Use Change and Forestry
MOP	Members of the Protocol
MRV	measurable, reportable and verifiable
Non-Annex-I countries	Countries not listed in Annex-I of the UNFCCC
NGO	Non Government Organisation
PES	Payment for Ecosystem Services
ppm	Parts per million
REDD	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
REL	Reference emission level
SBSTA	Subsidiary Body on Scientific and Technological Advice
SFM	Sustainable Forest Management
SPWP	Secondary Processed Wood Products
TDERM	Tropical Deforestation Emission Reduction Mechanism
TDERU	Tropical Deforestation Emission Reduction Unit
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

WCMR	World Conservation Monitoring Centre
WHRC	Woods Hole Research Center

Executive summary

The discussion paper assesses selected options currently "on the table" in the international debate and the United Nations Framework Convention on Climate Change (UNFCCC) negotiations on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD). REDD design options are analyzed with regard to their implications for overall climate change mitigation, biodiversity conservation and equity issues.

First of all, it is found that for REDD to be successful it will not be sufficient simply to put a price on forest carbon. Instead, to permanently reduce and stop global deforestation, REDD needs to trigger a change in our dominant human development model, which will require policy reforms and enforcement to prevent markets from driving deforestation.

Among other things, this needs to be reflected in the design of a REDD mechanism, which must i) pay heed to the complex task of reducing deforestation, allowing for a flexible, country-specific approach, to ensure broad participation to tackle deforestation on a global scale; ii) address deforestation by integrating REDD into overall development planning, to achieve lasting results and maximize synergies with other development goals; and iii) be consistent with the overall mitigation effort to prevent dangerous climate change.

The scope of REDD, definitions and several methodological issues will have a decisive influence on the extent of benefits, or in some cases even threats, REDD will have for biodiversity conservation and equitable access to REDD.

The design of transfer systems at both the international and national level is key to enabling countries to permanently reduce deforestation and forest degradation. To do so, transfer systems must go beyond mere compensation for avoided deforestation. Instead, they must be embedded in overall development planning and engage in providing alternative (at best low-carbon, low-resource) livelihoods. This will require political reforms and investment into other sectors, which may not immediately lead to emission reductions in the forest sector. Transfers channelled through a REDD offsetting mechanism are less suited to do so unless proper national transfer systems are in place. Alternatively, the Tropical Deforestation Emission Reduction Mechanism (TDERM) Triptych or the Forest Carbon Partnership Facility, the latter complemented by the UN REDD Programme, could be used as a transitional international transfer system for REDD funds in the period 2013–2020. Given their comprehensive international approach to tackling deforestation, both can be expected to perform better concerning active consideration of human, and especially indigenous people's rights, and delivery of benefits other than carbon retention.
It is safe to assume that REDD in the period 2013–2020 will require several billion US$ a year to set the incentives to reduce deforestation and forest degradation. The real costs may differ significantly from opportunity cost calculations though, both under an offset scheme and a market-linked approach, where prices would either be determined by the market or be negotiated. While prices will influence a countries decision to reduce deforestation, a price below the opportunity costs would not necessarily reverse a countries decision (and policies) to reduce deforestation.

The discussion on how these funds should be raised continues to be the most controversial one. While the demand from the Annex-I compliance market in the 2013–2020 period could most likely absorb all emission reductions through a REDD offset mechanism, this would seriously undermine domestic emission reductions in countries listed in Annex-I of the UNFCCC (Annex-I countries) and set the world on a path towards dangerous climate change. Depending on whether Annex-I countries commit to low or ambitious 2020-targets in Copenhagen and the amount of emission reductions from REDD and the Clean Development Mechanism (CDM), Annex-I countries could offset 24 to 69 % of their emissions via the CDM and REDD (not counting Brazil). Furthermore, the present uncertainty on Annex-I reduction targets and quantitative "REDD targets" set by countries not listed in Annex-I of the UNFCCC (non-Annex-I countries) makes it impossible to foresee the impact of REDD on carbon prices. Two models with different policy assumptions show, though, that REDD has a great potential to destabilize the compliance market, unless regulatory instruments, like e. g. banking of credits, are applied. According to the Intergovernmental Panel on Climate Change's (IPCC) 4th Assessment Report, emission reductions of 25–40 % in Annex-I and 15–30 % in non-Annex-I countries are necessary to see global emissions peak before 2015 and to stabilize the level of greenhouse gases in the atmosphere at 450 ppm, which is considered the threshold to dangerous climate change. To design REDD as an offset mechanism for Annex-I compliance, Annex-I 2020-targets would need to be around 38 %. Limiting the amount of REDD offsets to be used for Annex-I compliance could solve the problem of domestic emission reductions. However, it would also reduce the amount of funding below the level deemed necessary to reduce deforestation significantly. Furthermore, there are legitimate concerns that an offset mechanism could potentially yield lower benefits for biodiversity conservation and lead to an inequitable distribution of funds, though this depends strongly on the governance structure and type of national transfer system of each participating country.

Market-linked approaches such as the TDERM or another multilateral fund supplied with proceeds from the auctioning of emission allowances would also be able to raise the necessary funding without jeopardizing domestic emission reductions in Annex-I countries. Here, estimates range from 5.7 to 113 bn US$ annually, though the top-end figure would have to be split between finance for adaptation, REDD and technology transfer.

1 Introduction and rationale

The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) estimates that global deforestation and forest degradation contributed 17.4 % to global, annual anthropogenic greenhouse gas emissions in 2004 (IPCC 2007). The main part of these emissions results from the destruction and degradation of tropical forests in developing countries and countries in transition. According to the Food and Agriculture Organization (FAO) (2001), 97 % of deforestation from 1990 to 2000 occurred in tropical countries. Recent research by Hansen et al. (2008a) supports these findings. The first attempt to include the concept of avoided deforestation in the international climate regime failed for several reasons, but the topic was reintroduced by the Coalition for Rainforest Nations (CfRN) in 2005 as part of the negotiations for the post-2012 climate agreement.

In its 4th assessment report (2007), the IPCC states that *"[…] forestry can make a very significant contribution to a low cost global mitigation portfolio […]"* (IPCC 2007). Previously, the Stern Review (2006a) had come to a very similar conclusion, stating that the opportunity costs of avoiding 70 % of emissions from deforestation would be around 5 bn US$ a year. It may be assumed that this was an important driver behind the decision taken at COP 13, Bali, to include the concept of "Reducing Emissions from Deforestation and Forest Degradation in Developing Countries" (REDD) in the post-2012 climate agreement. By now it is largely acknowledged that REDD must be part of the international mitigation effort in order to prevent dangerous climate change.

However, there still is broad disagreement on how REDD should be integrated into the architecture of the post-2012 climate agreement. Consensus has been growing on many methodological issues, but views on policy approaches still differ widely. Much energy has been and continues to be put into the question "how to finance REDD", due to the far-reaching implications this issue could have. This is absolutely justified, yet it must not be allowed to commandeer the entire REDD debate. Just as important is the question of "how to spent the money (wisely)" and what shape an international system for REDD transfers should have. Also, there is a need to consider the implications of policy approaches on methodological issues and vice versa.

Finally, serious consideration must be given to how REDD design affects equity issues such as multi-level participation, poverty, biodiversity conservation and sustainable forest management. While it is often noted that REDD could yield co-benefits e. g. for biodiversity conservation and poverty alleviation (see UNEP / WCMC 2007), there are also voices cautioning against the adverse impacts of REDD. The impact of REDD on indigenous people's rights, biodiversity conservation and poorer people is a major concern (see Swallow et al. 2007; Griffiths 2007; Peskett et al. 2008; Miles / Kapos 2008).

In its Decision 2/CP.13 (UNFCCC 2007a), the Conference of the Parties (COP) recognized most of the concerns mentioned above. It stated, that:

- REDD should help to meet the ultimate goal of the convention, which is "*[…] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system […].*"
- REDD could complement the goals of other relevant conventions and should take note of their provisions

- REDD implementation should address the needs of local and indigenous communities
- REDD should take into consideration the role of sustainable forest management and conservation

However, as REDD is being developed and negotiated in detail, questions have been arising on how to fit these considerations into an all-encompassing solution. Interestingly, during Forest Day 2 in Poznan, Executive Secretary of the UNFCCC Ivo de Boer stated that REDD may be a mechanism too big for just one convention. Some parties however spoke a different language and refused to accept text on biodiversity and indigenous peoples during the session of the Subsidiary Body on Scientific and Technological Advice (SBSTA) in Poznan. While it is doubtful that REDD will equally benefit each interest/stakeholder group and will always create win-win situations, REDD should nevertheless strive for maximum comprehensiveness, in order to maximize synergies and reduce potential negative side effects. This calls for a look at REDD from an integrated perspective, i. e. it points to the need to shed light on REDD from the different viewpoints of climate change mitigation, biodiversity conservation and equity. This study will thus analyze the impact of proposed REDD design options (policy approaches and methodological issues) on climate change mitigation, biodiversity conservation and equity issues, and make some policy recommendations for an integrated REDD design.

2 Framing the problem: the true challenge of permanently reducing deforestation on a global scale

The debate on REDD is often reduced to methodological issues and questions of finance. However, there is very little discussion on what reducing or even stopping deforestation in fact means, or better, could mean. While this may seem like a somewhat theoretical or fundamental question to ask, the answer is key to the lasting success of a future REDD mechanism.

In a sense, reducing deforestation on a global scale means grappling with the dominant model that has accompanied human development for several thousand years. Deforestation has contributed to the rise of today's globalized civilization, and it is, within certain limits, still key to the success of this dominant development model, e. g. in terms of economic growth at the expense of unsustainable natural resource exploitation. This dominant human economic system favours the destruction of forests over their preservation, which is why deforestation has also been termed a "market failure". In consequence, some argue that forests must be given a higher market value, e. g. by putting a price on forest carbon. Yet, it is questionable whether this alone would really reduce deforestation in the long term. As the world's population grows in step with its per capita consumption of resources, so does pressure on the world's remaining forest areas. In addition, successful implementation of REDD will reduce the forested area available for agricultural production, decreasing supply and thus increasing commodity prices. At some future point in time, then, forests will have to make way for further development (e. g. with the need for food production trumping biodiversity protection), unless we adjust or change our dominant development model. As a result, putting a price on forest carbon, and possibly also on other (forest) ecosystem services, in due time does not address the root cause of deforesta-

tion or degradation of other ecosystems itself. It addresses the symptoms and should thus only have a bridging or triggering function in devising and implementing a new development model that does not degrade the world's ecosystems. In the long run, deforestation and the degradation of other ecosystems will only be stopped if cultural values change and find their way into political decisions (or vice versa). Nations need to make a decision to keep, which means sustainably use (not only in terms of timber) and protect a certain amount of their forest area, issue legislation and enforce it. REDD may facilitate and sweeten this step, but unless it is taken, forest conversion will not stop in the long run. Taking such measures is in a sense a step towards accepting, consciously or not, the ecological imperative: we cannot exceed the carrying capacity of the ecosystems sustaining us.

For REDD to be more than just an ephemeral hype, both the international community and countries thus need to address deforestation and forest degradation in the context of overall development. This calls for identification of the forces within our development model that drive deforestation. Deforestation is mainly driven by our economic system, which in turn is linked to global and national policy frameworks (or the lack of them). According to Geist and Lambin (2002, as cited in Kanninen et al. 2007), deforestation is mostly driven by agricultural expansion, wood extraction and infrastructure extension. Agricultural expansion, the main extra-sectoral source of deforestation, and wood extraction itself are driven by consumption of products whose production and fabrication require forests to be harvested or forest land to be cleared. Consumption is influenced by economic growth and demands both domestically and in other countries, but also currency exchange rates and foreign sector policies such as agro-fuel quotas. Examples are:

a) Palm oil production in Indonesia for groceries, cosmetics and agro-fuels. The biggest importers of palm oil are China, the EU-25, India and Pakistan (USDA 2005).

b) Soy production and related infrastructure (roads) in Brazil for groceries, livestock feed and agro-fuels. The biggest importers of soybeans are China, the EU, Japan and Mexico (USDA 2007a). The biggest importers of soybean oil are North Africa/the Middle East, China and India (USDA 2007b).

c) Cattle ranching in Brazil for beef production and related infrastructure (roads). The biggest importers are the US East Asia and Russia (USDA 2007c).

d) Legal and illegal timber extraction in all regions. The biggest importers of tropical logs are China, India and Japan. The biggest importers of tropical sawn wood are China, Thailand and Malaysia. Ultimately, the consumption of secondary processed wood products (SPWP, e. g. furniture) is important. The biggest importers of tropical SPWP are the EU, the US and Japan (ITTO 2006).

According to Kanninen et al. (2007), agricultural expansion at the expense of forests can be facilitated within a country by i) availability of fertile soils under forested areas, ii) high prices, including subsidies, for agricultural outputs, iii) low wages (increasing the competitiveness of production) and iiii) demographic changes, including population growth and higher rural populations.

Logging, both legal and illegal, is the principal driver of forest degradation and indirectly a driver of deforestation. It is closely interlinked with infrastructure extension, which may provide access to new forest areas and hence facilitates further deforestation through conversion to agricultural land. According to Kaimowitz / Byron / Sunderlin (1998, as cited in

Kanninen et al. 2007), this is especially true for areas where forest tenure and regulation of extractive activities are poorly enforced (e. g. due to lack of capacity or corruption), soil conditions of the forested area are favourable for agricultural production and there is a large inflow of immigrants, due to demographic and poverty-related factors in the migrant-sending areas. Additionally, lack of secured land-tenure rights or property rights facilitate exploitation of forests, as there is little incentive for sustainable forest management.

Infrastructure extension, e. g. in terms of road construction, settlements and hydro-electric dams, is another major cause of deforestation (Kanninen et al. 2007). However, road construction and improvement (e. g. paving) has by far the biggest indirect impact on deforestation, in that it reduces transport costs, facilitating economic activities in remote, forested areas (Chomitz 2007, as cited in Kanninen et al. 2007).

Apart from these main sources of deforestation, fuel-wood extraction and smallholder farming are another source of deforestation and forest degradation. The main drivers are poverty (itself a result of other factors), demographic development and a growing urban population (Nelson 2005; FAO 2007; Butler 2008).

It is thus evident that deforestation must be addressed by changing or enforcing policy frameworks that currently induce markets to force deforestation. Bringing these structural changes about will require embedding REDD into overall development planning. Thus, while understanding REDD as a catalyst in developing and implementing a more sustainable development model offers opportunities, it also entails the responsibility to achieve synergies with regard to other, sometimes closely linked, development goals such as biodiversity conservation and poverty alleviation. Here, it is important to acknowledge that REDD may also hold risks which could be detrimental to other development goals. Miles and Kapos (2008) e. g. reason that on the one hand REDD will benefit many species, ecosystems and ecosystem services, but that on the other hand it may also have adverse impacts on biodiversity. First of all, REDD favours the preservation of carbon-rich forest ecosystems, since payments will likely be based on carbon emissions reduced. It could thus shift pressure from carbon-rich ecosystems such as humid tropical forests to forest ecosystems with lower carbon content, e. g. dry tropical forests, since the latter are less likely to trump opportunity costs for alternative land-use systems. And second, REDD could also lead to "out of system" leakage. What this means is that REDD simply diverts pressure on forest ecosystems to other ecosystems, such as savannahs. Since REDD focuses on forests and will probably not (at this point) incorporate "full land use accounting", conversion of other ecosystems (possibly also with high carbon content) into e. g. agricultural production systems may occur. In view of a growing world population with a rising per capita consumption, expansion of agriculture into other areas seems likely. Additionally, pressure may also be diverted towards temperate and boreal forests, as REDD currently focuses on tropical forests.

Similarly, the potential contribution of REDD to poverty alleviation could be considerable, although REDD also entails new risks. Major concerns, which have also been observed during REDD workshops and UNFCCC side events[1], include:

1 Source: Several side events at COP 9 CBD Bonn 2008 and SB 28 UNFCCC Bonn 2008.

- "Guns and Guards" policies: Assigning a carbon value to forests will increase the interest of authorities and land-owners in keeping their land forested or preventing any kind of forest use which could be interpreted as degradation. This could lead to poor and marginalized people being cut off from their natural resource base, to which they may have (if at all) only customary rights. Since many poor people rely on forests for subsistence, people could be forced to move on to other areas. But this could also lead to armed conflicts and humanitarian disasters.
- "Land Grabbing": In countries where land titles are vague or where indigenous territories are not properly demarcated, forest land could be seized illegally by other parties to reap the monetary benefits from REDD.
- "Illegalization"/strict law enforcement: In order to reduce emissions from deforestation, countries may decide to crack down on illegal deforestation or declare formerly legal activities illegal. While this could be an essential strategy in many countries to combat deforestation, it may disproportionately affect poor people who e. g. work in the informal timber sector or depend on forest use for subsistence. Without alternative options for income, such actions could increase poverty (Peskett et al. 2008).
- "Corruption and elite capture": Lack of participation, lack of control over funds, and corruption could lead to the capture of REDD payments by individuals (rent seeking) and impede distribution of REDD funds to poorer people (Peskett et al. 2008).

Also, large-scale implementation of REDD could potentially lead to rising food and commodity prices as agricultural expansion is contained (Peskett et al. 2008). To some degree, this effect could be countered by agricultural intensification. Even though poor people could benefit as producers from higher food prices, Peskett et al. (2008) find that potential negative consequences are prevalent. In addition, land-use restrictions as a result of REDD implementation may boost fuel wood prices, which could impact heavily on poor people. According to Arnold et al. (2003), around 2.4 billion people in developing countries depend on fuel wood for cooking and heating.

Finally, REDD, as an offset mechanism, also holds the risk of seriously undermining overall climate change mitigation efforts, which could lead to dangerous climate change.

In consequence, REDD design should mirror these responsibilities by adopting a few overarching principles, which should be:

- REDD design must consider the specific deforestation profile and the individual capacities of each country to allow for maximum participation in order to tackle deforestation on a truly global scale.
- REDD should aim at reducing deforestation and forest degradation permanently and must thus be integrated into overall development planning to be successful. Integration of REDD into development planning should result in maximizing synergies, e. g. in the field of biodiversity conservation and poverty alleviation, wherever possible.
- REDD design must ensure that efforts to reduce deforestation are consistent with an overall global mitigation strategy designed to prevent dangerous climate change and stabilize GHG emissions in the atmosphere at 450 ppm (2° goal).

Given the fact that deforestation is often driven by consumption patterns in Annex-I countries and countries in transition (beef, soy for livestock fodder, sugar-cane/soy/palm oil for agro-fuels, tropical timber for furniture and paper), it should be clear that a REDD

mechanism alone will not be able to reduce deforestation and forest degradation. While transfer systems may target national policies (e. g. remove subsidies), REDD must be flanked by hard and soft international and/or foreign regional/national measures (e. g. in the EU, the US, Japan). This includes stronger promotion and strengthening of FLEGT (forest law enforcement, governance and trade), stricter import standards for forest and agricultural products, moratoria by the processing industry and certification/labelling. Otherwise, a compensatory REDD scheme will run the risk of loosing the race against rising opportunity costs for commodities sought by industrialized countries and countries in transition.

3 Methods and assumptions

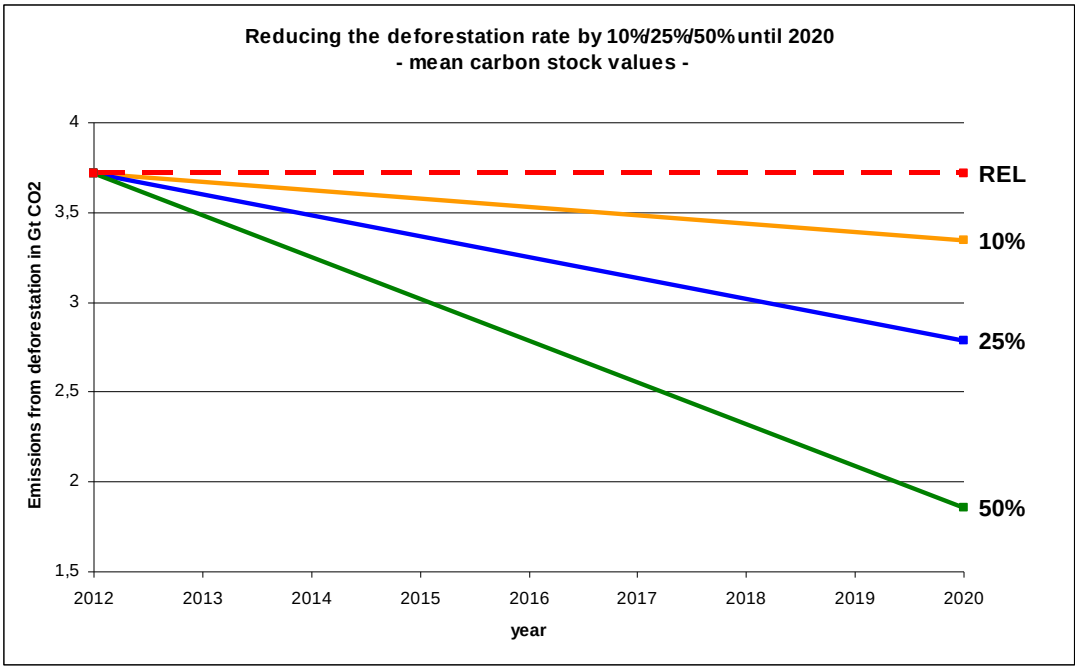
The results of this study are mainly based on literature research. This includes analysis of scientific literature as well as submissions by parties and observer organizations to the UNFCCC. Participation in UNFCCC negotiations, workshops and side events as well as communication with parties and observers provided further information and valuable insights. Finally, in order not to rely exclusively on models designed to estimate, among other things, the potential impact of REDD on overall climate change mitigation, the magnitude of the supply of potential REDD credits, implications for Annex-I reduction targets, some calculations have been made using mainly the Food and Agriculture Organization of the United Nations (FAO) and the UNFCCC Greenhouse gases (GHG) data, but also other scientific sources.

3.1 Assumptions on the supply of potential REDD credits

To estimate the supply of emission reductions from REDD for the 2013–2020 period it was necessary to establish a hypothetical historic reference emission level (REL) based on the data currently available. To build a rough reference emission level for tropical deforestation, the following steps were taken:

1. Based on the availability of carbon stock data from Gibbs et al. (2007) and FAO (2005), 59 tropical countries were chosen to build a global REL for tropical deforestation. Eight countries were excluded, because they did either not qualify as non-Annex-I countries under the UNFCCC or had no net deforestation in the period 2000–2005. Furthermore, Brazil was excluded, since it recently established a national REL as part of its national plan to curb deforestation.
2. For the remaining 51 countries, the minimum, mean and maximum forest carbon stock value was extracted from Gibbs et al. (2007) and FAO (2005). These values were then divided by the forest area in 2000 (according to FAO 2005) to establish average minimum, mean and maximum forest carbon stock values per ha.
3. The deforestation rate (in ha) of each country in the period 2000–2005 was multiplied with the average minimum, mean and maximum carbon value per ha to estimate minimum, mean and maximum forest carbon emissions from deforestation for each country in the period 2000–2005.
4. The average annual carbon emissions (minimum, mean, maximum) of all 51 countries in the period 2000–2005 were added up, converted into CO_2 emission (times 44/12)

Figure 1: Joint historic REL for 51 tropical countries (mean carbon stock values, excluding Brazil) and different REDD "targets" for the 2013–2020 commitment period



Source: Author's calculations based on FAO (2005); Gibbs et al. (2007)

and linearly extrapolated until 2020, representing the historic global REL for deforestation.

5. It was assumed that emission reductions from deforestation in the 2013–2020 period would be measured against this REL.
6. To calculate potential emission reductions from RED, it was assumed that all 51 countries together would reduce their deforestation rates linearly by 10, 25 or 50 % until 2020 compared the average annual deforestation rate from 2000–2005 i. e. the deforestation rate would be 10, 25 or 50 % lower in 2020 than the average annual deforestation rate from 2000–2005 (see Figure 1).
7. Cumulated emission reductions were calculated for the period 2013–2020 for minimum, mean and maximum carbon stock values and different reduction trajectories (10, 25, and 50 %).

As a result, the historic REL for REDD for 51 tropical countries (without Brazil) for the period 2013–2020 is, for the purpose of this study, estimated at 1.87 Gt of CO_2 (minimum carbon stock values), 3.71 Gt of CO_2 (mean carbon stock values) and 5.75 Gt of CO_2 (maximum carbon stock values). Using mean carbon stock values, a reduction in deforestation by 10, 25 or 50 % against the established REL would generate 1.67, 4.18 or 8.36 Gt CO_2 in emission reductions in the period 2013–2020 (w/o Brazil).

3.2 Assumptions on demand for emission reductions from REDD by Annex-I countries

The demand for and amount of emission reductions from REDD that could potentially be used as offsets by Annex-I countries for compliance will depend strongly on Annex-I reduction targets. To estimate the demand, several policy assumptions were made with regard to a country's starting point, i. e. its GHG emission level in 2012. Furthermore, different assumptions were made with regard to Annex-I reduction targets for 2020. Calculations are based on UNFCCC GHG data, excluding Land-Use, Land-Use Change and Forestry (LULUCF) (UNFCCC GHG data 2008; FCCC/KP/CMP/2008/9Rev.1 Page 9).

According to the assumptions in Box 1, joint Annex-I GHG emissions at the end of 2012 would accumulate to 17.62 Gt of CO_2-eq.

Box 1: Potential GHG emission levels of Annex-I countries at the end of 2012

- EU-27 emissions in 2012 8 % below 1990 levels[2]: **5.31** Gt of CO_2-eq. (Kyoto target incl. new members)
- Australia's emissions in 2012 8 % above their 1990 level: **0.45** Gt of CO_2-eq. (Kyoto target)
- US emissions in 2012 are estimated at **7.00** Gt of CO_2-eq. (average annual emissions 2000–2006)
- All other Annex-I Annex-B countries reach their respective Kyoto targets, combined emissions in 2012 are: **4.86** Gt of CO_2-eq.[3]

Source: Author's calculations based on UNFCCC GHG data excluding LULUCF and FCCC/KP/CMP/2008/9/Rev.1 Page 9

Box 2: Potential 2020-commitments by Annex-I countries and resulting emission reductions in the period 2013–2020 based on countries assumed 2012 emission level

- EU-27: 20 % or 30 % by 2020 compared to 1990: 5.59 or 10.20 Gt of CO_2-eq.
- USA: 0 % or 25 % by 2020 compared to 1990: 12.74 or 23.56 Gt of CO_2-eq.
- Australia: 20 % or 30 % by 2020 compared to 2000: 0.93 or 1.27 Gt of CO_2-eq.
- Remaining Annex-I countries: 20 % or 30 % by 2020 compared to 1990: – 3.26 or 2.19 Gt of CO_2-eq. (the negative figure is the result of the "hot air" that Russia and Ukraine would carry into the 2013–2020 period when choosing 1990 as a base year again).

Source: Author's calculations based on UNFCCC GHG data excluding LULUCF (FCCC/KP/CMP/2008/9/Rev.1 Page 9)

2 The emission level for Kyoto countries does not represent the real emission level in 2012, as it does not account for the amount of offsets used

With the more ambitious commitments described in Box 2, Annex-I countries' efforts would result in 37.05 Gt of CO_2-eq. emission reductions in the period 2013–2020. Only 16.04 Gt of CO_2-eq. emission reductions would be achieved with the less ambitious targets.

These potential reduction efforts of Annex-I countries are compared to the potential supply of REDD credits from non-Annex-I countries to demonstrate the offset potential of REDD.

3.3 Assumptions used to calculate potential proceeds from the sale of Assigned Amount Units

To calculate potential proceeds from the auctioning of Assigned Amount Units (AAUs), the following assumptions are made:

Box 3: Assumptions on reduction targets for Annex-I countries for the period 2013–2020
— The EU-27 commits to a 20 % or 30 % reduction by 2020 compared to 1990
— The US commits to a 0 % or 25 % reduction by 2020 compared to 1990
— Australia commits to a 15 % or 25 % reduction by 2020 compared to 2000
— All other Annex-I countries commit to a 20 % or 30 % reduction by 2020 compared to 1990
Source: Author's calculations based on UNFCCC GHG data excluding LULUCF.

It is then assumed that Annex-I countries would have to purchase their Assigned Amount Units (AAUs) at the beginning of the 2013–2020 commitment period (see Chapter 4.2.3 for the results).

4 Results – Assessing REDD options

This section summarizes the implications of REDD design options on the three main issues, namely **overall climate change mitigation**, **biodiversity conservation** and **equity issues.** Furthermore, wherever possible, the section estimates the political viability of the options, highlighting linkages between scope, policy approaches and methodological/ technical issues.

4.1 Scope, definition and methodological REDD issues

The scope of REDD, forest definitions, and in some case also methodological issues, are highly relevant to prevent negative effects of REDD on biodiversity conservation and to improve equitable access to and participation in REDD. The various technical options for

3 The emission level of Russia and Ukraine was adjusted since it seems very unlikely that both countries will return to their 1990 emission level by 2012. Their emission level in 2012 is estimated at 2.1 (Russia) and 0.41 (Ukraine) Gt CO_2-eq. (average annual emissions 2000-2006). The emission level for Turkey was estimated in the same way (0.29 Gt CO_2-eq.).

methodological issues will not be covered here, as they have already been described in detail in many publications (see e. g. GOFC-GOLD 2008; Biocarbon Fund 2008; Olander et al. 2008). Consequently, the following section will focus on two key issues related to the scope of REDD, forest definitions under REDD and methodological issues:

— What are the implications of scope, forest definition and methodological issues for biodiversity conservation and equity issues?

— What are the implications of scope, forest definition and methodological issues for policy approaches (if applicable)?

4.1.1 Scope of REDD and accounting modalities

The Scope of REDD has implications for climate change mitigation, biodiversity conservation, equity issues and methodological issues, such as leakage.

In general, since REDD is a voluntary scheme, a broader scope will increase participation and may thus reduce international displacement of emissions from deforestation and forest degradation. A broad scope is however also important to ensure that all forest-related emissions are accounted for. The integration of forest degradation e. g. is important to account for forest-emissions that do not lead to deforestation. Depending on the forest definition of a country, emissions from forest degradation could make up a significant proportion of forest-related emissions. The integration of forest degradation is thus also highly relevant for biodiversity conservation, as degraded and disturbed forests are less biodiverse than intact forests. But the integration of degradation has also an equity implication. Countries with low historic or current deforestation rates but high levels of degradation will be able to achieve compensation for reduced forest degradation. Similarly, including the enhancement of forest cabin stocks under REDD+, will benefit countries with net reforestation rates and (if present accounting rules from LULUCF are taken) young forests stands with high increment rates, such as e. g. China and India. The latter may however more a political necessity rather than an equity issue.

The Bali-Action Plan set the scope of REDD to include *"reducing emissions from deforestation and forest degradation in developing countries"; and the "role the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries"*. This left the question open whether REDD would only account for emission reductions from reduced deforestation and forest degradation, or whether it would include accounting for forests sinks.

During the climate change talks in Accra in August 2008, some parties expressed the wish for a REDD+ scheme, while others favoured focusing on a REDD scheme restricted to reduced deforestation and forest degradation[4].

In Poznan, the SBSTA drafted conclusions which put the *"role of conservation, sustainable management of forests and enhancement of forest carbon stocks"* on the same level as *"reducing emissions from deforestation and forest degradation"*. This is also reflected in the methodological guidance, where it is recommended to estimate *"forest-related*

4 UNFCCC 2008c, Summary of the Chair AWG_LCA.

emissions by sources and removals by sinks", as is the case in Annex-I countries. If these SBSTA conclusions were to be adopted by the COP for a final REDD agreement, non-Annex-I countries could gain emission reductions by accounting for both reduced deforestation and forest degradation and for positive forest carbon stock changes.

How the scope of REDD will finally affect the contribution to climate change mitigation and biodiversity conservation, will ultimately depend on the accounting rules (or the absence of accounting rules and exceptions) for REDD. Major concerns here include:

— The conversion of natural forests stands to forest plantations must not be accounted for. This would result in significant amounts of unaccounted GHG emissions and set a perverse incentive with regard to biodiversity conservation. In case REDD would be a fungible offset mechanism, this would result in hot air entering the compliance market.

— Cherry picking: no obligation to account for forest degradation, while gaining benefits for reducing deforestation. This would omit significant amounts of GHG emissions and biodiversity loss.

In summary, it is of vital importance that under REDD+ all forest-related emissions are accounted for and no perverse incentive is given to e. g. convert intact natural forests into forest plantations. In the long run, extending REDD to a broader agreement to cover all emissions from land use, land use change and forestry would ensure that e. g. displacement of emissions to non-forest ecosystems could be better avoided.

4.1.2 Forest definition

In ways similar to scope, the definition of forests under REDD could have major implications for biodiversity conservation. Instead of using a general forest definition, such as the one used e. g. by the FAO, each country has its own forest definition. While it makes sense for each country to use its own definition to account for the peculiarities of its forest ecosystems, this must not be used to create perverse incentives. Inclusion e. g. of forest plantations in the forest definition could be such a case, if conversion of natural forests into plantations is not accounted for. This would greatly reduce or even reverse the positive effect REDD is expected to have on biodiversity conservation.

Another issue is the definition of forest by crown cover. Using a high crown cover as part of the definition could exclude forest ecosystems with a naturally low crown cover such as tropical dry forests, and, among other things, deforestation in these areas would not have to be accounted for and could thus continue unabated; or deforestation could shift from accounted areas to unaccounted areas, with potentially negative effects on biodiversity conservation.

4.1.3 Methodological issues

Leakage

Leakage, or better, displacement of carbon emissions at the national level is not a major concern with REDD, as national reference emission levels will likely be established. Yet,

displacement of activities causing deforestation or conversion of other natural ecosystems may still occur, possibly including areas that do not need to be accounted for. As already mentioned, this "out-of-system" leakage could pose a threat to biodiversity conservation, as unaccounted areas could face increasing land-use pressure (Miles / Kapos 2008; Ebeling / Yasue 2007). Furthermore, international leakage is linked to the scope and the design of the REDD finance mechanism. A REDD mechanism addressing the individual needs of each country in terms of activities to be funded, institutional capacity and financial needs is likely to encompass more countries and thus to reduce the potential for international leakage. The amount of international or transboundary leakage that will still occur under REDD will also depend on the comprehensiveness and quality of REDD transfer systems, including REDD country strategies. Transfer systems that do not target the underlying causes of deforestation, e. g. by providing alternative employment, are more likely to contribute to international leakage. In this respect, the amount of international leakage will also depend on further efforts by industrialized countries, countries in transition and the international community to choke demand for products related to deforestation.

Reference Emission Levels

RELs, or national deforestation baselines, for REDD will be based on both historical deforestation rates and/or projected rates of anticipated future deforestation (using development adjustment factors). Börner and Wunder (2007, as cited in Peskett et al. 2008) find that the use of historical deforestation rates without the use of development adjustment factors would lead to an inequitable distribution of REDD funds at the international and the sub-national level. Both countries and states with high past deforestation rates would receive the lion's share of REDD transfers. Additionally, in choosing the time period for the historical deforestation rate and defining the rules for the development adjustment factor, it must be ensured that no perverse incentive is set to increase deforestation, which would also harm biodiversity conservation. Finally, the establishment of a REL, both historical and projected, holds a significant risk of creating hot air. In the absence of established REL this speaks rather against REDD as an offset mechanism for Annex-I compliance.

4.2 Policy approaches – REDD transfer systems

The term REDD transfer systems is used as a synonym for the instrument responsible for distributing funds to and within non-Annex-I countries participating in a future REDD mechanism. Depending on the finance mechanism, an international REDD transfer system could be:

- An offset mechanism, where the central governments of non-Annex-I countries would receive credits/emission allowances for emission reductions accomplished through reduced deforestation and forest degradation and for the enhancement of forest carbon stocks, and these could be sold to Annex-I countries to meet (part of their) their commitments.
- A multilateral fund such as the TDERM Triptych (Stockwell et al. forthcoming)
- A multilateral fund such as the Forest Carbon Partnership Facility (FCPF) or a Multi-Donor Trust Fund like the UN REDD Programme Fund

Regardless of the choice of the international transfer system, countries will need to put in place national transfer systems responsible for the distribution of REDD funds or funding of REDD activities at the subnational level. The Brazilian "Fundo Amazônia" (see Box 3, page 11), the "Socio-Bosque"-Program in Ecuador (see Box 3), or a national PES system such as that in Costa Rica are only three examples of what shape such a national transfer system could have. A transfer system may also take the form of certain policies and measures, e. g. in cases where countries target illegal deforestation and direct revenues from REDD towards different government expenditures.

As an international transfer systems will be responsible for the distribution of REDD funds, their design will have an impact on the range of activities funded, the conditionality of funding and consequently also on the number of countries able to access funding. This is important to keep in mind if a REDD mechanism is to meet overall mitigation, biodiversity and equity demands. From an integrated perspective, a transfer system should ensure that:

1. Access to funding is available to all countries wishing to reduce deforestation and forest degradation (or conduct other activities within the scope of a final REDD agreement), regardless of their present institutional and technical capacity.
2. Activities aimed to reduce deforestation and forest degradation respect and support the goals of other relevant international conventions, i. e. REDD efforts are in line with human, and specifically indigenous peoples', rights and, support biodiversity conservation.
3. Activities that address the underlying causes of deforestation and forest degradation and permanently reduce (emissions from) deforestation and forest degradation (and thus have a lasting mitigation and biodiversity conservation effect) are supported, even if they do not immediately lead to measurable, reportable and verifiable (MRV) emission reductions.

Before assessing the proposals against these three qualifying criteria, the importance of the last point will be stressed here and in this context the role of development policy and cooperation will be elaborated in brief.

As mentioned in Chapter 2, the underlying causes of deforestation are manifold, vary both between and within countries, often cut across different sectors and administrative levels within a country, and can also be found in other countries and the world markets.

As a result, it is very important that REDD transfer systems are seen not only as an instrument to temporarily compensate countries for avoided deforestation but also as a mechanism to enable countries to reduce or even stop and reverse deforestation. A transfer system should thus have a strong governance architecture which sets incentives and supports activities that reduce deforestation permanently. As deforestation accompanies the dominant human development model, this implies that REDD transfer systems must help to facilitate a human (economic) development that is not – or to a lesser extent – based on deforestation and continuous forest degradation. To give an example, Indonesia's pulp mill processing capacity is far too high to be supplied with timber from sustainable forest management from within the country (Kanninen et al. 2007; Spek 2006). As a result, there is illegal logging and overexploitation of forests to meet pulp mill demand. Within an effective REDD mechanism, pulp mill capacity (among other things) would need to be reduced to avoid illegal logging and overexploitation. Strong law enforcement could thus

avoid deforestation in Indonesia, but timber could then be imported to satisfy pulp mill demand, resulting in displacement of emissions from deforestation. A phenomenon of this kind can be observed e. g. in Vietnam and Laos. A national logging ban in Vietnam has reduced pressure on Vietnamese forests but increased pressure on forests in Laos, as the Vietnamese wood processing industry continues to thrive, driven by end markets in the US, Japan and Europe (EIA / Telepak 2008). In such cases, REDD transfers should be used to shrink wood processing capacity to a level which can be met by timber from sustainably managed domestic forest areas and create alternative employment in other sectors, if leakage is to be avoided and deforestation reduced permanently. Here, the challenge is to create employment in less carbon- (or generally less resource-) intensive sectors, since developing countries will also face constraints with regard to carbon emissions and resources in the future. Also, REDD payments cannot be expected to continue for an unlimited period of time, which makes structural changes imperative to permanently stop global deforestation. Leap-frogging carbon-intensive industrial development, on the pattern known historically, could save developing countries the "painful" and costly experience of decarbonising their economies in the future. But this more easily said than done, as there is no precedent for such a development process and developed countries continue to fail in producing evidence that current welfare levels can be kept with a low-carbon, low-resource economy.

The role of development policy and cooperation in supporting REDD transfer mechanisms

With regard to the design of transfer systems and the question of "how to use REDD to provide alternative income from ecologically sustainable development", development policy and cooperation could and should play a key role. Not only because it presents an opportunity (and a formidable challenge) to achieve multiple objectives, but also because development policy and cooperation can in many cases draw on decades of (country-specific) experience related to deforestation and forest degradation. Already, development policy and cooperation play an important role in both shaping international and national dialogues on REDD and designing and implementing REDD demonstration activities together with partner countries. Beyond facilitating technical readiness (e. g. establishing RELs), demonstration activities are vital to developing and testing custom-made national transfer systems keyed to promoting the structural changes necessary to slow or stop deforestation and forest degradation, thus linking REDD measures to a country's overall development architecture . Here again, country- or region-specific knowledge on governance issues will be very valuable to estimate which approaches could succeed and which actions are likely to fail. In this context, efforts like FLEGT and certification could be scaled up and made an integral part of reform measures and REDD demonstration activities.

Furthermore, development policy and cooperation should engage more strongly in promoting development that is consistent with efforts to reduce emissions from deforestation and forest degradation (not only in countries participating in REDD). To give an example, development policy and cooperation must not contradict itself by financing agricultural expansion or wood processing at the expense of overexploiting a (foreign) countries forest resources, while at the same time promoting forest governance and law enforcement. Especially when the concern is to reduce poverty through "conventional" economic growth in natural resource exploitation or agriculture, it may be difficult to achieve a win-win situation for poverty alleviation and forest preservation. Rather than merely acknowledg-

ing this conflict, development policy and cooperation should engage much more pro-actively in finding alternative development solutions that are less carbon- and resource-intensive than those of industrialized economies and societies.

Finally, development policy and cooperation can help to put more focus on the role played by forests for adaptation to climate change. While this issue is often referred to and generally acknowledged, quantitative and qualitative data on the importance of forests for adaptation at the local or national level are rare and a systematic approach to combining REDD and adaptation is missing.

4.2.1 Channelling transfers through a REDD offset mechanism

Designing REDD as an offset mechanism implies that non-Annex-I countries would be allowed to sell their emission reductions achieved through REDD to Annex-I countries for compliance in 2013–2020 and possibly the subsequent commitment periods as well. Since national accounting is a prerequisite, revenues would flow directly into central government budgets. Payments, as with LULUCF in Annex-I countries, would be ex-post.

Implications for equity and biodiversity issues

To ensure the integrity of the ETS, though, accounting standards would need to be similar to those for LULUCF accounting in Annex-I countries, requiring extensive and reliable datasets. Due to the present lack of institutional, financial and technical capacity, it is yet unclear how many countries will be able to meet these accounting standards by 2013. The scale of REDD readiness activities may enable many, but certainly not all countries to meet the necessary accounting and reporting standards by 2013. Consequently, to ensure broadest possible participation (and thus minimize leakage), especially from least-developed countries, financing REDD cannot exclusively rely on an offset mechanism.

In addition, it is as yet unclear whether or not non-Annex-I countries would be willing to commit to binding REDD reduction targets, including liability in case of non-compliance. Yet, the latter is a necessary prerequisite to estimate the supply of emission reductions from REDD and introduce caps or adjust Annex-I reduction targets accordingly to ensure sufficient domestic emission reductions in Annex-I countries take place. Brazil has announced a voluntary target to reduce deforestation and some countries are signalling their willingness to so as well. However, not all countries can be expected to commit to targets, underlining the need for an alternative (or complementary) financing approach to REDD.

In terms of an equitable and pro-biodiversity distribution of REDD funds at the national and sub-national level, buyers (Annex-I countries) would have few means of ensuring that deforestation would be reduced in accordance with agreed REDD principles under the UNFCCC (such as consideration of indigenous people's rights and biodiversity conservation). If e. g. deforestation were reduced by driving "illegal" settlers out of protected areas, this could negatively affect millions of people (Rights and Resources Initiative 2008). Also, concerns have been raised that "guns and guard" policies will be put in place, effectively disregard customary rights and the vital need of many poor people to access forest resources. This could be triggered by the fact that while many countries may lack capital to make upfront investments to reduce deforestation, payments in the case of an offset

mechanism would be made ex-post. According to the United Nations Development Programme (UNDP) – United Nations Environment Programme (UNEP) – UNEP / UNDP / FAO (2008, as cited in Peskett et al. 2008), this may keep countries from implementing time-consuming and expensive participatory measures designed to reduce deforestation. Furthermore, countries with poor forest governance may face delivery risks, if no upfront funding is provided (UNDP-UNEP-FAO 2008, as cited in Peskett et al. 2008). This may shift investor – i. e. Annex-I countries' – interests towards countries with lower delivery risks (Ebeling / Yasue 2008).

Corruption or elite capture of benefits is another concern with regard to the distribution of REDD funds (Peskett et al. 2008).

If a REDD offset mechanism proves inadequate to address guiding REDD principles, it is up to national transfer systems to address these.

The Woods Hole Research Center (WHRC) has put forward a conceptual framework for a national REDD transfer system, taking Brazil as an example (Nepstad et al. 2007). Three funds would be created to which the returns from REDD carbon credits are allocated. This would include a public forest stewardship fund, a private forest stewardship fund and a government fund.

The public forest stewardship fund would performance-based compensation payments to indigenous and other forest-based people for avoiding deforestation (not only for changing land-use practices but also for preventing deforestation by other actors). Payments would not be related to opportunity costs but use minimum salaries as a reference. Valuable experience can be drawn from existing Brazilian programmes such as Proambiente and Bolsa-Floresta (Nepstad et al. 2007).

The private forest stewardship fund would compensate private forest owners for foregone opportunity costs. Forest owners would receive 20 % of the opportunity costs of forest maintenance for forest areas they have to maintain due to legal requirements. Full opportunity costs would be paid for forest areas kept in excess of legal requirements (above 50 % or 80 % of the total area respectively, depending on individual state regulation).

Finally, the government fund would cover the costs for monitoring, management of public forests and further administrative efforts, such as the establishment of protected areas or the set-up of a cadastre (Nepstad et al. 2007).

What sounds like a convincing and workable solution has so far received little attention by parties. Brazil, though, has recently set up the Fundo Amazônia (Amazon Fund, see Box 4, below) under the control of its national development bank (BNDES). Similarly, Ecuador has established a national trust fund to finance its "Socio-Bosque"-Program (see Box 4 below).

Box 4: Examples for national transfer systems: The Brazilian "Fundo Amazônia" and the "Programa Socio-Bosque" in Ecuador

Brazil: *"Fundo Amazônia"*

Brazil has recently set up the Fundo Amazônia (Amazon Fund), under the control of its national development bank (BNDES). According to BNDES (BNDES News 2008), the fund is to support […] *management of public forests and protected areas; environmental control, monitoring and supervision; sustainable forest management; economic activities developed with the sustainable use of the forest; ecologic and economic zoning, agrarian regulation and organization; conservation and sustainable use of biodiversity; and recovery of deforested areas* […]. It is to draw on both national and international funding (mainly donations) and has a target volume of 21 bn US$ by 2021. Norway has made an initial contribution of 21 m US$ and is considering a total contribution of up to 1 bn US$, depending on Brazil's performance in reducing deforestation (Reuters AlertNet 2008). Contributors will not receive tradable carbon credits but instead an emission reduction certificate. How the fund will be linked to an international REDD mechanism is however still unclear. The fund will support activities both from governmental and non-governmental organizations. A steering committee will establish priorities and guidelines on the use of funds. Project or programme proposals will be approved by BNDES, but will also undergo an independent auditing process.

Ecuador*: "Programa Socio-Bosque"*

Ecuador has recently established a national programme to reduce its deforestation rate by 50 %. A central component of this programme is the *Programa Socio Bosque*. Within 7 years, *Socio Bosque* aims at putting a forest area of 4 m ha under protection, by providing an economic incentive to indigenous communities and individual forest smallholders. *Socio Bosque* focuses on forest areas

— with high levels of deforestation

— with high carbon content and which provide other valuable ecosystem services

— with high levels of poverty

Socio Bosque is a voluntary scheme in terms of participation. Forest owners, both individuals and communities can sign an agreement, which is then valid for 20 years. The agreement comprises certain restrictions with regard to forest use, so as to maintain or enhance current carbon stocks. A monitoring system, including both satellite observation and sample checks, ensures compliance. Participants receive 30 US$ per ha per year for up to 50 ha, and less for each ha thereafter. The programme is financed through a national trust fund. Payments are made 3 times a year directly from the trust find to the bank account of the beneficiary. In case a community has signed an agreement, the community must submit an investment plan to show how revenues are distributed or spend. Beneficiaries are supported in opening bank accounts and designing investment plans. The trust fund currently holds 23 m US$. The government of Ecuador estimates that 60 m US$ will be needed annually to protect the 4 m ha of forests through *Socio Bosque* and expects REDD and other multilateral and bilateral initiatives to contribute to *Socio Bosque*. In 2008, 15,000 agreements to protect 165,000 ha of forests were signed. In 2009, the government of Ecuador expects another 74,000 agreements to be signed to protect another 1 M. ha of forests.

Source: BNDES News (2008), Reuters AlertNet (2008), Presentation of Brazilian Forest Service, side event by the government of Ecuador on the Socio Bosque Programme at COP 14, Poznan.

4.2.2 The TDERM Triptych

The TDERM Triptych (Stockwell et al. forthcoming) elaborates on the transfer system of the TDERM originally presented by Hare and Macey (2007). Drawing on experiences gained from the Clean Development Mechanism (CDM), Stockwell / Hare / Macey (forthcoming) sketch in detail how the transfer-system, and especially the institutional arrangement, of the TDERM might be designed. Borrowing in part from the CDM, they suggest the establishment of an Executive Committee (ExComm) under the Conference of the Parties (COP) / Members of the Protocol (MOP). Unlike the CDM, however, the REDD ExComm would be a permanently staffed body, responsible for trading Tropical

Deforestation Emission Reduction Units (TDERUs) and reviewing annual reports from the parties. Applying the portfolio-performance approach (Hare / Macey 2007), it would buy MRV emission reductions from non-Annex-I countries at close to opportunity costs, and would sell them to Annex-I countries at close to carbon market prices (Stockwell et al. forthcoming). The profit margin would be used to fund activities that do not result in immediate MRV emission reductions (such as capacity building and policy reforms) and be used to finance the ExComm.

At the country level, Designated National Authorities (DNAs) would be established, and they would serve as national focal points for REDD activities and reporting to the ExComm. The DNAs would be responsible for developing a national REDD strategy to tackle deforestation (considering criteria like human rights and biodiversity issues), coordinating the implementation of government REDD activities at the national level and approving sub-national activity. Reporting to the ExComm would occur along one of three tracks, depending on the institutional and technical capacity of the country to be monitored, and account for and report on emission reductions from deforestation (Stockwell et al. forthcoming).

Annex-I countries would purchase the credits at the beginning of the commitment period, giving the ExComm a budget to finance capacity building and provide loans to countries otherwise unable to finance avoided deforestation. Payments for MRV emission reductions would occur ex-post (or be settled against a given loan).

Implications for equity and biodiversity issues

The TDERM would actively consider biodiversity and a range of equity issues. First of all, it would provide funding for capacity building and carbon trading along three tracks, which would allow all countries to participate in REDD according to their institutional and technical capacity to deal with deforestation. Funds would be available at the beginning of the commitment period, which again would make it possible to address the countries' individual capacities and financial needs. Second, as in the case of the World Bank's Forest Carbon Partnership Facility (see below), the countries would be required to develop a national REDD strategy paper addressing e. g. the implications of REDD activities on biodiversity conservation and the rights of indigenous people. At the same time, the development of the REDD strategy paper would leave the countries free to decide how to best deal with deforestation. This would make it possible to consider the country-specific facets of deforestation and forest degradation and would not impose any external restriction on a country's sovereignty over land-use decisions. The establishment of the ExComm and DNAs would create a permanent institutional structure both within the participating countries and the UNFCCC (in part familiar from the CDM), which is important to create ownership and ensure the longevity of efforts to reduce deforestation and forest degradation.

4.2.3 The Forest Carbon Partnership Facility (FCPF)

The FCPF is thus far the largest multilateral REDD pilot programme, in terms of both available funding and number of participating countries. The FCPF was launched in Bali in December 2007 and was declared operational at the end of June 2008. It consists of two

funds: A Readiness Fund and a Carbon Finance fund, with an original target volume of 100 and 200 m US$, respectively (Gordon et al. 2007). Due to the high demand by non-Annex-I countries to participate in the Readiness process (46 requests), the volume of the Readiness Fund was increased to 150 m US$.

Additionally, the FCPF may be complemented by the World Bank's Forest Investment Fund (FIF) to finance, among other things, REDD-related policy reforms, alternative livelihoods and provide capital for investments to reduce the impact of business on deforestation. The FIF is however no integral part of the FCPF and it is yet unclear how the cooperation between the FCPF and the FIF will look like.

So far, the FCPF has received (pledges for) 204 m US$ in grants, 128 m US$ of which has been allocated to the readiness fund and 76 m US$ to the Carbon Finance Fund (World Bank presentation January 2009). Among the contributors are mostly countries, but also private sector entities (Porter et al. 2008). The Readiness Fund is to support 30 developing countries and strengthen their capacity to tackle deforestation as well as to establish technical readiness to participate in a future international REDD mechanism (Gordon et al. 2007; updated). So far, 25 countries have been selected for the readiness fund: Argentina, Bolivia, Cameroon, Colombia, Republic of Congo, Costa Rica, DR Congo, Ethiopia, Gabon, Ghana, Guyana, Kenya, Lao PDR, Liberia, Madagascar, Mexico, Nepal, Nicaragua, Panama, Papua New Guinea, Paraguay, Peru, Vanuatu and Vietnam.

These countries were selected on the basis of a "*Readiness Plan Idea Note*" (R-PIN), which had to be submitted to the FCPF. The R-PIN Template is a comprehensive questionnaire and requires the country concerned, among other things, to submit information on:

- scale and type of deforestation and forest degradation and data availability
- institutional responsibilities in the forest sector and key problems
- causes of deforestation and current activities to address deforestation
- the role of forest dwellers and indigenous people
- participation/consultation of forest stakeholders in forest governance processes
- technical and political challenges for REDD implementation
- monitoring systems
- a future strategy to tackle deforestation, taking into consideration the development strategy of the forest and other sectors (e. g. agriculture) and relationships to other policies such as rural development policy and biodiversity conservation; expected co-benefits

According to Gordon et al. (2007), approx. 5 countries that have gone through the readiness stage will be given the opportunity to participate in the Carbon Finance Fund. Payments will be made for measurable and verifiable emission reductions in relation to a national REL. However, the FCPF acknowledges that REDD activities must not harm local people or the environment and should, in particular, consider benefits of REDD activities other than avoided carbon emissions. This may include contributions to biodiversity conservation by e. g. improving existing or establishing further protected areas and improving rural people's living conditions by securing their access to forest resources. Development of methods and tools to value such co-benefits may occur in the readiness phase, and this

lies within the responsibility of each country. The participants committee of the FCPF will decide whether the value of emission reductions yielding additional benefits, e. g. for biodiversity, should be expressed through higher financial returns (World Bank 2008).

The Carbon Finance Fund was originally also designed to support a range of REDD activities such as e. g. policy reforms in forest management and conservation, land-use strategies, payment for ecosystem services schemes (PES), establishment of protected areas and intensification of agriculture (Gordon et al. 2007). These activities are now being targeted by the Forest Investment Fund, which leaves the Carbon Finance Fund to provide incentive payments and compensation for emission reductions from deforestation and forest degradation

Financing will usually occur ex-post, but upfront payments may be provided under certain circumstances.

The governance structure of the FCPF consists of

- a participants assembly,
- a participants committee,
- a Carbon Fund participants committee
- one or more Technical Advisory Panels,
- a Facility Management Team,
- and one trustee for each the Readiness and the Carbon Finance Fund.

At the core of the FCPF are the participants committee and the Carbon Fund participants committee. The former is the main governing body and also responsible for the Readiness Fund. It consists of 20 members, 10 from participating and 10 from donor countries, with one vote each. Decisions should be reached by consensus if possible, otherwise a two-thirds majority of the members present is needed. Four observers, including one representative each from Intergovernmental Organisations (IGOs), Non-Government Organisations (NGOs), indigenous people and the private sector, are allowed to participate in the meetings of the participants committee.

The Carbon Fund participants committee is responsible for the steering of the Carbon Finance Fund. Decisions will be also be reached by consensus or otherwise by simple majority of the members present. Here, however, votes are allocated on the basis of financial contribution: one vote per one m US$ in contributions.

Implications for equity and biodiversity issues

The use of the R-PIN and the demand for a REDD strategy provide a theoretical framework for a REDD instrument which actively seeks to maximize synergies between climate change mitigation, biodiversity conservation and poverty alleviation. Countries applying to the Readiness Fund need to address questions related to biodiversity, poverty, participation of indigenous people and other forest dwellers. It is crucial, however, that what has obviously been planned with the idea of “maximizing synergies”, or at least “causing no harm”, is also executed properly. Consequently, it would be important to closely monitor the performance of the FCPF Readiness Fund, in order to contribute to the development of

methods to maximize co-benefits, and the results of the Carbon Finance Fund in realizing these benefits. Recently, an encouraging step was taken towards further interaction with and integration of indigenous and other forest-dependent communities. The recently elected FCPF Participants Committee approved a US$1 million small grants programme for indigenous and other forest-dependent communities.

One major equity concern, though, is the composition of one of the governing bodies, the Carbon Finance Fund participants committee. The important decision on "which country is selected for carbon trading" after completing the readiness phase is made exclusively by donor countries.

Due to the scale on which experience is being gathered at the FCPF, it will at least provide valuable lessons learned for the design of an international REDD instrument. Yet, it could also provide important building blocks or a blueprint for the institutional structure of an international REDD transfer system if it performs well concerning the delivery of benefits additional to forest carbon retention and seriously addresses the aforementioned equity concerns.

4.2.4 UN REDD Programme Fund

The UN REDD Programme Fund is a collaborative programme by the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP) and the FAO to coordinate and bundle their REDD activities. It may as such not be recognized as a potential REDD transfer system, as it lacks a carbon trading component like the FCPF. However, its support activities aim, among other things, at developing solutions for REDD payment distribution schemes that are consistent with existing policies on e. g. biodiversity conservation and poverty alleviation. One approach is to view the UN REDD Programme Fund as a further large-scale readiness programme for REDD, both additional and complementary to the FCPF and other bilateral initiatives. On the other hand, as the UN REDD Programme features a Multi-Donor Trust Fund, it could also administer REDD funds to compensate countries for emission reductions and continue to support countries in capacity building.

The UN REDD Programme offers a very comprehensive assistance strategy to countries planning and implementing REDD activities. Additionally, its governance structure is aimed at implementing REDD strategies with regard to the overall development process of the respective country. National REDD Steering Committees are put in place to ensure consistency with the United Nations Development Assistance Framework (UNDAF) and provide a focal point for REDD activities within the country. As such, the UN REDD Programme will at least contribute significantly to the readiness phase.

4.3 Policy approaches: REDD finance

It is widely believed that the financial transfers for REDD must be in the order of several billion US$ a year. This belief is based on the assumption that a REDD mechanism is expected to compensate countries for foregone opportunity costs of other land-use systems and that countries would reduce deforestation on the basis of opportunity costs. Opportu-

nity cost estimates range from detailed studies on single countries (or regions) to more or less rough global estimates. Research by Nepstad et al. (2007) suggests that the costs for nearly stopping deforestation in the Brazilian Amazon would cost 18 bn US$ over thirty years. The Stern Review (Stern 2006b) estimated the costs of reducing 70 % of non-Annex-I land-use emissions in 8 countries to zero would initially cost 5 bn US$ a year. However, according to Trines (2007), this figure represents the lower end of opportunity costs and according to Grieg-Gran (2006), the costs may be more around 11–15 bn US$ a year. Global modelling approaches provide yet other figures. Sathaye et al. (2007) estimated the cost of reducing emissions from deforestation by 10 % by the year 2030 would range from 0.4 to 1.2 bn US$ a year, while a more recent global modelling approach by Kindermann et al. (2008) indicates that a 50 % reduction in tropical deforestation by 2030 would cost 17.2 to 28 bn US$ a year.

However, compensating countries on the basis of opportunity costs is only one way to achieve reduced emissions from deforestation and forest degradation. Incentivizing policy reforms or paying for emission reductions gained e. g. through the implementation of new, or in some cases even the enforcement of existing, policies, the costs would need to be calculated by considering e. g. administrative costs, a potential reduction in tax revenues, transaction costs etc.

If sold to or compensated by a market-linked mechanism, one ton of CO_2 could either be bought at a fixed rate or at the actual costs plus a certain profit margin (both to be negotiated). If on the other hand emission reductions from REDD could be sold to Annex-I countries for compliance, the price per ton of CO_2 is likely to be close to the costs of other emission reduction certificates (e. g. from the CDM), which could be substantially higher than the actual costs of achieving this emission reduction. While this would increase returns for non-Annex-I countries, it would also increase compliance costs for Annex-I countries. Consequently, a market-based approach may not be the most cost effective option in terms of achieving overall low-cost compliance.

Estimates for REDD finance based on opportunity cost calculations are only one way to calculate the financial needs for REDD. Another approach to derive the potential amount of funding needed would be to relate the amount of emission reductions to be expected by 2020 (derived from REDD-targets) with a potential CO_2-price range needed to incentivize these targets. This would be based on the assumption, that non-Annex-I countries would take measures, including the implementation of polices, to reduce deforestation and forest degradation, given the prospective revenues from a REDD mechanism from 2013 onwards. Brazil e. g. expects the international community to contribute 21 bn US$ to its Amazon Fund by 2021 to achieve emission reductions of 4.8 Gt CO_2 by 2017. Likewise, a Forest Fund under the UNFCCC could pay non-Annex-I similar incentives to reduce emissions from deforestation and forest degradation. As described in chapter 3 (methods), a 50 % reduction in deforestation by 2020 would lead to approx. 8 Gt CO_2 of emission reductions within 8 years. If non-Annex-I countries were given an incentive of e.g. 5 US$ per avoided ton of CO_2, a price well within the range of estimated opportunity costs for REDD, this would amount to 40 bn US$ in the period 2013–2020, or 9.3 bn US$ in 2020 (not considering payments for Brazil). Doubling the financial incentive to 10 US$ per avoided ton of CO_2 would result in 80 bn US$ over 8 years, or 18.6 bn US$ in 2020.

The main dispute on REDD finance is less on the costs of REDD, though this plays a certain role, but on how to leverage the necessary funding for REDD. Only two options are considered viable to leverage several billion US$ a year. The auctioning of the AAUs or emission allowances from regional/national emission trading schemes (e. g. EU, US) or designing REDD as an offset mechanism like e. g. the CDM (though not project-based).

The latter is favoured e. g. by the Coalition for Rainforest Nations, Australia and several observer organizations (see e. g. submissions by Papua New Guinea, Colombia and Australia to the UNFCC 2008a; see Schwartzman / Nepstad / Moutinho 2008), while the so-called market-linked approaches are mainly promoted by the NGO community and to a lesser extend by parties (see e. g. Hare / Macey 2007; CAN AWG-KP submission 2008; Stockwell / Hare / Macey forthcoming). Recently, a "basket approach" (Boucher / Movius / Davidson 2008; submission by the Coalition for Rainforest Nations to the AWG-LCA 3, UNFCCC 2008b) has been introduced with a view to combining the different financing approaches step by step.

The following section sheds light on those proposed financing mechanisms for REDD and analyses their potential to fund REDD as well as implications for overall climate change mitigation, equity and methodological issues.

4.3.1 REDD as an offset mechanism for Annex-I compliance

Potential REDD funding and implications for overall climate change mitigation

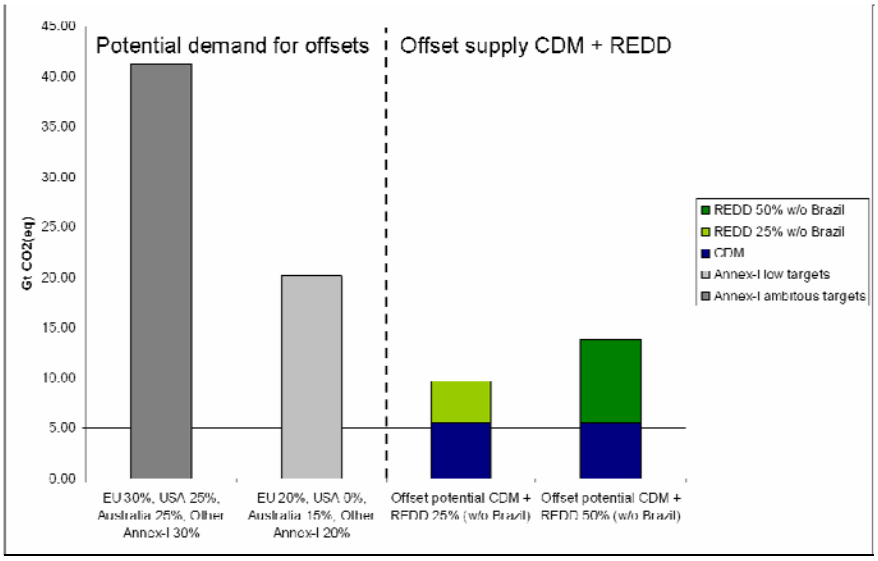
Designing REDD as an offset mechanism would allow non-Annex-I countries to sell their emission reductions achieved through REDD to Annex-I countries for compliance (to reach their reduction target).

Figure 2 shows the demand for emission reductions from Annex-I countries under two different target scenarios and the potential or anticipated supply of emission reductions from the CDM and REDD in the period 2013–2020.

Figure 2 shows that the emission reduction supply from the CDM and REDD in the period 2013–2020 provides significant amounts of offsets for Annex-I compliance. Assuming low 2020-targets by Annex-I countries, a 25 % reduction in deforestation together with the CDM supply would allow Annex-I countries to nearly offset half of their emission reductions. With ambitious Annex-I targets, a 50 % reduction in deforestation together with the CDM supply would allow Annex-I countries to offset around a third of their reductions. The potential supply of emission reductions from REDD for offsetting given here should be considered a rough estimate, since FAO data on deforestation was used and it was assumed that deforestation would lead to a 100 % release of above- and below-ground biomass. For the following reasons, the potential amount of offsets from REDD is however deemed a conservative estimate:

— Mean carbon values for each country were used, so carbon stocks and thus carbon emissions may have been underestimated, especially since soil carbon has not been considered. The historic REL using mean forest carbon values is set at 3.71 Gt CO_2

Figure 2: Emission reductions by Annex-I countries for different targets (demand) and offsetting potential through the CDM and REDD (supply) in the period 2013–2020



Source: Author's calculations based on UNFCCC GHG data (see methods for underlying assumptions); CDM estimate taken from UNEP RISØ Centre at http://cdmpipeline.org/overview.htm#2

(w/o Brazil), which is significantly lower than the estimate from the IPCC's 4th Assessment Report (5.8 Gt CO2-eq.)

— Emissions from forest degradation have not been considered.

— A historic REL was used for all countries, which is not likely to be the case. The use of development adjustment factors, especially in the case of countries with low deforestation rates in the past,, may increase the amount of emission reductions from REDD.

— Emission reductions from Brazil, as well as removals gained through the enhancement of carbon stocks in e. g. China and India have not been considered.

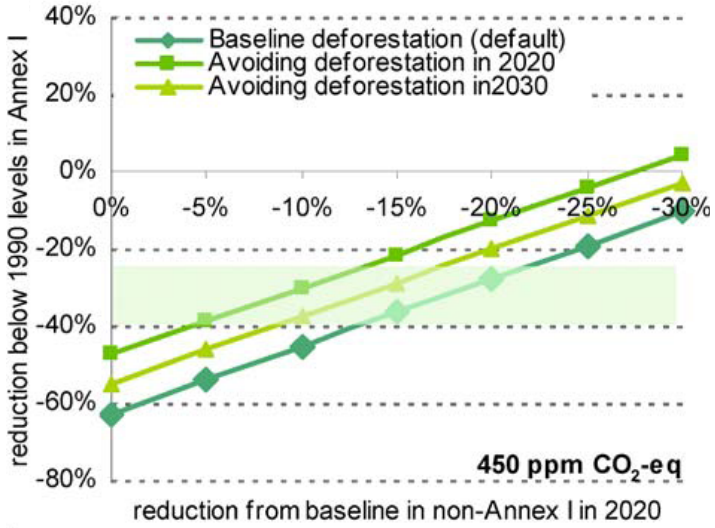
Consequently, the offset supply from emission reductions generated through REDD could be significantly higher.

Designing REDD as an offset mechanism is however problematic. Two major concerns have been voiced. Using emission reductions from REDD to offset Annex-I emissions may lead to stabilization above 450 ppm (or at least a temporary overshoot), the threshold at which average global warming could still be limited to 2° C, if Annex-I and non-Annex-I targets for 2020 are not sufficiently high. In addition to that, emission reductions from REDD could lower the carbon prices both internationally and e. g. in the EU Emission Trading Scheme (EU-ETS), which would delay investment into low-carbon technology. In consequence, carbon intensive energy structures in both industrialized countries and countries in transition may continue to be put in place that would make it difficult to achieve long-term mitigation objectives (lock-in effect).

According to the IPCC (2007), Annex-I countries as a group must reduce their GHG-emissions 25–40 % below 1990 levels by 2020 in order to reach stabilization at 450 ppm.

At the same time, a substantial deviation from "business as usual" (BAU) emissions in non-Annex-I countries is necessary to reach this goal (Gupta et al. 2007, as cited in den Elzen and Höhne 2008). According to den Elzen and Höhne (2008), this "deviation from BAU" in non-Annex-I countries has been specified to be roughly 15–30 % by 2020. These stabilization scenarios do however not consider a reduction in emissions from deforestation until 2020. As a result, if emissions from deforestation would substantially decline until 2020, emissions from other sources could decrease slightly less in this period (den Elzen / Höhne 2008). The important presumption though is that emission reductions from reduced deforestation cannot be used as offsets by either Annex-I or non-Annex-I countries, but must be achieved (and financed separately) in addition to fossil emission reductions in Annex-I and non-Annex-I countries. Figure 3 (taken from den Elzen / Höhne 2008) shows possible trade-offs for 2020 targets by Annex-I and non-Annex-I countries under different avoided deforestation scenarios.

Figure 3: Trade-off options for 2020 targets of Annex-I, non-Annex-I and avoided deforestation for achieving stabilization at 450 ppm, presuming no offsetting takes place between the three different mitigation efforts



Source: Taken from den Elzen / Höhne (2008)

Accordingly, one option for 2020 targets in line with stabilization at 450 ppm would be:

- Annex-I as a group: 30 % by 2020 compared to 1990
- Non-Annex-I as a group: 15 % by 2020 compared to BAU
- Reducing deforestation to 0 % by 2030, this roughly corresponds to halving emissions from deforestation by 2020.

Again, this presumes that neither Annex-I nor not-Annex-I countries use emission reductions from REDD to offset their domestic emission reductions. Also, if Annex-I countries continue to use offsets from the CDM, these may not be counted as emission reductions in non-Annex-I countries.

Thus, to use REDD as an offset mechanism for Annex-I compliance, Annex-I targets would have to be increased. According to the European Commission (2009), the 2020

target for Annex-I countries as a group would need to climb to 38 % (compared to 1990), assuming a 50% reduction in deforestation was achieved in 2020. In contrast, the low and ambitious 2020-targets for Annex-I countries laid out in chapter 3 (methods) of this paper correspond to a joint Annex-I emission reduction effort of 14–28 %. It is evident, that not even with an Annex-I target that may currently be considered ambitious, would it be possible to use REDD as an offset mechanism for Annex-I compliance and at the same time reach stabilization at 450 ppm. If however Annex-I as a group would commit to a 38 % reduction until 2020 compared to 1990 and non-Annex-I would commit to a 15 % reduction until 2020 compared to BAU, REDD could be used as an offset mechanism for Annex-I compliance. In case Annex-I countries commit to a 2020-target between 31 and 38 %, supply of REDD credits would need to be capped accordingly and a complementary finance mechanism would be needed

Another main concern with regard to REDD offsets is the anticipated effect of REDD offsets on carbon prices. The carbon price is an important regulatory instrument for technological innovation and thus transformation towards low carbon development, especially in the energy sector in both Annex-I countries and non-Annex-I countries such as China and India. A high carbon price is e. g. crucial to develop and deploy carbon capture and storage and to trigger investment into renewable energies and prevent further investment into fossil energy production.

It is hard to predict the impact of REDD on the carbon market, though, as long as both demand (reduction targets) and supply (scale of avoided deforestation) and the price of emission reductions from REDD are largely unclear.

In the absence of reliable data on demand and supply, two studies have modelled the impact of REDD on the carbon market. Just as time scales and (policy) assumptions differ markedly, so do the results.

Anger and Sathaye (2008) have modelled the impact of REDD on the ETS, including implications for the CDM until 2020. Table 3 shows their main assumptions.

Table 1: (Policy) Assumptions for the Emission Trading Scheme of the European Union (EU ETS) ++ model	
Reduction targets	A 27 % reduction target for the EU compared to 1990
	A 20 % reduction target for Japan and Canada compared to 1990
	A 15 % reduction target for the US and Australia compared to 1990
	No reduction target for the Russian Federation (but no hot air either)
REDD suppliers	Regions supplying REDD credits comprise Africa, South-East Asia, Central and South America
CDM participants	CDM participating countries: China, India, Brazil, Mexico and South Korea
Source: Anger / Sathaye (2008)	

They find the carbon price in 2020 reduced from 23 US$ (no REDD) to 9–10 US$ per t CO_2-eq, reducing compliance costs by 75 %. CDM market volume is reduced by 50 % (crowding-out effect). Deforestation is reduced in Africa by 66 %, in Central America by 16 %, in South America by 15 % and in South-East Asia by 8 %.

The other model by Cabezas and Keohane (2008) makes the following assumptions (Table 2).

The model is run under 5 different scenarios, with varying amounts of REDD credits supplied for the carbon market, and produces carbon prices for 5 different points in time. Table 5 shows the development of the carbon price range (scenario 1 to 5) from 2012 to 2050. Integration of REDD (avoided deforestation only) reduces the price per t of CO_2-eq by 4–49 %, depending on year and scenario.

Table 2: (Policy) Assumptions for the model by Cabezas and Keohane (2008)	
Reduction targets	The US enacts the Lieberman-Warner Climate Security Act, i. e. up to 25 % emission reductions compared to 2005 levels by the year 2020
	The EU, Japan, Canada, Australia and New Zealand reduce emissions by 60 % in 2050 compared to 1990.
	Non-Annex-I countries start reducing emissions by 2020 and reach 1990 levels by 2050
Offsetting	10 % offsets through the CDM are allowed in all Annex-I countries except the US
	The US allows only for offsets from Annex-I countries until 2020, afterwards from all countries
Regulation	No caps or other regulations on REDD credits in international and domestic carbon markets
	Banking of REDD credits is allowed
Source: Cabezas / Keohane (2008)	

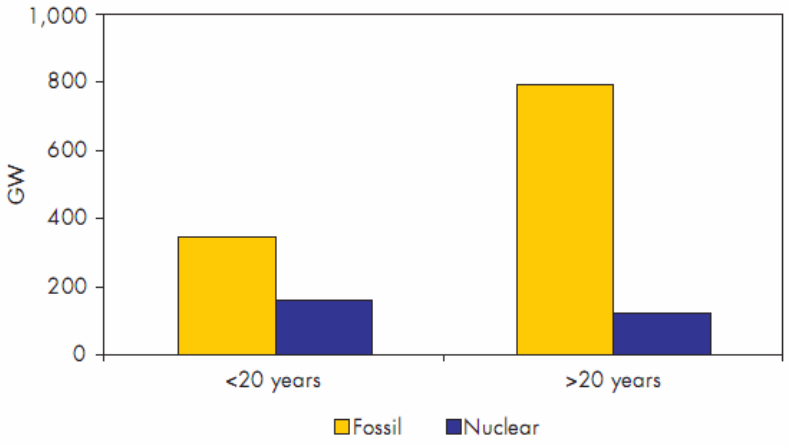
Table 3: Carbon price range from 2012 to 2050, as a result of REDD market integration				
Year	Carbon price range with REDD integration in US$	Carbon price without REDD integration in US$	Price reduction range in US$	Price reduction range in %
2012	12– 22	23	1–11	4–48
2020	18– 32	35	3–17	9–49
2030	30– 53	56	3–26	5–46
2040	49– 86	92	6–43	7–47
2050	79–140	150	10–71	7–47
Source: Cabezas / Keohane (2008)				

Due to the different assumptions the models are based on, the results cannot be compared directly. Still, both models depict trends. REDD leads to a lower carbon price, though the magnitude differs greatly (4–260 %). The model by Anger and Sathaye (2008) additionally highlights the potential crowding-out effect that REDD could have on CDM credits.

The drop in carbon prices, especially those modelled by Angerer and Sathaye (2008) could significantly undermine the transformation of Annex-I countries into low-carbon economies. According to the International Energy Agency (IEA 2007) about 60 % of Annex-I countries' power generation capacity until 2030 is expected to come from fossil energy sources. According to the World Energy Investment Outlook (IEA / OECD 2003), 90 % of this capacity will stem from coal. Due to the age structure of OECD power plants

(see Figure 4), the IEA (2003) estimates that 1,400 GW of coal power plant capacity will be built in the OECD countries by 2030.

Figure 4: Average age of power plants (in GW) in the OECD



Source: Taken from IEA / OECD (2003)

With an operating time of 40–60 years, lasting energy structures could be put in place that would make stabilization of GHG concentrations at 450 ppm CO_2-eq in the atmosphere unachievable without Carbon Capture and Storage (CCS; McKinsey 2008). To prevent this and enable the broad-scale deployment of CCS technology, a carbon price of 38–60 US$ is needed in 2030 (McKinsey 2008). With REDD integration, the carbon price in 2030 ranges between 30–53 US$ (Cabezas / Keohane 2008), depending on the scenario chosen. During its development, though, CCS is estimated to cause costs of 75–113 US$ per ton of CO_2. As a result, CCS development will need considerable subsidization, but carbon prices still need to be high all the way to 2030 to set incentives and pave the way for broad-scale deployment of CCS and truly renewable energy supply systems.

In addition, in the model by Cabezas and Keohane (2008) demand is driven by Annex-I commitments for 2050 and it is assumed that countries (or the private sector) will be allowed to bank REDD credits. Banking would allow market players to buy carbon credits, bank them, and use them for future compliance. The anticipated effect is that "cheaper" REDD offsets would quickly be bought by market actors and stored for either future compliance or for sale at a higher price in the future. Demand for REDD until 2020 will, however, be driven by Annex-I commitments for 2020, as long as there is no binding climate agreement until 2050. With regard to banking, there are two uncertainties: First, should REDD credits be issued as temporary credits (like tCERs); and second, provided banking were allowed, what amount of credits would actually be banked is mere speculation.

Implications for equity and methodological/technical REDD issues

Annex-I countries selling emission reductions from REDD as offsets would need to ensure delivery at the end of the commitment period. This could result in Annex-I countries buying REDD credits from countries where the delivery risk for emission reductions from reduced deforestation is comparatively low (Ebeling / Yasue 2007). This could result in many countries currently lacking the institutional capacity to ensure a predictable flow of emission reductions from REDD not being able to derive benefits from REDD.

Also, non-Annex-I countries would need to meet the same standards for accounting required of Annex-1 countries under LULUCF. Otherwise, the integrity of the compliance market could not be ensured (e. g. "hot air"). While the present readiness process may enable many countries to participate in an offset mechanism, it is highly questionable, though, whether all non-Annex-I countries would reach this level by 2012. Market-access by only a few countries, however, could result in international leakage/displacement of emissions, unless a complementary finance mechanism is established. Discount factors to account for the uncertainty of measurements could be used as a solution to grant countries with insufficient data quality access to a REDD offset mechanism, by issuing e. g. one REDD credit for 3 tons of CO_2 reduced. Yet, depending on the uncertainty/ discount factor, this could also greatly decrease prospective financial returns for non-Annex-I countries and reduce the attractiveness of REDD.

Political viability for a REDD offset mechanism

Support from parties and also some NGOs for a REDD offset mechanism has grown. Even the EU, which had previously rejected the idea of REDD as an offset mechanism (European Commission 2008), faltered slightly during the adoption of its climate and energy package (Council of the European Union 2008). However, in the new proposal by the European Commission for a post-2012 agreement, REDD as an offset mechanism is not mentioned. Within the UNFCCC negotiations, Brazil, China, Tuvalu and Venezuela have come out clearly against REDD as an offset mechanism before 2020. Brazil, another major player in the REDD negotiations, has been against a market solution from the outset (Peskett et al. 2008). China is also against a carbon market solution, a fact that may be due to the potential impact of REDD on the CDM and possibly other sectoral approaches. China has benefited more than any other country from the CDM and is likely to continue to do so in the future. It is thus doubtful whether China would approve an instrument which would potentially reduce its profits from the CDM or its successor (see Implications on climate change mitigation, above). Countries and observer organisations in favour of a REDD offset mechanism have demanded higher reduction targets by Annex-I countries. As has been mentioned previously, this would require Annex-I targets to climb beyond 30 %, which does not seem very realistic at present

4.3.2 Tropical Deforestation Emission Reduction Mechanism (TDERM)

In the following section, the TDERM is discussed only as an instrument to raise funds for REDD. Its extensive governance structure (Stockwell / Hare / Macey forthcoming) is discussed further under REDD transfer systems (4.1.5).

Implications for climate change mitigation

The Tropical Deforestation Emission Reduction Mechanism (TDERM) is a market-linked instrument developed by Greenpeace for both REDD funding and transfer of payments (Hare / Macey 2007; Stockwell / Hare / Macey forthcoming). The TDERM addresses many of the concerns related to carbon market integration and introduces several regulatory mechanisms to prevent negative side-effects. First of all, the TDERM introduces a new trading unit called TDERU (Tropical Deforestation Emission Reduction Unit). Annex-I countries would be obliged to meet part of their reduction target with

TDERUs. To ensure a predictable and continuous financial flow for REDD, a minimum purchase level is introduced. At the same time, an upper limit on TDERUs would be set, to reduce offsetting and ensure that Annex-I countries meet their reduction targets mainly through domestic emission reductions. TDERUs would, however, not be traded directly between Annex-I and non-Annex-I countries. Instead, revenues would go into a fund supervised by an Executive Committee under the authority of the COP/MOP (Stockwell / Hare / Macey forthcoming; see Chapter 4.1.5). Greenpeace does not propose any particular limit on TDERUs, but according to Hare and Macey (2007), the TDERM could raise 6–29 bn US$, given a price of 25 US$ per ton of CO_2-eq. and an upper limit of 5 % on TDERUs (see Table 4).

Table 4: TDERM fundraising potential for REDD

% of 1990 base year Annex I industrial gas emissions (22.8 $GtCO_2e/yr$)	Value of TDERUs € Bn/yr at 20 €/tCO_2e	TDERUs allowed $MtCO_2e/yr$	Actual deforestation emission reductions $MtCO_2e/yr$ (Discount factor 3)	Deforestation reduction (in million hectares) (550 t CO_2e/ha)	% of deforestation reduction in comparison to average
1 %	4,6	228	685	1,24	10 %
2 %	9,1	456	1369	2,49	19 %
3 %	13,7	684	2054	3,73	29 %
4 %	18,2	912	2738	4,97	38 %
5 %	22,8	1140	3423	6,22	48 %

Source: Taken from Hare / Macey (2007)

The introduction of TDERUs also serves a symbolic purpose – it earmarks a certain amount of the Annex-I reduction target for REDD funding and would thus highlight the commitment of Annex-I parties to protecting the world's (tropical) forests. The introduction of TDERUs is, however, not a mandatory element of the TDERM. The TDERM could also be financed through revenues from the auctioning of Assigned Amount Units (Bill Hare 2008, personal communication). This option could e. g. be applied when Annex-I commitments are too low to allow for additional offsetting. Furthermore, a so-called portfolio-performance approach is used. This means that a discount factor of e. g. three is applied to emission reductions. Consequently, funding would not be restricted to MRV emission reductions but rather allow for the funding of a broad range of other activities that do not directly reduce deforestation in the short run.

The TDERM could raise sufficient funds for REDD (see Table 4, above), but the introduction of TDERUs (partial fungibility) could be problematic for two reasons. The upper purchase limit on TDERUs, which is meant to ensure sufficient domestic emission reductions by Annex-I countries, is subject to negotiation. In consequence, negotiations could result in an upper limit that would not be in line with stabilization at 450 ppm. Additionally, the amount of TDERUs, and thus the dimension of REDD funding, depends on the reduction target set by Annex-I countries. An overall Annex-I reduction target of 25 % or lower by 2020 compared to 1990, would hence not allow for the introduction of TDERUs without further jeopardizing stabilization at 450 ppm.

Implications for methodological issues

The TDERM allows all countries, with their varying capacities, to participate in REDD. The portfolio-performance approach (see Hare / Macey 2007 for details) makes it possible to achieve measurable, reportable and verifiable (MRV) emission reductions and at the same to support other important activities that do not lead to imminent emission reductions (such as institution building). It thus reduces the potential for international displacement/leakage of emissions from deforestation. The introduction of TDERUs, which would mean partial fungibility with the ETS, would also raise the problem of permanence of emissions and hot air in the market. Here again, the portfolio-performance approach reduces the risk, as 1 TDERU would represent e. g. 3 t of CO_2 reduced through avoided deforestation.

Political viability

The TDERM has not been mentioned in parties' submissions to the UNFCCC. However, according to Hare (personal communication 2008), Greenpeace has received positive responses from several non-Annex-I countries concerning the TDERM. Also, Annex-I countries in favour of a fund approach to REDD and limited offsetting as well as non-Annex-I countries that would face difficulties in accessing carbon markets due to lack of institutional capacity and/or data could be in favour of the TDERM.

On the other hand, countries in favour of a market-based approach to REDD are likely to be against the TDERM. In addition to that, the portfolio-performance approach may not be welcomed by non-Annex-I countries that are able to meet high accounting standards, as the portfolio-performance approach would effectively reduce their benefits by e. g. a factor of three.

4.3.3 REDD fund financed with proceeds from auctioning emission allowances

Implications for climate change mitigation

The proposal to use proceeds from the auctioning of international emission allowances (AAUs) for REDD funding was first proposed by Norway and the Climate Action Network International (CAN AWG-KP submission 2008; Norway AWG-LCA submission 2008). As in the case of the process of selling emission allowances in the EU Emission Trading Scheme (EU ETS), it is suggested that a fraction of AAUs could be sold or auctioned to Annex-I countries for the post-2012 commitment period. Revenues would be split between to accommodate the needs adaptation, REDD, technology transfer and possibly other. According to the Climate Action Network (CAN) (AWG-KP submission 2008), sale of 20–30 % of AAUs at a price of 30–40 US$ would raise 75–113 bn US$ a year. Norway, in its latest submission to the AWG-LCA (2008), reasons that 15–25 bn US$ could be raised annually by auctioning a small percentage of AAUs to Annex-I countries. Depending on Annex-I countries' targets (low or ambitious, see methods for details), auctioning of 10 % of AAUs at 20 US$ apiece in the period 2013–2020 would generate 208 to 250 bn US$, or 26–31 bn US$ annually. Funding is, however, not exclusively for REDD, but also for adaptation and technology transfer.

Auctioning of AAUs could provide sufficient funding for REDD (and partly also for adaptation and technology transfer). Funding would be decoupled from Annex-I reduction targets, which means that REDD funding needs could be met even with an overall Annex-I reduction target below 30 % by 2020 compared to 1990. Emission reductions from REDD would be additional to domestic emission reductions by Annex-I countries. Furthermore, there would be no danger of crowding out credits from the CDM or sectoral approaches and low carbon prices jeopardizing e. g. CCS introduction. As a result, this would increase the probability/chance of reaching stabilization at 450 ppm. Also, with REDD not being an offset mechanism, there is no danger of "hot air" (certificates that do not represent real emission reductions) in the compliance market in the case of e. g. overly "generous" RELs.

Implications for methodological issues

Funding REDD from auction revenues means there would be no fungibility with the compliance market. Consequently, requirements e. g. for accounting would not need to be as stringent as they would be in the case with market integration. This would allow more countries to participate in REDD (using different levels of participation for different levels of capacity), hence reducing the potential for international displacement/leakage of emissions from deforestation. Additionally, funding would not need to be restricted to MRV emission reductions, but would allow for a wide range of supportive actions necessary to curb deforestation in the long run, such as establishment of forest laws, institution building and political reforms (see e. g. Kanninen et al. 2007). Technically and institutionally more advanced countries participating in a fund-based carbon trading programme (comparable to the FCPF) would still effect MRV emission reductions, which would then be additional to emission reductions by Annex-I countries. Should these emission reductions not be permanent, they would not create hot air, as would be the case with a REDD market integration.

Political viability

It can be assumed that non-Annex-I countries, except those asking for full market access, are generally in favour of the "auctioning approach", as sufficient finance could be provided by Annex-I countries. The amount of support, though, will depend on the amount of money promised, the timeframe and the degree of commitment. If Annex-I countries refrain from making binding financial commitments (from AAU auction revenues) for a sufficiently long time period (e. g. until 2020 or 2030), it is unlikely that non-Annex-I countries will accept this approach.

On the other side, many Annex-I countries will be reluctant to accept the auctioning of AAUs for several reasons. Instead of gaining a low-cost mitigation option (REDD carbon market integration), they would face further costs. Annex-I countries subject to cap-and-trade systems (such as the EU countries) may pass on these costs through the EU ETS, thus loosing out on existing revenues from the auctioning of emission allowances. Annex-I countries outside of cap-and-trade systems will have to pass on these costs through taxes or adjust their public budgets through other means. Admittedly, in view of the global financial crisis, which has been and still is straining public budgets, this will become increasingly unpopular.

On the other hand, the EU Commission's proposal to allocate 5 % of EU ETS auctioning proceeds (1.9–3.1 bn US$/year) for tropical forest preservation is encouraging. If the proposal is accepted, this would send a positive signal for the "auctioning approach" at the international level. Several US climate change bills also give consideration to the possibility of financing REDD by auctioning revenues from a US cap-and-trade system. According to Movius et al. (2008), this could raise 1.8 to 4.6 bn US$ annually, starting in 2012 and going up to 2.1 to 5.4 bn US$ in 2020. If an international agreement to fund REDD fails, several regional efforts (revenues from cap-and-trade systems in the EU, the US, possibly NZ, AUS and Japan) may still provide sufficient funding for REDD. An international agreement, though, would definitely be preferable.

5 Conclusion and recommendations

5.1 Scope, accounting modalities, forest definitions and methodological issues

The scope of REDD, as well as accounting modalities, forest definitions and methodological issue will have significant impacts on overall climate change mitigation, biodiversity conservation and equity issues. There is merit in focussing on emission reductions from deforestation and forest degradation, as they present the biggest mitigation potential. Also, accounting for degradation should be obligatory. Otherwise significant amounts of emissions may be omitted. Yet, including the enhancement of carbon stocks is politically important to include countries which have stabilized their forest cover and have engaged in afforestation activities. This could also be an option for high forest, low deforestation countries, which do not expect much deforestation in the future, rather than using an artificially high projected reference emission level, which could undermine the compliance market in case REDD is designed as an offset mechanism. In the long run, REDD should be substituted or complemented by a comprehensive LULUCF agreement.

As REDD is now likely to be restricted to forest-ecosystems, it is important to monitor whether REDD will lead to increased conversion of non-forest ecosystems. In this respect, it is also important to consider the role of the country specific forest definition. Choosing e. g. a forest definition with a high crown cover could exclude many areas of dry forest. While these may not be as valuable in terms of their carbon content, they nevertheless provide other valuable ecosystem services and contribute to the biological diversity of this planet.

With regard to deforestation, gross accounting must be applied to prevent perverse incentives such as the massive afforestation efforts to reduce net deforestation (while deforestation of natural forests could continue). Additionally, exceptions from accounting such as the conversion of forests to forest plantations must not be made. Such exceptions would render REDD into a farce, undermine overall climate change mitigation (especially in case of an offset mechanism) and biodiversity conservation. Even though accounting will most likely focus on carbon alone, social and environmental safeguards should be put in place and be part of the reporting requirements.

5.2 REDD finance and transfer systems

While the real costs of REDD remain largely uncertain, it should be safe to assume that several billion US$ will be required annually to the set positive incentives necessary for significantly reducing emission from deforestation and forest degradation in developing countries. In the period 2013–2020, emission reductions from a REDD offset mechanism could be absorbed by Annex-I demand for 2020 compliance. Offsetting through REDD would however seriously undermine domestic emission reductions in Annex-I countries. In addition, carbon prices, both in the Emission Trading as well as in the EU ETS, could drop significantly and delay investment into low carbon development. Altogether, this entails the risk of dangerous climate change, as industrialized countries postpone their structural transformation towards low carbon economies. Market advocates argue that REDD should be designed as an offset mechanism, also to push Annex-I countries towards more ambitious 2020-targets. While this is theoretically possible, the Annex-I 2020-target to include REDD as an offset mechanism and avoid dangerous climate change would be around 38 %. Such a target is way beyond anything currently discussed in the negotiations. It is hence risky to push for a REDD offset mechanism knowing that such a target will most likely not be achieved. Proper regulation, including e. g. caps on emission reductions from reduced deforestation may reduce the amount of offsets and a drop in carbon prices, although it would also constrain REDD funding considerably. Caps would also be subject to negotiation by the parties, which could render them worthless in terms of regulatory effect.

Voluntary funding, apart from funding for readiness activities, is not a serious option to finance REDD. Instead, auctioning of AAUs or EAs of national and regional emission trading schemes (ETS) could provide the large amounts of finance necessary to implement REDD. Climate change legislation in both the EU and the US suggests this as a course of action, while under the UNFCCC a proposal by Norway is being addressed in the AWG-LCA. Such market-linked approaches could provide sufficient funding for REDD, while ensuring sufficient domestic emission reductions in Annex-I countries and without increasing ETS volatility. Furthermore, funds with a strong governance architecture (financed by market-linked approaches), such as the TDERM Triptych, are also much better suited to addressing both the individual needs that countries have in tackling deforestation and concerns related to biodiversity conservation and human and the rights of indigenous people. It is important to note that the use of AAU auctioning proceeds is not an attempt to refuse non-Annex-I countries access to finance from compliance market in order to reduce their benefits. On the contrary: It is an attempt to enable vast amounts of financial transfers to flow to as many non-Annex-I countries as possible in order to reduce deforestation and forest degradation in accordance with human rights (especially indigenous people's rights) and the conservation of biological diversity, and at the same time to ensure significant fossil emission reductions in Annex-I countries.

However, the global financial crisis has greatly increased public budget deficits around the world, and it must be acknowledged that this could jeopardize global and regional/national efforts to auction emission allowances. While this may speak against market-linked approaches, it does not favour market integration either. With economic growth abating in many industrialized countries, governments will be reluctant to set reduction targets that are high enough to allow for REDD to be designed as an offset mechanism, as this would put further pressure on their economies.

In consequence, it is suggested, as in the Eliasch Review (2008), that a combination be used of both a market-linked approach and a capped integration of REDD credits, the latter, though, only under certain conditions. For the period until 2012, finance for "Reform and Readiness activities", and possibly also compensation for early actions, should be provided by Official Development Assistence (ODA) and additional public funding (including e. g. proceeds from the EU ETS) through existing initiatives such as the FCPF, the UN REDD Programme Fund and other bilateral programmes. From 2012 to 2020, REDD could be financed along two tracks.

Track 1

A fraction of Annex-I targets in excess of IPCC minimum requirements for stabilization at 450 ppm is set aside to be met by REDD credits. A portion of REDD credits would thus only be allowed for Annex-I compliance, if Annex-I commitments exceed a total Annex-I emission reduction of 30 % by 2020 compared to 1990 (and non-Annex-I commits to at least 15 % by 2020 compared to BAU). Credits could either be traded freely or Annex-I countries could receive quotas for REDD credits based e. g. on their individual commitments. Non-Annex countries would be allowed to sell emission reductions from REDD for Annex-I compliance under the following conditions:

— Countries meet TIER-3 accounting standards by 2012 and assume full liability in case of non-compliance

— Countries set a sectoral target and a performance-based reference emission level, that goes beyond a historical reference emission level

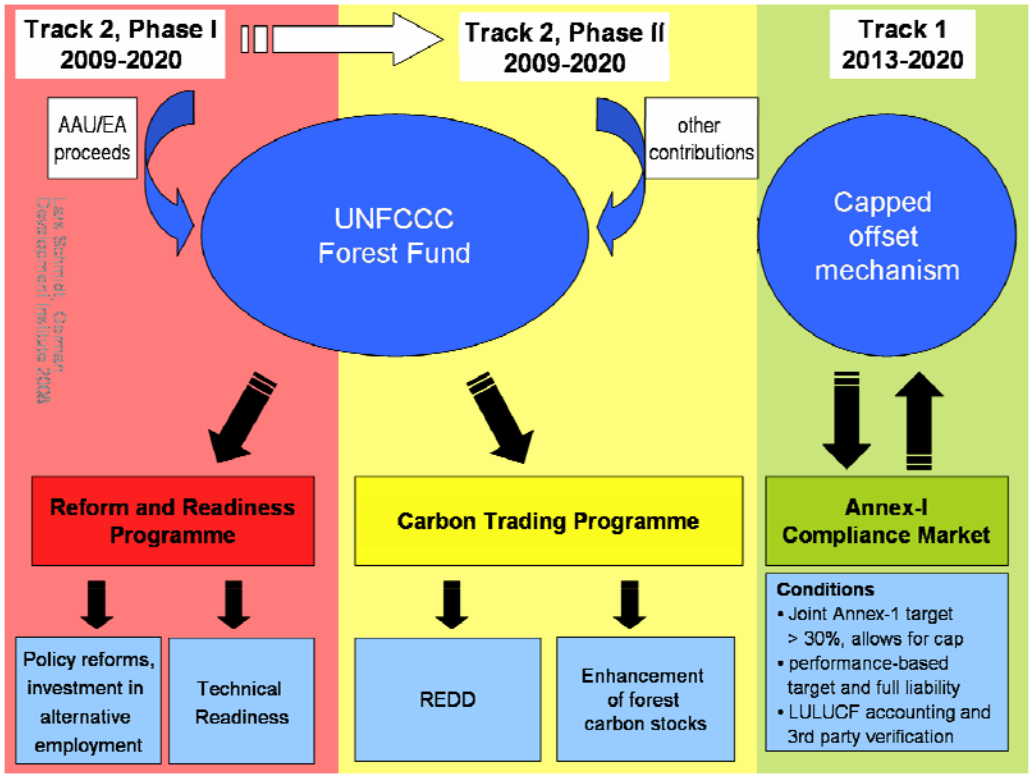
— Countries report in detail on the efforts undertaken to reduce deforestation, forest degradation or other forest-related activities (depending on the scope of REDD plus) and allow third-party verification to ensure that REDD activities do not harm human and especially indigenous people's rights and biodiversity conservation.

In case supply exceeds demand, Annex-I countries could either tighten their targets or supply in excess of the cap could be sold via Track 2.

Track 2

A global or multiple regional market-linked approaches (auctioning of AAUs / EAs) provide funding through a forest fund, such as the TDERM Triptych or the FCPF, to countries that are not yet able to meet TIER-3 accounting requirements or do not wish to participate in a REDD offset mechanism. While funding for Readiness continues where needed, most funding could either be channelled towards fund-based carbon trading (in case countries are ready) or to finance policy reforms, make investments in alternative employment and reduce the impact of business on deforestation. Environmental integrity and consideration of indigenous people's rights would be ensured through the governance structure of the fund (REDD strategy, ExComm, DNA etc.).

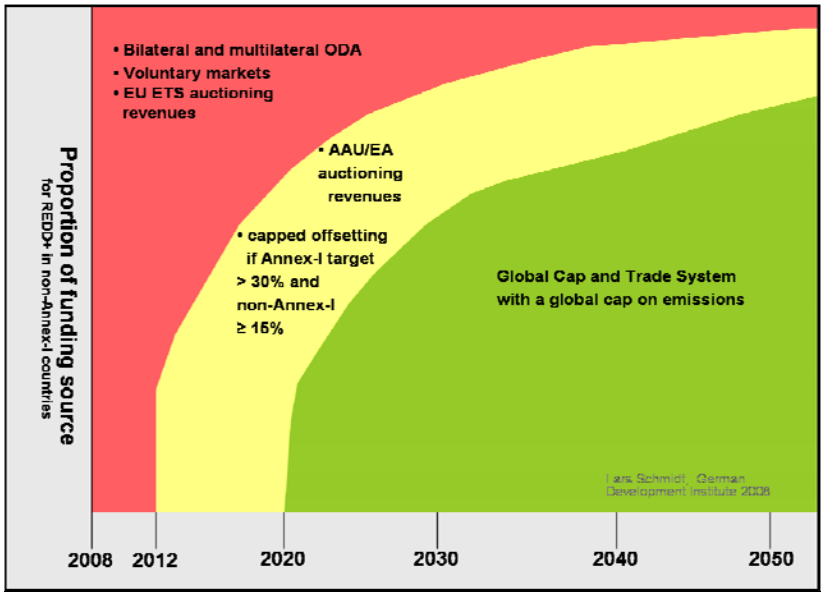
Figure 5: Potential REDD architecture for the period 2009–2020



Source: Author's design

From 2020 onwards, REDD could become part of a global cap-and-trade system, with a global cap to ensure global emissions are reduced in accordance with the target of stabilization at 450 ppm. Under such a system, which would include all parties to the UNFCCC, offsetting would no longer be a concern, as global emissions would be capped.

Figure 6: REDD funding sources outlined over time (sketch)



Source: Author's design

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