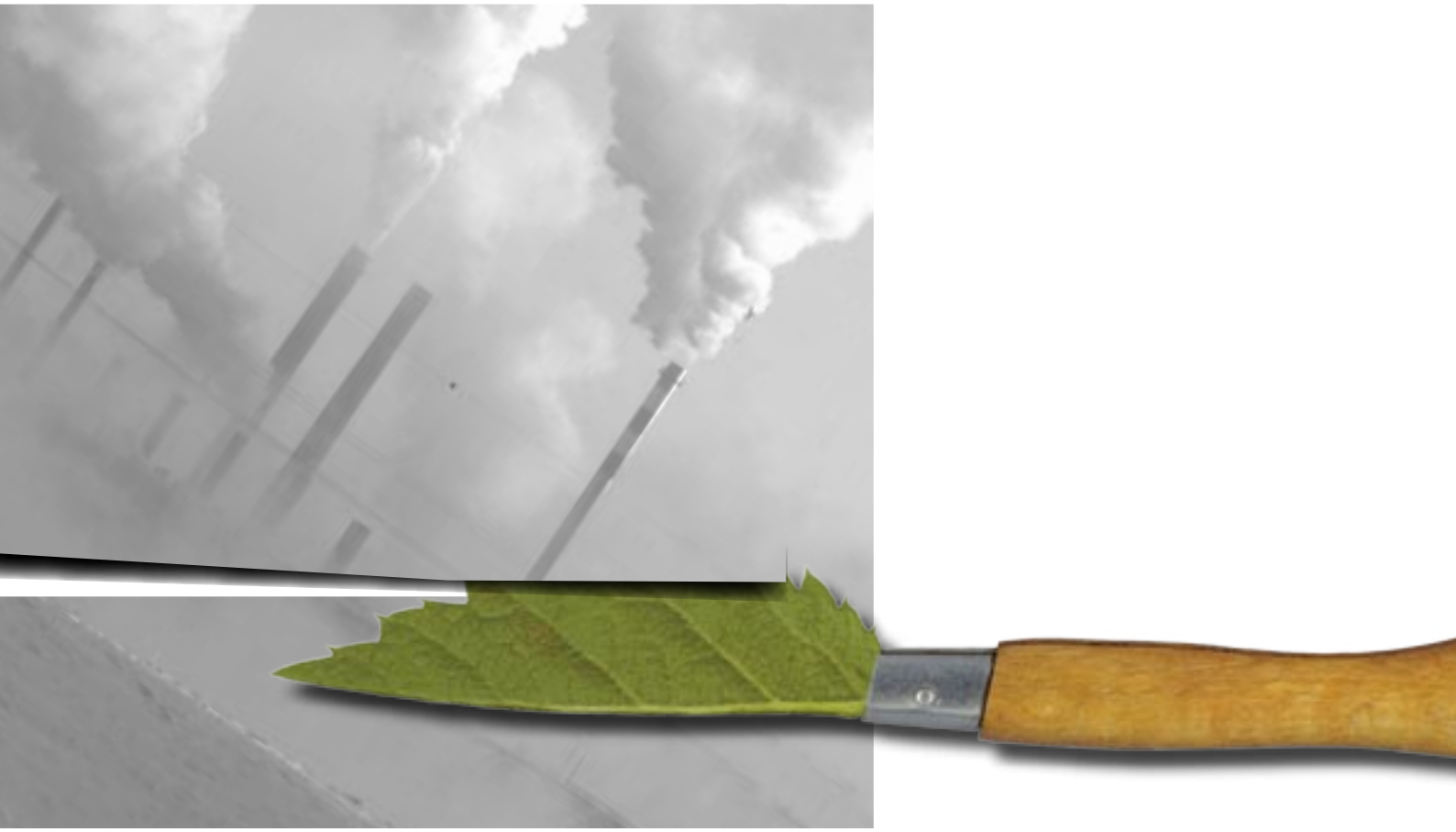


Reducing Emissions from Deforestation in Developing Countries

The way forward

gtz Climate Protection Programme

commissioned by
Federal Ministry
for Economic Cooperation
and Development

Impressum

Editor
Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH
Climate Protection Programme
in Developing Countries,
Postfach 5180
65760 Eschborn / Germany
T +49 61 96 79 – 1376
F +49 61 96 79 – 801376
I http://www.gtz.de/climate

Responsible
Reinhard Wolf

Authors
Michael Dutschke, BioCarbon Consult
Reinhard Wolf, GTZ

Design
Additiv. Visuelle Kommunikation,
Berlin

Photos
Additiv. Visuelle Kommunikation
pixelio.de

Printed by
W.B. Druckerei GmbH,
Hochheim am Mein

Eschborn, April 2007

Overview

Acknowledgements

This study, which is based on a wide range of different documents, actors and experiences, would have been impossible without the valuable inputs of a number of people. The authors therefore would like to thank Johannes Scholl (GTZ Brasil), Joerg Seifert Granzin (CIM Bolivia) and Claus Michael Falkenberg (GTZ Cameroon, COMIFAC) for providing invaluable information and insights.

We also would like to thank Bernhard Schlamadinger (Joanneum Research), Evelyne Trines (Treeness Consult), Michael Scholze and Lorenz Petersen (GTZ Germany) for their helpful comments and suggestions on earlier versions of this paper.

Michael Dutschke (BioCarbon Consult)
Reinhard Wolf (GTZ)

Foreword

Land use and land use changes are estimated to contribute around 20% to global CO_2 emissions. A large share of this number results from the destruction of tropical forests. Efforts to come up with incentives to halt this process are critical for the various functions these forests perform globally ranging from biodiversity to a healthy climate.

A proposal in 2005 of the Coalition for Rainforest Nations to address deforestation in the international climate regime was therefore welcomed by a large number of countries. Reducing emissions from deforestation in developing countries could not only address a major source of greenhouse gas emissions but would also pave the way for developing countries to actively take part in emission reduction efforts under the international climate regime.

While the idea of incentivising forest conservation under the climate regime is almost universally praised as important and substantial contribution in international climate policy, the real challenge is finding ways to implement the concept in a credible fashion. It is not only the complexity of causes of worldwide forest destruction that makes this difficult but also the methodological challenges associated with it.

The document that you are holding aims to contribute conceptually to the methodological challenge on how avoided deforestation and degradation can become measurable contributions for global efforts to save the earth's climate. Even as the obstacles are by no means trivial, real substantial emission reductions are critical. We hope this paper will help move the discussion forward towards implementable solutions.

Dr. Lorenz Petersen

Head
GTZ Climate Protection Programme in Developing Countries

Abstract

Deforestation is considered the second most important human-induced source of greenhouse gases, being responsible for approximately 20% of total emissions. In recent years, much knowledge has been gathered on drivers and causes of deforestation and forest degradation. Also methodological tools are available to monitor large areas and proxies for the quantification of carbon benefits from reduced deforestation and forest degradation (REDD). There is a common understanding that these emission sources need to be tackled in the near future. Several proposals have been brought forward that could support REDD in developing countries. This paper finds that they are complementary in many aspects.

As distinct from most industrial mitigation activities, REDD requires a coordination between different levels of governance of the implementing country. Much experience has been gathered in official development assistance (ODA), notably in the context of the Brazilian PP-G7 program, with strong support by Germany.

Once there is a long-term greenhouse gas emissions target in place, emission reduction credits from REDD could be traded freely during commitment periods, without risking environmental integrity. This would furthermore allow taking full advantage of today's ample reduction opportunities without distorting the market.

Estimates for the total potential and costs of REDD vary widely in literature. With the aim of protecting substantial quantities of the world's tropical forests, an annual transfers in the order of 10 billion USD would be needed. This would equal double the amount of all Kyoto markets until present. Finally, we put up some design and framework criteria for REDD projects.

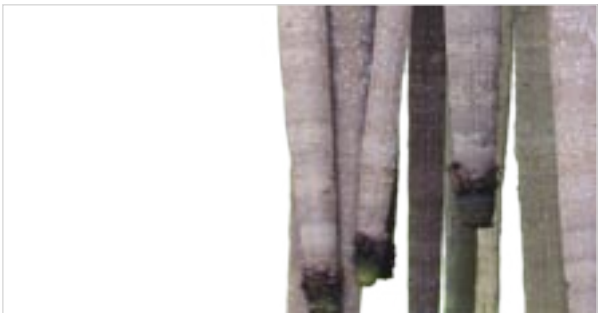
1. Introduction

Deforestation is the second single greenhouse gas source, behind energy production, being responsible for about 20 % of human GHG emissions. The carbon reservoir in the world's forests is presently higher than the one in the atmosphere (Stern 2006).

The current paper will resume the **state of the discussion around reducing emissions from deforestation and forest degradation (REDD)**. It departs from the proposals that have been submitted by developing countries and the research community during the last years.

At the 11th Meeting of the Parties to the UN Framework Convention on Climate Change (COP 11), Papua New Guinea and Costa Rica, supported by several developing countries, tabled a proposal for including emissions from avoided deforestation in any kind of compensation scheme under the UNFCCC (UNFCCC 2005). It leaves open, whether that should happen under a separate forest protocol or as a part of an overall post-2012 protocol under the Convention. It argues that time was pressing for the last natural forests, and that including deforestation avoidance would help to integrate developing countries into the efforts to reduce greenhouse gas emissions. The proposal was welcomed by most Parties. Indirectly it referred to "**compensated reductions**" (CR), as proposed by a group of Brazilian authors (Santilli, Moutinho et al. 2005). This model foresees emission reduction certificates to **help industrialized countries in fulfilling their emission targets**. Differently from the project-based CDM, implementation would take place **on the country level**. As a baseline against which reductions would be verified, the authors proposed average deforestation rates from the 1980s, 1990s, or the phase between 1995 and 2005. The country would commit to reduce these emissions below the baseline. In an earlier version of the paper, countries achieving their deforestation emission reduction targets would receive financial compensation according to the average market value of CO_2 equivalents in 2012 (Santilli, Moutinho et al. 2003). This way, ***early action*** **during the first commitment period would already be compensated for**. Conversely, if the country increased its emissions from deforestation, it would be liable to reduce the related emissions accordingly in the subsequent commitment period. In the Papua proposal, a share of the credits would not be sold, but banked, in order to compensate for potential future losses. A later research paper by the European Commission's Joint Research Centre JRC (Achard, Belward et al. 2006) assists the proposal by introducing a **methodology based on remote sensing** for a simple determination of proxies for carbon gains and losses from deforestation and forest degradation processes. It avoids the difficult political differentiation between forest and non-forest by defining three categories, intact forest, non-intact forest and non-forest. The three possible downward transitions between those three categories would be accounted for with standard carbon losses, according to ecosystem and growth region.

The 11th Conference of the Parties to the UNFCCC (COP 11) called on Parties to the Climate Convention to submit their views and invited interested Parties to a workshop on the issue held in Rome in August 2006. COP 13 by the end of 2007 is requested to decide on the treatment of REDD after 2012.



	Compensated Reductions	Papua New Guinea et al	Joint Research Center (JRC)	Brazil
Scope	Deforestation + implicitly Degradation	Deforestation	Deforestation & Degradation	Deforestation
Mechanism under Kyoto or a separate Protocol	Kyoto Protocol	Open	Not considered	separate Protocol
Reference level	Historical, "over some agreed period" (e.g. 1980s, 1990s, 1995-2005)	Historical	(Tropical) Global Conversion Rate & historical National Conversion Rate	Historical
"Growth cap" for historically low-emitting countries	Yes	Not considered	Yes	Not considered
Liability	Banking & Borrowing, insurance	Banking & Borrowing	Temporary crediting	Banking & Borrowing
Financing	Credits sold to governments or private investors	REDD as part of CDM is one option	Not considered	Voluntary fund by Annex II Parties
Price formation	Nearly unrestricted access to allowance market	Open	Not considered	Contracted fixed price per t CO_2e
Early action	Not considered	Yes	Not considered	Not considered
Monitoring	Remote sensing	Remote sensing	Remote sensing	Not considered

Table 1 Main features of the different proposals for voluntary approaches to reduced deforestation and degradation

At the UNFCCC Rome Workshop, **Brazil proposed a voluntary REDD fund**, arguing that participation of developing countries **should not create future obligations**, and that the system **should not offset Annex I commitments** for emis-

sion reduction. This fund was to compensate countries if they remained below a negotiated deforestation level. If deforestation was above this level, the country would be liable to compensate for these emissions with lower emissions during the subsequent commitment period, similar to the CR proposal. Another similarity is the **intent to reward early action** on REDD already during the first Kyoto commitment period. Also the countries of the **Congo Basin proposed a fund** that would be shared along the percentage of forests under sustainable management and certification (UNFCCC 2006).

Table 1 summarizes the main features of the REDD approaches actually under discussion. Not every proposal considers every aspect. Except for the JRC's, all approaches propose a carry-over of commitments to the subsequent commitment period, in case deforestation has increased, together with some share of obligatory credit banking (termed "Banking & Borrowing" in Table 1). Overall, the different proposals show a high degree of compatibility. What is diverging most is the framework in which the mechanism is embedded. The Brazilian proposal is opposed to any compensation of industrialized countries' commitments, which is why it suggests a separate protocol under the UNFCCC.

An important message from the Rome workshop was that **advanced remote sensing technologies** are available that – combined with appropriate ground truthing – allow for a monitoring of country commitments. Also, enough data are available to **establish a backward-looking multi-year reference level** for nearly every part of the world since the year 1990 at last.

We will first **review current knowledge** on deforestation reasons and drivers and **discuss arguments for including REDD** in a future climate regime. Such a regime requires some design features granting long-term reliability for the actors involved, in order to accommodate REDD commitments. In REDD project activities supported by ODA some experience has been gathered a future regime should build upon.

The Introduction presents differences and communalities between different approaches for accounting emission reductions from deforestation and degradation.

The proposed commitments for tropical countries involved are more or less voluntary

It is contentious whether the reductions achieved shall be tradable

Alternatively, a fund would reward emission reductions beyond the agreed level

2.
Tropical forest loss: causes and consequences

In order to **assess the chances of REDD**, it is important to understand the **background of deforestation and forest degradation**. According to the FAO 2005 Forest Assessment Report (FRA), forests cover around four billion ha or 30% of the earth's land area. Compared to the previous 5-year reporting period, net global annual forest losses decreased from 8.9 to 7.3 million ha. From a carbon perspective, it is however not admissible to account deforestation against new forestation due to the asymmetry of carbon sequestration ("slow in, fast out"). Replacing a standing forest by a forest plantation usually implies significant carbon losses. **Gross deforestation is 13 million ha, equivalent to 1.5 percent annual loss compared to the 858.842 million ha of the world's tropical forests** (ITTO 2006). Forests represent a carbon pool of 1,037 Gt CO_2e, most of all decreasing in Africa, Asia,[1] Oceania and South America, increasing in North and Central America. Deforestation is estimated to be responsible for around 20 percent of all human-induced CO_2 emissions, two thirds of this effect being attributable to the loss of tropical forests. This figure is highly uncertain, due to the following reasons: (1) There is a notorious lack in reliable forest inventories. (2) the ascertainment of deforestation depends on the diverging definitions of forests. (3) Greenhouse gas emissions from forest degradation (i.e. vegetation loss inside a standing forest) are difficult to estimate, and there is no single accepted definition of it. (4) Re-growth after deforestation (also the one below the forest definition threshold, i.e. revegetation) is a widely unknown variable and (5) N_2O and CH_4 emissions due to forest fires have not yet been quantified on a global scale, but they contribute in a significant way to the increase in greenhouse gases in the atmosphere.

Historically, most of today's industrialized nations had a period of deforestation. Over-use of forest resources may be due to a variety of malfunctions – policy, institutional and market failures. In most cases, more than one cause act towards deforestation. Frequent causes are deforestation due to agricultural extension combined with wood extraction, or infrastructure expansion. On most occasions, forests compete with agriculture, and deforestation occurs at the agricultural frontier. An important driver is infrastructure development. The latter is true for all types of land use change, whether its intention is timber extraction, grazing or cash crops. There is no such strong correlation between other single factors and deforestation (Geist and Lambin 2001; Wunder 2005).

Globally, forest losses increase the greenhouse effect. Regionally, they are expected to lead to micro-climatic changes, biodiversity losses, and changes in the water regime. As an aggravating feedback effect, climatic change itself may lead to a die-off of forests in tropical areas, which could trigger a chain reaction difficult to stop (Hadley-Centre 2000).[2] While for individuals deforestation is usually profitable, it leads to a macroeconomic welfare loss. Deforestation will decrease over time, as the

[1] The massive reforestation programs in India and China partially outweigh the forest losses in South-East Asia.

[2] For some time yet, fertilization due to higher CO_2 levels will likely outweigh the savannization effect. Depending on rainfall patterns and the availability of sunlight, both negative and positive effects of climate impacts on standing forests will not be evenly distributed.

remaining forests become less accessible. Avoiding deforestation therefore acts under time constraints; the window of opportunity is closing. **The immediate *and* long-term effects of REDD are highest if it is started as early as possible** (Dutschke 2006).

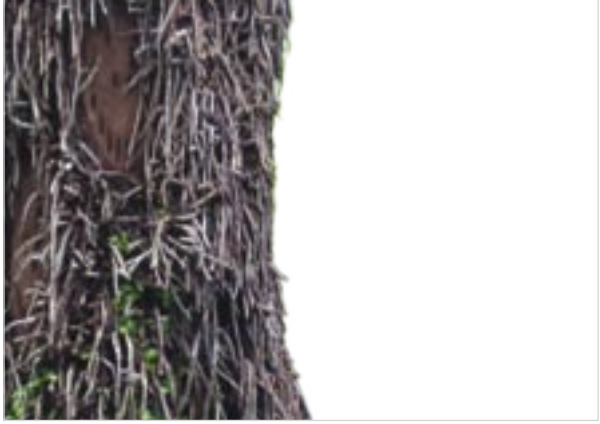
Causes and drivers of deforestation are very case-specific. In most cases, causes are interdependent, and thus allow for diverse interpretations. Nevertheless, researchers coincide that there are spatial patterns of deforestation that can be observed worldwide on the agricultural frontier and alongside roads. Depending on coverage and quantity of remote sensing data, regional deforestation hotspots can be identified globally (Lepers, Lambin et al. 2005).

Literature has distinguished between **governed and ungoverned deforestation** (Trines, Höhne et al. 2006). Nevertheless, **there are hardly any policies deliberately directed to deforestation as such**. Planned deforestation occurs with infrastructure development (e.g. road building, canals, airfields and pipelines) or where mineral resources are being explored. Direct effects of these activities are usually minimal, compared to indirect consequences. Opportunity costs for refraining from those development projects can be extremely high, besides that it would run counter the intent of the Climate Convention not to hinder economic development in tropical countries. However, large deforestation often occurs around the affected areas: Road building attract loggers that cut logging roads deep into the forests, because the road makes timber transportation cost-effective. The same occurs with pipelines, because of their service roads. Furthermore, oil spills by accident or due to illegal tapping increase the risk for adjacent forest and wildlife.

In many cases, **short-sighted land use is related to legal uncertainty**. In the Brazilian Amazon, around one third of the forests – the terras devolutas – have an uncertain ownership status, leaving them legally unprotected. Traditional land rights are often not codified, which leaves local populations defenseless against a change in the legal status of open access lands. In most of Latin America, deforestation used to be considered a proof of ownership, thus provoking the so-called "land race": land claimers compete for the area by clearing as much forest as they can. Economic rationality is a good explanation for people's behavior (Wunder 2005). In subsistence economies, cattle are often the only way to build up a capital stock, even though they contribute in many cases to forest degradation and devegetation. Due to **market imperfections, standing forests are usually under-valuated**, and benefits like their life support functions and the value of its scenic beauty do not materialize for the forest owner or tenant (Karousakis 2006).

Additionally we need to take into account **socio-cultural factors**. For instance, the culture of "clearing the wilderness" often survives regulation. Cattle ranchers sometimes enjoy a higher social status than foresters. **Slash-and-burn practices** in agriculture will in some places have been the most rational behavior for subsistence farming in the past. During the idle phases, the land had plenty of time to recover to a near-natural vegetation, and nutrients would accumulate in the soils again. As population grows, this type of agriculture is no longer adequate in most places, but **consciousness is lagging behind**. In many African cases, firewood collection is the domain of women and children, and a change in behavior will entail gender issues.

Unplanned and semi-legal or illegal deforestation and devegetation are symptoms of a **lack in governance**. Governments can be expected to take an interest in the strengthening of institutions and in streamlining administration, as these can bring about a variety of secondary benefits on all levels of governance.



Chapter 2 resumes principal causes and consequences of deforestation and degradation.

Deforestation and forest degradation are worldwide the second single important source of GHG emissions.

Only a minor share of deforestation is planned. The vast majority of deforestation and all forest degradation are side effects of non-forest policies.

For the individual agent, the over-use of forest resources follows economic rationality, sometimes sustained by traditional land use patterns. Unchecked deforestation and forest degradation are usually symptoms for a lack in governance and legal uncertainty.

3.
REDD in the future climate regime

The ultimate objective of the UNFCCC, as defined in its Article 2, is to prevent "dangerous human interference with the climate system" and to "ensure food production" by stabilizing GHG concentrations in the atmosphere. Among other things, this is to be done in a timeframe that allows ecosystems to adapt naturally to inevitable climate change already underway. Adaptation of natural systems is a process of species selection and mobility. This is best possible in large, biodiverse areas under a regime of low human intervention and which comprise different climatic zones. While forests and agriculture compete for available areas, the latter depends on the genetic pool represented by natural forests, on ecosystem services like natural pest control, the stabilization of water supply, the forests' function as windshields, and pollination, to name only a few. Besides, in many tropical countries, forests provide a regular supplement of food for local populations.

Worldwide, climate policies are providing massive incentives for the use of biomass energy. If unchecked by forest conservation, **biomass policies may lead to a negative leakage effect, because the increased demand for arable soils may foster higher GHG emissions from deforestation**, in case this development is not controlled by integrated forest conservation and management. At the same time, the above-mentioned feed-back effect in consequence of increasing temperature levels may lead to

the die-off of forest stands already debilitated by human intervention. Thus, deforestation and forest degradation make up an important part of human interference with the climate system and, at the same time, increases the forests' vulnerability against climate change. The Climate Convention pays reference to this fact on various occasions, for instance, Article 3 on Principles in its paragraph 3 declares: *"[p]olicies and measures should … be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors."* A sink (naturally) absorbs CO_2 from the atmosphere, e.g. a growing forest. **Standing forests are the most important terrestrial reservoir of CO_2**.

The mandate has not been fulfilled by the Kyoto Protocol, which limits accountable forest management to Annex I Parties (Dutschke 2006). There were several concerns that led negotiators in 2001 not to include REDD under the project-based Clean Development Mechanism (CDM) of the Kyoto Protocol. These were the leakage risk, non-permanence, baselines, monitoring and measurement uncertainties, lack of human control, and the potential scale of total emission reductions (Schlamadinger, Bird et al. in print). Today, **sector-wide national approaches are being discussed**, whereby a country as a whole commits itself to a REDD target. They address many of the concerns against project-based REDD.

Leakage is an issue common to all climate change mitigation activities, but there was the notion that it could be especially high in land use. On a project level, leakage can be estimated and deducted from emission reduction credits. On a national level, and with national monitoring in place, **leakage is automatically accounted for**. Leakage can be avoided by intensifying land use on non-forested areas, e.g. by increasing agricultural production per hectare (Chomitz 2002; 2006).

Non-permanence only becomes a problem, if a country that reduces its emissions from deforestation is not held liable for later re-emissions by increased deforestation. For afforestation and reforestation under the CDM, the solution of temporary crediting has been found, whereby the liability falls back to the Annex I investor in five-year intervals. Temporary credits could in fact be one solution for REDD. The flipside is that the market value of a temporary emission allowance can be very low, as it depends on the price expectations for the subsequent commitment period (Dutschke, Schlamadinger et al. 2005). In order to increase proceeds from the sale of carbon credits, countries could be willing to take over liability for long – but not infinite – periods. For instance, a country may remain liable for forests preserved under a REDD scheme within the timeframe of a long-term 2050 emissions target. **Deforestation has never been a long-lasting phenomenon**, but it has been occurring in consequence of specific local historical situations. In case the Climate Convention is still active in 2050, it is very likely that in the meantime all Parties have become accountable for their GHG-related activities (Dutschke 2002). Finally, REDD may **buy time for technological development**, thus forming a "wooden bridge to a clean energy future" (Lecocq and Chomitz 2001).

Baselines: The reference level of emissions against which progress is measured is always hypothetical. It was proposed by Santilli et al. (Santilli, Moutinho et al. 2005; Schwartzman 2005) to be the average deforestation in the 1990s. Alternatively, a reference level could be determined by projecting a trend from previous periods into the future, or by identifying secondary indicators (like the prices of meat, cash crops or timber) that have influenced deforestation rates in the past. A third alternative is a normative baseline that benefits countries that are already undertaking action for REDD (Achard, Belward et al. 2006). These techniques offer basis for the reference deforestation level. **National REDD targets** for tropical countries - like any other country target – **are subject to political negation**. On the one hand, they bear the risk of creating "hot

air" (i.e. rewarding inactivity). On the other hand, they offer a real chance to revert the global deforestation and forest degradation trend.

The **uncertainties** around monitoring and measurement **can be treated in a conservative manner**. It is good practice in CDM methodologies to apply a **discount** on the measured carbon benefits by taking the lower boundary of a 95% confidence interval. There are **standard values** recommended by the Intergovernmental Panel on Climate Change (IPCC) for above-ground carbon density in the different types of vegetation that can be easily applied. For large-scale monitoring on a region or country level, the use of **satellite imagery** is steadily becoming less expensive and more accurate. The Joint Research Center (JRC) of the EU (Achard, Belward et al. 2006) has proposed a **simple system** to observe and quantify land use changes between **intact and non-intact forests** and deforested areas, attaching standard values to each of the transitions. This avoids many of the uncertainties created by different forest definitions.

As compared to other human activities, forest interventions are marked by a **lower degree of human control**. Natural systems interact with the climate and hydrological systems, which makes them behave **unpredictably** to a certain degree (Schlamadinger, Bird et al. in print). This is reflected in the distinction between direct and indirectly human-induced land use changes, the so-called "factoring out". There is little chance in telling the one from the other, or both from natural variability. Therefore, **emission reductions from land-use changes should be averaged over longer periods**. In this context, the actual discussion around 10-year commitment periods could be specifically interesting for the land use sector. REDD country targets expressed in CO_2 equivalents could be bolstered by **conservative standard IPCC values** for carbon content per hectare in different forest types, with the aim to avoid unexpected losses due to climate change.

Finally, the **magnitude of potential reductions** was a concern when REDD was discussed as a compliance tool for the already determined Kyoto commitments of Annex I. In that historic moment, environmental NGOs and European negotiators perceived the risk that these targets would be nullified by the unforeseeable quantities of allowances produced under a REDD scheme. Annual deforestation in Brazil and Indonesia alone is estimated to be equivalent to four fifths of the total Annex I reduction targets under the Kyoto Protocol (Skutsch, Bird et al. 2006). The **situation for post-2012 agreements is different**, as future commitments have not yet been fixed. **The potential magnitude of REDD credits should rather be a hope than a concern** (Chomitz 2006). The influx of REDD credits will allow to reach ambitious reductions with less costs. Combining **an ambitious long-term target** with shorter, Kyoto-type commitment periods **can create a robust balance between demand for and offer of emission reduction certificates**. Emissions from deforestation are in the same order of magnitude as all GHG emissions from the United States. Nobody concerned about climate stability would prefer the US not to adopt binding commitments, just because this might disrupt the market. **Market stability is a weak argument against the inclusion of REDD**.

Chapter 3 argues for accounting emission reductions from avoided deforestation.

Incentives for the use of **biomass energy** need to be paired by efforts to preserve forests, in order to avoid negative leakage from deforestation

Many methodological problems known from REDD project activities find their solution with a sector-wide REDD agreement

Leakage is widely considered, if all forests of a particular country are monitored.

Permanence of carbon stocks in forests preserved under a REDD scheme is a question of liability. Implementing countries' long-term liability in the context of a long-term GHG stabilization goal is preferable.

The **baseline** issue is different between project and country levels. Different approaches for determining a reference deforestation level have been proposed. For a country commitment (voluntary or not), these are good starting points, provided that sufficient forest inventory capacity is available.

Monitoring and measurement uncertainties can be minimized by the use of rapidly developing remote sensing technologies combined with advanced statistical tools.

Land use, compared to industrial activities, features a **lower degree of human control**. Emission reductions could therefore best be averaged over longer periods.

The **magnitude of potential reductions should a hope, rather than a concern**. A long-term stabilization goal will create enough demand for REDD credits.

4. Setting targets and linking sectors

The Rome 2006 UNFCCC workshop on reducing emissions from deforestation in developing countries focused on methodological issues, while avoiding political questions. Nevertheless, some criteria were formulated for policies that reduced deforestation: These should

1.
not be policy-descriptive at the national level

2.
not weaken incentives for emission reductions in other sectors

3.
be flexible enough to adapt to national circumstances

4.
reward early action[3]

At the same time, these instruments shall reward real, additional and measurable emission reductions in developing country land use and contribute to the achievement of the ultimate objective of the UNFCCC. It is acknowledged by the Parties that **REDD implies opportunity**

[3] Chairman's summary, non-paper distributed after the workshop

costs for the implementing countries, even though these may vary according to national circumstances and actors. Given the magnitude of emissions related to deforestation, **a meaningful reduction will require considerable financial North-South transfers**. In order to be politically acceptable in times of widespread budget deficits among industrialized countries, **these transfers need to be allocated in a cost-efficient manner**.

An international policy solution that takes account of all these criteria and premises and finding an agreement will necessarily require an **optimization process**.

Before COP 3 at Kyoto, Brazil had proposed a "Clean Development Fund". This fund was to finance mitigation activities in developing countries. It would have to be filled up by contributions of countries according to their historical contribution to the current levels of atmospheric GHGs. As a side effect, this proposal caused scientific discussions on decay periods of different GHGs to determine the relative responsibility of each nation. Eventually, the proposal gave rise to what became the CDM. The old "Brazilian Proposal" completely fulfilled the criterion of not offsetting Annex I reduction obligations. With the Brazilian REDD fund proposal, the principle of historic responsibility may see a renaissance. Scientific questions arising from such an approach would become even more complex, as it would have to consider re-growth occurred in the meantime and could end up in a **backward-looking full carbon accounting**.

As pointed out in section 1, **the proposals presented on REDD can be seen as complementary in many ways**. The main difference is that the proponents of the REDD fund are not (yet) willing to accept a marketing of credits. From a macro-economic perspective, the difference may not be as important as it seems: Given that a worldwide limited amount of money is available for climate change mitigation and assuming that the efficiency level of both instruments to be comparable, filling up a REDD fund theoretically costs as much money as buying emission credits for compliance. **Timing is more important**, because the money will have to be spent before the mitigation effect can be verified. The next sections will therefore focus on timing and funding efficiency.

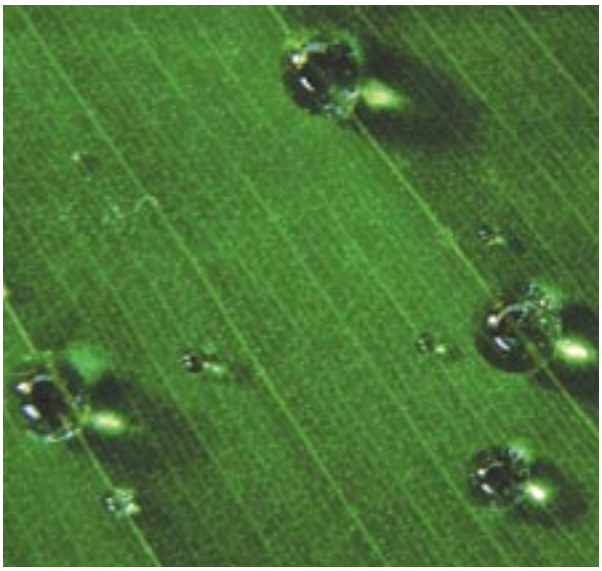
4.1. Target setting

Forest management decisions are long-term, as trees need time to grow and to re-grow. An additional factor is the virtual non-permanence of carbon stocks in vegetation. Long-term continuity is a prerequisite for any functioning market in GHG credits, but **liability questions in forestry make a long-term climate target even more pertinent**. This is completely in line with the stabilization goal formulated in the UNFCCC's ultimate objective.

A post-2012 system suited for REDD would **combine a long-term emissions target with shorter** (e.g. 5-year or 10-year) **commitment periods**. Not only for the sake of forests; carbon market balance, investment security and ultimately the atmosphere would all benefit from a long-term binding worldwide GHG emissions cap.

4.2. Market-based approaches

At Kyoto, country targets were negotiated based upon historic emissions – the grandfathering principle. **Grandfathering is as much opposed to equity as to efficiency**. It creates a virtually unlimited number of assets for free and consequently the perverse incentive for each country Party to overstate its own future emission necessities, instead of obeying to the "common but differentiated



responsibilities" for the stabilization of greenhouse gas concentrations in the atmosphere. A symptom of imbalanced distribution is the emergence of windfall profits. Additionally, under Kyoto, there is uncertainty for the market participants, what – if at all – will be the supply after 2012.

A market based approach requires scarcity – a finite supply of goods and services, and a temporal reference. Long-term climate policy will require a massive North-South transfer of funds. UNFCCC Executive Secretary Yvo de Boer estimates that **the 60 – 80% cut in GHG emissions by 2050** required to stabilize temperature at a level of approximately 2 degree Celsius **will have to lead to a necessary North-South transfer of 100 billion USD** of green investment per year (UNFCCC 2006). For industrialized country policymakers, this is an "inconvenient truth" (like Al Gore puts it), because in the end it will cost consumers' money without immediate and noticeable benefits. During the next decades however, it will avoid social costs that are orders of magnitudes higher (Stern 2006).

The actual dual system between Annex I and non-Annex I countries offers no one-size-fits-all solution to the complex necessities of climate change mitigation and adaptation.

There will necessarily be different degrees of commitment to GHG emission reduction. We therefore depart from a multi-stage model for a post-2012 regime (Höhne, Phylipsen et al. 2005).

It was proposed that countries taking over an REDD commitment might choose to temporarily limit the liability for the REDD credits produced on their territory, making them comparable to temporary CERs (Certified Emission Reductions), known for afforestation and reforestation projects under the CDM (Achard, Belward et al. 2006). According to first experiences, temporary CERs seem too complex for the market. Most of all, **temporary crediting for REDD will not bring about increased participation in the climate regime for developing country parties**.

Poorer countries will lack capacities and institutional strength to implement REDD. Bilateral "bubbles" or **forest partnerships between Annex I and developing countries** can liberate the necessary upfront North-South financing for REDD. **The Annex I Party in question would assist the tropical country partner in the fulfillment of its (voluntary) REDD target**. The participating industrial country could engage in creating an enabling institutional environment in the tropical partner country. In exchange, it could negotiate favorable conditions for REDD credit futures. Forest partnerships would evolve between countries that have a tradition in bilateral cooperation, and where enough mutual trust has been built up over the years. Because of the risk involved, no limitation would apply for the Annex I Party on using credits from forestry for compliance.

For emerging economies, voluntary REDD targets could be a testing ground for an economy-wide GHG (voluntary) reduction commitment. They could grant long-term liability and even withhold credits for risk mitigation for the country's own future compliance.

Any of these options would require **transitions between the current and a future climate regime**. For example, assuming a land use sectoral cap, CDM project activities shall not be double-counted, just because these are not de-

forested during their crediting period. They would either be excluded from monitoring or their carbon proceeds "nationalized", so that their owners would be compensated under a domestic environmental service scheme.

4.3. Linking REDD to other sector-targets

As the human influence on forests is limited and unforeseeable climate events have the potential to exert considerable influence in terrestrial carbon stocks, the magnitude of reductions is difficult to estimate. Some observers fear that increased credit supply from REDD would lead to higher-cost industrial, transport or household mitigation options to be deferred into the future. Contrarily, were the supply of REDD credits lower then expected, committed country Parties would menace to fall short in meeting their targets, and allowance prices would sour. It has been proposed therefore to set up a separate protocol under the Convention for the protection of carbon pools in vegetation (Graßl, Kokott et al. 2003; Freibauer, Höhne et al. submitted). There are two reasons that justify scepticism against the separate-protocol solution. (1) Considering the destiny of the United Nation Forum on Forests (UNFF) and the negotiation time needed for Kyoto, much deforestation would occur before such an accord became effective, and (2) As industrialized countries have little or no deforestation, and trading would only be allowed inside the forest sector, there would be no demand for REDD credits. We will therefore refrain from further discussing a separate land use protocol in this paper.

Besides a full integration in the carbon markets, **REDD credits need to be transferable toward future commitment periods** (i.e. "banking"). This is for two reasons: (1) A certain amount of banking is needed to insure against unforeseeable forest losses, and (2) **Today's deforestation reduction opportunities will not come again, once they are foregone**. Therefore, **early reductions achieved during the first commitment period should be accountable towards compliance in future commitment periods**.

Chapter 4 discusses the design of a future climate regime that is able to accommodate REDD.

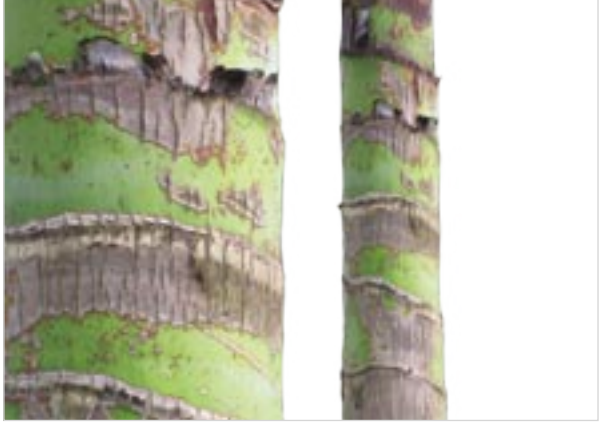
More than in other sectors, decision makers in the forest sector need information on future credit demand

A long-term future target is most adequate for REDD engagement

Forest partnerships between Annex I and tropical country Parties can secure liability for reductions achieved

Industrial country Parties involved in forest partnerships could be rewarded by unlimited accounting towards their respective commitment.

Banking REDD credits will help grasp today's REDD opportunities that will under business-as-usual not be around for a long time



5.
Development assistance and avoided deforestation

Mitigating the climatic effects of deforestation has not been in the focus of development cooperation. Nevertheless, in this section, we will review some examples of cooperation projects in tropical countries targeting deforestation. We cite a forest protection project in Bolivia, a large-scale example from Brazil, and a supra-national policy initiative in the Congo Basin.

5.1.
The Noel Kempff Climate Action Project

The Bolivian **Noel Kempff Climate Action Project** (NK-CAP) is an ongoing project activity that started in 1997 under the auspices of the so-called "Activities Implemented Jointly", a pilot for the CDM, which did not generate credits to be accounted towards binding Annex I commitments. NK-CAP's aim is to reduce deforestation. Projects under this regulation were developed to gain experience in baseline determination and monitoring. Deforestation is reduced by a) **stopping legal logging** by indemnifying logging concessions, and b) **increasing the protected area** and creating employment opportunities in forest management, thereby **reducing slash-and-burn degradation** practiced in small-scale agriculture. In spite of not being an eligible activity under the CDM, the project's methodology has over the years been adapted to comply with methodological requirements of the CDM.

The emission reductions are being **verified by the certification enterprise SGS**. For baseline determination, project developers use **GEOMOD**, a spatial explicit dynamic model that predicts the size and area distribution of deforestation, based on **variables for relevant drivers**, like proximity of roads, rivers or urbanizations and edges of natural forests. Between 1997 and 2005, **a total of 1 million tons of CO_2 equivalent reductions were verified**. There is a wider, non-contingent observation area around the project that eventually allows a recalibration of the baseline.[4] Over its 30-year lifetime, the project is expected to result in 5.8 megatons of CO_2 equivalents reduced net of baseline regrowth and leakage (activity shift and a decrease in carbon stocks in long-lived harvested wood products). **Half of the certified offsets belong to the Bolivian Government**. Total costs are expected to arise to 10.85 million USD, equivalent to a price of 1.87 USD per CO_2 equivalent. Considering profit sharing with the Bolivian government, the **CO_2 price is below 4 USD per ton**. The project costs are shared among the Bolivian Government and the private investors American Electric Power Company (AEP), BP of America and Pacific Corp.

5.2.
PP-G7 and ARPA – a framework for action

Planned in the late 1980s, launched at the Rio Conference on Environment and Development in 1992, and started in 1995, the ***Pilot Program to Conserve the Brazilian Rain Forest*** (**PP-G7**) has been **implemented jointly by Brazil and seven donor countries**. Its objectives are

[4] Personal communication Jörg Seifert-Granzin, Nov. 3, 2006

described by the World Bank (Millikan, Leitmann et al. 2002) as follows:

1.
Experimenting with and demonstrating ways of protecting Brazil's rain forests and using them in a sustainable fashion

2.
Protecting and conserving rain forest natural resources

3.
Strengthening civil society and public institutions involved in environmental protection of Brazil's rain forests

4.
Supporting scientific research and disseminating findings to conserve Brazil's rain forests

Since 1995, PP-G7 has spent 428 Million USD, 360 Million USD of this amount was contributed by Germany, divided into several sub-programs. Among those, indigenous lands have been demarcated and registered. Cooperations between forest communities on the one side and major national cosmetic companies, logging companies and soft drink producers on the other have been established. 200 participatory community projects for biodiversity conservation were implemented, institutions were empowered. Under the Amazonian Working Group (GTA), a **social network** has been created, today **linking more than 700 non-governmental organizations**. The following enumeration includes the most significant projects that have been implemented within or in the context of PP-G7.

Since its coming into existence in 1994, the ***Indigenous Lands Project (PPTAL)*** has demarcated and registered 45.4 million ha of indigenous land, an area larger than Germany, Switzerland and the Netherlands combined. It has identified 9.5 million ha of new areas of indigenous reserves. Indigenous reserves are uniquely administered by FUNAI, the National Indian's Foundation. PPTAL is strongly orientated towards a participatory approach, thus strengthening the indigenous communities' autonomy and modernizing FUNAI's activities. There is an **indirect effect on deforestation reduction**, because forests inside indigenous reserve areas have over long periods proven to be better protected then other Amazon forests. This effect may be due to the cultural context, it can however not be taken as granted.

The ***Extractive Reserves Program (RESEX)*** responded to an older claim of the Brazilian national federation of rubber tappers. It created four prototype reserves for the use of non-wood forest products and appropriate forest management. In doing so, the participative reserve management resorts to traditional local knowledge. One objective is to offer alternative income sources, in order to prevent the local populations from migrating into the large urban areas, in which case the forests would be left unprotected. During the years of implementation, forest population has even increased. Sub-objectives are (1) the legal implementation of the reserve areas, (2) strengthening of organizational structures among the forest users, (3) the improvement of productive activities, and (4) the establishment of environmental management and development plans.

The ***Project for Mobilization and Training for the Prevention of Forest Fires in the Amazon (PROTEGER)*** promotes the sustainable use of fire in small-scale agriculture, while raising public awareness for the risks attached to uncontrolled forest fires. Besides forest destruction, fires spreading to neighboring cultivations have been causing extreme economic losses for small farmers. For both rural and urban populations, respiratory health problems result from wildfires. Training in controlled use of fire directly involved 12,000 community leaders. In an internal review, PROTEGER was evaluated a successful grassroots program initiated by NGOs and jointly managed with government agencies.

The ***Ecological Corridors Project*** with an initial budget of 5 million USD has introduced large-scale land planning by interconnecting fragmented forests. Five corridors were installed within the Amazon, and two along the Central Atlantic Coast forest. The ecological corridors lead to a decentralization of environmental protection, increased stakeholder involvement, and biodiversity benefits. Last, but not least, ecological corridors enable a better adaptation of protected areas to the consequences of unavoidable climate change,

The ***Natural Resources Policy Project (NRPP)*** follows a participatory approach to environmental management, including – among others – environmental monitoring, licensing and enforcement, ecological-economic zoning and educational activities. The largest land owners now need a license to put their land under productive use. They need to determine once and forever legal reserves (under permanent forest use), areas of permanent protection, and degraded areas that need to be recovered. Most of the measures like licensing and zoning are not new, but they were usually not enforced and implemented. Also the process was streamlined. Enforcement is backed up by remote sensing and has been **extremely successful in the federal state of Mato Grosso**, where in the years 2000/2001 an annual 319,393 ha were spared from deforestation, **compared to the 1998/1999 baseline**. In these base years, Mato Grosso alone had accounted for 40% of all Amazonian deforestation. Considering the different vegetation types, 156 million tons of CO_2e (36 Mt C) from deforestation were reduced annually, which is about half of Brazil's emissions from fossil fuels. The program costs between 1999 and 2002 were 6 Million USD per year, 5 of which were covered by PP-G7 (Fearnside and Barbosa 2003). From a back-of-the-envelope calculation, we may find that each ton of CO_2 emission reduction cost below 0.20 USD per year. Salaries, buildings and infrastructure provided by the State Environment Foundation FEMA are not included in this budget. Another study using multivariant analysis confirms that the project's success cannot be attributed to a decrease in soy demand only (Chomitz and Wertz-Kanounnikoff 2005). Nevertheless, with the rapid land use changes going on in Mato Grosso in recent years, **no reliable reference deforestation level** can be determined from a two-year base period. Overall, the success has been very encouraging, as Mato Grosso was historically among the federal states with least public concern about deforestation. Therefore, the federal Ministry of the Environment has decided to scale up the experience to the entire Legal Amazon.

Finally, the ***Science and Technology support program*** has improved conditions for work and dissemination for the National Institute for Amazonian Research (INPA) in Manaus and the Emílio Goeldi Museum of Pará (MPEG) in Belém. Until 2002, 23 dedicated research projects were funded, involving 26 regional institutions, 17 national agencies based in other parts of Brazil, and nine international institutions. Amazon institutions have been in the forefront of the international debate around deforestation and how to reduce it, including the occurrence of fires, which suggests that funding under the program has reaped some effects.

5.2.1. The Amazonian Protected Areas Project ARPA

The ***Amazonian Protected Areas Project (ARPA)*** is executed outside the PP-G7 framework, but it builds upon its experiences. Started in 2000 with the aim to create and consolidate areas for conservation and sustainable use, covering 50 million ha or 10% of the land area of the Legal Amazon until the year 2013, it has already achieved several targets before the end of its first implementation phase. There is increasing evidence that the expansion of the national protected area system (SNUC), fuelled by ARPA, contributed to the over 50% drop of deforestation between 2004 and 2006 in Brazil. Financed jointly by the Brazilian Federal Government, GEF, WWF Brazil and

KfW development bank, commissioned by Germany, it is operated by the NGO FUNBIO under the coordination of the Ministry of Environment and the participation of civil society, federal and state environmental agencies. The program receives technical assistance from Germany by GTZ. Due to increased fundraising efforts, several major Brazilian companies with concern for the environment have made individual contributions of up to 500.000 USD. One of ARPAs key instruments is an endowment fund to sustainably finance protected areas in the long-term. Donors can monitor the use of their funds in real-time through the internet. Implementing agencies have reliable and flexible access to these funds on the ground. With its outstanding transparency and flexibility, ARPA is not only prepared to efficiently receive and administer future carbon receipts for protected areas. Its institutional setup can also serve as a model for national financing mechanisms to implement REDD in a broader context.

The above examples are **typical ODA sector programs**. They address the underlying drivers of deforestation in a synergetic manner by combining legal and institutional instruments, as well as incentive structures destined for REDD on state and private lands. They are clearly orientated towards the grassroots level and social empowerment of the actors. All this makes them complex and sometimes burdensome to manage. **The PP-G7 has been criticized for not achieving its goal of reducing deforestation**. Nevertheless, as the proper name states, the program is only implemented in pilot areas, and it is an ongoing effort, with new elements starting up every now and then. Compared to a climate change mitigation project activity, it definitely lacks carbon methodology. As its elements are inter-related, a scaffolding baseline and monitoring concept would be needed for every single activity. Therefore, **success in relation to emissions reduced cannot be measured, but only argued**. There is a high likelihood that the combination of increased institutional capacities, better forest conservation enforcement, raised environmental awareness among the population, increased productivity among smallholders and financial incentives for sustainable forestry among other things, will lead to lower deforestation pressure in the pilot areas. Due to its patchy regional implementation, its effects will hardly be measurable over the whole Brazilian Amazon. There was **no baseline scenario determined before the program's start** that would allow verification whether it has really been effective in reaching its goal on this regional level, and there is **no systematic monitoring of appropriate indicators**. Still a variety of disincentives exists. Subsidies in meat and soy bean production since the coming into existence of PP-G7 are dwarfing the amount invested into sustainable forest use and conservation. PP-G7 demonstrates the high coherence between REDD and "traditional" ODA values, like poverty alleviation, given that the primary aim is the reduction of deforestation and forest degradation. On the other hand, a prioritization of infrastructure, energy supply or productivity in the agrarian sector has the potential to increase deforestation pressure. These issues were not addressed by PP-G7. **Hence, program integration cannot be broad enough to cover all relevant policies**.

5.3. The Forest Commission of Central Africa

The **COMIFAC** (Commission Forestière de l'Afrique Centrale) is an initiative of ten Central African **Congo Basin** countries, with support by international donors, including WWF, IUCN, FAO, The World Bank, the European Commission, and Germany (Ministry for Economic Cooperation and Development, BMZ). Its lines of action are (1) Harmonization of forest and fiscal policies, (2) Resource inventory, (3) Ecosystem management and reforestation, (4) Biodiversity conservation, (5) Valorization of forest resources, (6) Employment alternatives and poverty reduction, (7) Capacity building, (8)

Research and development, (9) Development of financing mechanisms, and (10) Regional cooperation and partnerships (COMIFAC 2004). There is a first CDM pilot project supported by the French government with five subcomponents: industrial afforestation, community-based afforestation, forest regeneration, use of wood residues for bioenergy production, and improved forest management guidelines. Actually, the program is in its beginnings, and it starts from a very low level. Governance is weak over the whole region. There are indications that the actual deforestation rate is very low (0.19% p.a.). Forests are in state property. Among these, 10.2% are under legal protection, 76% may be managed under restrictions, and 14% are completely unprotected. Due to the lack of reliable data, these numbers need to be interpreted cautiously.[5] The amount of **degradation is an unknown factor, but it is assumed to be relevant**. The civil wars in the zone have led to a decrease of activities in the land use sector. **Under peace conditions, the agricultural frontier will most likely be pushed forth**, putting a new threat to the forests. **This scenario will have to be considered when determining the deforestation reference level**. For potential deforestation avoidance projects, a baseline cannot be determined by past deforestation trends only; it will need to model proximate causes and drivers for the **prediction of future trends**. The precondition for any sector-based activities is a reliable inventory and a drastic improvement in forest law enforcement and governance. COMIFAC is thus only an appropriate first step towards efficient protection.

5.4. Lessons learned from pilot activities

From the activities presented, some preliminary lessons can be deduced. More than any other mitigation activities, **REDD depends on the political and institutional framework conditions**. Capacity building for project participants and on all levels of governance is needed. The **Noel Kempff Climate Action Project represents the first generation of REDD**. While benefiting from the extension of a national park, there was no fundamental change involved in the legal and political framework. Therefore, a trend-based project baseline is feasible. There is an inevitable part of activity shift from the protected to unprotected land that could be deducted from the project's carbon receipts as leakage.

The PP-G7 program is on a much more advanced stage. In the Brazilian Amazon, reliable forest inventories are in place, fire and deforestation monitoring is based on time-near remote sensing. PP-G7 includes diverse policies and measures in selected regions that take an integrated approach to sustainable management of forest resources. A baseline in the classical sense cannot be determined, because the regulatory environment is changing. Also leakage from activity shifting is difficult to postulate. The activities in the program's framework are regionally overlapping, even though they do not cover the Amazon as a whole. Still, many drivers of deforestation remain active, even within the target areas, most of all in consequence of policies outside the land-use sector. With the associated ARPA program, Brazil already disposes of a transparent and flexible financing mechanism that could serve as a model for channelling future carbon revenues.

The Forest Commission of Central Africa, **COMIFAC**, on the other hand, **is a supra-national endeavor to integrate policies and measures** to make sure that the forest resource remains intact. First of all, it needs to depart from reliable forest inventories. Independent third-party monitoring will increase the credibility of actions taken. Determining a deforestation reference level is an indicative modeling exercise, based upon factors that potentially increase the pressure on the existing forestlands, but they need to be considered no more than proxies helping to defend a politically negotiated deforestation reference level. National REDD targets create an integrated policy incentive to protect forest resources. Should COMIFAC become effective, it may in future constitute an example for nature resource management that even avoids international leakage.

[5] Personal communication by Claus-Michael Falkenberg, GTZ, Aug. 14,. 2006 and Nov. 18, 2006

In this section, three example for REDD are reviewed.

The Bolivian case is a project-level example eventually being complemented by consistent governance

The Amazon G7 Pilot Program is an intermediate example for an "integrated approach"

The Congo Basin Initiative tries to initiate a supra-national regional REDD process

Due to different regional coverage and advancement of the efforts described, no judgment can be ventured at this time, which approach is most promising.

Lessons learned include

- **There is no effective REDD, if not complemented by policies on different governance levels**
- **Capacity building is crucial for success**
- **For higher aggregation levels, a politically negotiated cap becomes increasingly important, and concerns like activity leakage can be neglected**

6. Sources of finance for REDD in developing countries

Tropical forests deliver significant benefits for local and regional development, potentially including adaptation to inevitable climate change for the local population. At the same time, preserving standing carbon and biodiversity pools represents an **international public good**. Contrarily to afforestation and reforestation, successfully halting deforestation will reduce large amounts of emission in a short timeframe. Issuance of emission reduction certificates will only be done in the true-up period after the end of each commitment period. Therefore important **upfront investment** is needed to implement the necessary activities.

There are "**traditional**" **sources of bilateral and multilateral finance**, like development assistance and GEF, but these **are by far insufficient to tackle the enormous task ahead**. As soon as the Kyoto Protocol Adaptation Fund (filled with a share of the proceeds from CDM projects) and the Special Climate Fund become operational, these could contribute a small part of the finance needed for poorer countries. Nevertheless, GEF as these funds' manager will have to weigh between multiple interests. Stabilizing forests may in some cases not be considered as efficient on the short run as demonstration projects like dams or water reservoirs. A **dedicated forest fund** has been proposed, yet the question is where the money could stem from. **First experiences with voluntary funds show that no significant amounts can be expected from these.**

2010 CO_2 Price + annual increase	Carbon Price ($/t CO_2)		Averted deforestation (Mha)		Carbon Benefits gained (Mt CO_2)	
	2.050	2.100	2.050	2.100	2.050	2.100
$1.36 + 5%	10	110	122	499	2.191	10.120
$2.73 + 5%	19	220	219	649	4.035	13.319
$5.45 + 3%	9	39	160	478	2.917	9.422
$5.45 + 3%	18	78	288	684	5.363	13.905
$27.27 + 0%	27	27	454	810	9.181	16.834
$20.45 + $5	75	75	501	959	10.261	20.396

Table 2: Deforestation avoided under different price scenarios (Source: Sathaye, Makundi et al. 2005 originally cited C values converted to CO_2)

6.1. How much does REDD cost?

How much carbon in forests can be kept out of the atmosphere depends on the price level. Table 2 summarizes a model run starting in year 2010 for different price scenarios.

Costs are extremely region-specific, most of all because of land opportunity costs, i.e. the income foregone from alternative land use. Many of the estimates in literature are given as a one-off payment, which does not reflect the cost and the necessary incentive structure for the landowner. Annual payments have higher chances for success, because deforestation and forest degradation incentives act on a long-term timescale. One study indicates that an annual transfer of 10 billion USD would save as much as 70 to 80 percent of Latin America's forests (López 1996). In a meta-analysis, the recently released Stern Report (Stern 2006) differentiates between opportunity costs, administration and enforcement costs and the costs of managing the transition. International estimates are available for opportunity costs only. Worldwide opportunity costs alone for forest preservation are estimated in the range of 5 to 10 billion USD annually. Similarly, the "$5.45 + 3%" scenario from the above table is equivalent to a total annual payment of 10 billion USD in emissions reduced in 2010 prices. From the literature reviewed we resume that **10 billion USD is the minimum annual amount able to save a substantial part of the world's tropical forests**. A transfer of 10 billion USD is 0.02% of 2005 world GDP and 13% of total ODA. Due to the socio-economic benefits for the tropics, the macro-economic cost would likely be lower. Just for illustration: (1) An annual transfer of 10 billion could be refinanced by a tax of 39 cent per barrel of oil. (2) The amount could as well be financed out of a modest cut in the budgets spent on distorting energy subsidies of around 250 billion USD annually worldwide (Stern 2006).

6.2.
Who pays, if not the polluter?

The most straightforward, yet unrealistic, solution would be the application of the **polluter-pays principle on the problem of deforestation**. Obviously, had countries and individuals to pay for deforestation and forest degradation on their territories in the context of an emissions target, they would only buy emission allowance for the share for which opportunity costs of REDD are higher then the GHG allowance prices.[6] The principle of "common but differentiated responsibilities" laid down in the UNFCCC leads us to a more complex solution involving international transfers.

How shall Annex I Parties honor their responsibility towards the forest resources of developing countries by providing the necessary funds? One solution would be to levy a **border tax on wood and wood products**. This would however be incompatible with the goal of increased carbon storage in wood products and the increased use of bioenergy. It would furthermore be felt as a tariff barrier benefiting northern producers.

A **tax on Kyoto Mechanisms** would be another option. This is actually being applied on the CDM, thereby putting CDM projects at a disadvantage against the compliance mechanisms exclusive to Annex-I. It would thus be justifiable to levy a share of proceeds from the other two mechanisms, namely Joint Implementation and International Emissions Trading, to forest preservation and management. Yet, the actual volume of the total carbon market since 2000 up to the present is 10 billion USD, half of it from CDM transactions (Capoor and Ambrosi 2006). Even assuming a steep increase in trading over the coming years, **any share of proceeds from the Kyoto market would never suffice for the imminent REDD needs**.

[6] Of course, this purely rational behavior is likely only if we assume perfect foresight and market transparency.

More income could be expected from a sector for financial participation that has been spared from targets during the first commitment period. **International air and maritime transport** has shown a steep emissions increase in the last years. An international agreement on "bunker fuels" is pertinent anyway. As transport companies are free to buy their fuels outside the Annex I countries, an inclusion under their targets will not be effective. The overall quantity of bunker fuel emissions for 2002 was estimated between 409 Mt CO_2e (UNFCCC 2005) and 817 Mt CO_2e (Wit, Kampman et al. 2004). Assuming airlines and marine shipping companies had to pay a 15 USD tax per ton of CO_2 emitted (i.e. no baseline allocation) the **total receipt would be between 6 and 12 billion USD per year**. In the tax case, we will need to deduct a share of transaction costs for the Parties. This receipt could also be realized through an international auction of emission permits, which may have the advantage that a centralized auction is lower in transaction costs. The flipside is that this would imply overall emission limitation targets for the bunker fuel sector, which may be difficult to agree upon. In any case, it makes sense that a climate-related instrument should feed back to climate change mitigation in another sector that has not been included under a climate treaty until now. There are many interests involved trying to receive a piece of the pie, but at least **bunker fuels can contribute a share of the money needed for REDD**.

What other option is there for filling up a **fund that subsidizes efforts for REDD**? For the first commitment period, industrialized countries have received their allocations (emission targets) for free, meaning that they only need to pay for mitigating the exceeding share of their GHG emissions. In order to create an incentive to keep target allocations low, **Parties could be obliged to make a contribution to a compliance fund** for every ton of CO_2e they are entitled to emit during the commitment period. Committed Parties found to be in compliance after the true-up period would recover their payment afterwards. In the event of non-compliance, the payment would be lost partially or in total for the country Party in question. The fund's receipts would be used for financing additional mitigation activi-

ties (Dutschke, Michaelowa et al. 1998). How high could this contribution be? Taking the first commitment period GHG emissions target as a reference, in order to gather the amount of 10 billion USD, countries would have to spend around 0.90 USD per ton CO_2e, respectively 0.60 USD per ton, if the US and Australia were to participate (calculations based on Ziesing 2006). For Germany, this would make up an annual amount of 2.8, respectively 4.4 billion USD over the five-year commitment period.

The upfront compliance payment could be used for a revolving fund. This fund should primarily **finance capacity and institution building, as well as forest inventories and monitoring**, while the proceeds from REDD could be sold on the international allowance market, as described above.

In order to honor early action and at the same give time for negotiating an eventual target, the fund could consist of two tranches: The first tranch would be disbursed directly to country Parties willing to take over a voluntary target, and which helps building up capacity and inventories and would be on a grant basis. The second tranch would only be disbursed, once a reference level and a target had been agreed. In order to achieve a firm commitment by the country Party, the fund would be on a loan basis only, to be repaid with receipts from ex post allowance trading.

In the above chapter, capital demand for REDD was determined and potential sources of finance weighed against each other.

For national REDD targets to become effective, important North-South transfers are needed

Carefully reviewing the existing literature, we conclude that a REDD fund should distribute 10 billion USD annually in current prices, in order to save a substantial part of the earth's tropical forests, thereby reducing GHG emissions accordingly

One option could be a revolving fund, refinanced by the future sale of emission permits

This fund could be filled up by upfront payments from committed industrial Parties proportional to their respective GHG target allocations and / or contributions from the users of bunker fuels, relative to their respective GHG emissions

The fund's first tranch would be disbursed, as soon as the implementing country declares its intention to take over a voluntary commitment. It should finance capacity and institution building, as well as forest inventories and monitoring A second tranch would be liberated as soon as the respective country has accepted an deforestation reference level, and it would be on a loan base only, in order to lead over to a market-based system

7.
Concept for the design of country-based pilot programs

Due to the diverse regional and national circumstances in tropical countries, there is obviously no one-size-fits-all approach to REDD. In order to describe the instruments, some definitions are needed:

Policies and measures: In order to be successful, REDD needs an enabling policy framework. It includes, among others, clearly defined land rights, law enforcement towards deforestation agents, general investment security, transparent subsidy schemes, and administrative capacity to support land use programs.

Programs: The terms "program" and "project" are often used in an overlapping manner. Typically, a program is **a policy-near instrument with a joint budget, pursuing a variety of goals**. A program for the land use sector may pursue the goals of rural poverty alleviation, stopping rural depopulation, promoting food and energy security. It will include institution building, capacity building, and integration of marginalized groups, including indigenous population. It will aim to improve the access to finance, energy, transport and education.

Projects: Under a program's auspices, several projects can be carried out. Projects typically group targeted activities. In our example, REDD can be the target to be reached within the context of a program. In order to prove its effectiveness the project's target should be measurable ex ante and ex post. In order to allow an efficient allocation of funds, for climate change mitigation, the reference scenario (i.e. the baseline deforestation) needs to be determined before starting concrete activities.

Project activities: Activities are the category most related to the desired effect. They may or may not be financed out of the project budget. Sustainable forest management definitively is a field of activities that can result in REDD. Assuming the most frequent case of frontier deforestation, **REDD is no one-time activity**. Reducing deforestation is an activity that takes place on a fraction of the whole forested area. **Funds can thus be efficiently concentrated along the deforestation frontier**. Ideally, a sectoral project for REDD will combine all forest related activities, deforestation avoidance, forest management, and reforestation.

REDD as an overarching goal can be pursued on all levels, and these can be mutually reinforcing. **ODA should concentrate on the policies and program levels**. It can further contribute to **national baseline setting and finding an appropriate emissions reference level** and the development of **in-country technical capacities** for methodology, project design, and monitoring. Not by coincidence, the discussion on CDM sector-level projects came up after first experience had been gathered with CDM project activities for some years. **The CDM has demonstrated that success was greatest where policies, program and project levels were involved in a mutual learning process**.

REDD can thus only be successful where there is a **bundle of mutually supportive measures and activities**. Experience should be gathered in different tropical countries. In some cases, an international eco-regional approach to an ecosystem appears to be sensible, like in the case of the Amazon or the Congo basins, thereby limiting international leakage currently not addressed under the Kyoto Protocol.

REDD pilots should be developed in a stepwise approach:

Carry out an inventory of a country's or the region's forest resources and their development since 1990.

Identify and map deforestation and biodiversity hot spots.

Among the above, separate the ones deemed crucial for the country's economic or demographic development, i.e. the land areas with highest opportunity costs.

Devise areas that can be protected at low cost. Ideally, an REDD cost curve is established for the country.

Determine the carbon density for the different vegetation classes, either by on-the-ground measurements or by referring to relevant IPCC sources.

Derive a deforestation baseline for the business-as-usual scenario, and calculate the reductions achievable under different CO_2 allowance price assumptions.

Create a land use development plan, including agricultural expansion areas and future protected areas.

Distinguish between state, communal and private property and tenure. For each case, a different composition of deforestation and devegetation drivers will apply. The better these are identified, the more efficient REDD will be.

Identify agents of deforestation and forest degradation and design mechanisms that are capable to involve them in REDD.

Open space for private investment in land use. Allow for sustainable forest management where appropriate.

Identify a pipeline of priority forestry activities to be executed by private actors.

Develop suitable compensation and incentive schemes. These may also consider local environmental services, like enhanced water catchments or pest resilience through biodiversity conservation.

It is of utter importance to find suitable and convincing monitoring and verification mechanisms.

The described process will necessarily result in a labor division between the different activity areas. Different pilot activities should use compatible baseline and monitoring methodologies, so these can be integrated under the sector-wide approach.

8.
Conclusions

After shortly summarizing the current understanding of deforestation and forest degradation processes, we have analyzed the proposals on how to include REDD into a future climate change mitigation agreement. Fully including REDD credits into the carbon market will be possible once there is a reliable long-term climate policy framework. Based on real-life examples and on experience from the Clean Development Mechanism (CDM), we draw conclusions on how to design programs, projects and concrete REDD policies. According to different estimates from literature, a reduction of worldwide emissions from deforestation and degradation by half may cost 10 billion USD annually. A combination of refundable upfront North-South transfers and ex post carbon credit sales could ensure the necessary funds.

The failure to conserve existing forests will forego a huge mitigation potential that is relatively low-cost today, but unavailable in the future, independently from the willingness to pay. As most deforestation and forest degradation occur along the forest frontier, there are good chances to concentrate funds efficiently. Further studies will have to develop frameworks for upscaling and integrating forest governance programs on different levels.

References

Achard, F., A. S. Belward, et al. (2006). Accounting for avoided conversion of intact and non-intact forests: Technical options and a proposal for a policy tool, Joint Research Centre of the European Commission

Capoor, K. and P. Ambrosi (2006). State and Trends of the Carbon Market 2006. Washington, D.C., The World Bank Carbon Finance Unit: 49

Chomitz, K. M. (2002). "Baseline, leakage and measurement issues: how do forestry and energy projects compare?" Climate Policy 2: 35 - 49

Chomitz, K. M. (2006). Policies for national-level avoided deforestation programs: a proposal for discussion. Draft 1.3 of background paper for Policy Research Report on Tropical Deforestation. mimeo Washington, D.C., World Bank: 17

Chomitz, K. M. and S. Wertz-Kanounnikoff (2005). Measuring the initial impacts on deforestation of Mato Grosso's program for environmental control. Washington D.C., World Bank: 58

COMIFAC (2004). Plan de convergence pour la conservation et la gestion durable des écosystèmes forestiers d'Afrique Centrale. Yaounde: 55 http://www.comifac.org/comifac/plandeconvergence1.pdf

Dutschke, M. (2002). "Fractions of permanence - Squaring the cycle of sink carbon accounting." Mitigation and Adaptation Strategies for Global Change 7(4): 381-402

Dutschke, M. (2006). "CDM Forestry and the Ultimate Objective of the Climate Convention." Mitigation and Adaptation Strategies for Global Change preview(DOI: 10.1007/s11027-005-9013-6)

Dutschke, M., A. Michaelowa, et al. (1998). Tightening the System: Central Allocation of Emission Rights. HWWA Discussion Papers. Hamburg, Hamburg Institute of International Economics: 15

Dutschke, M., B. Schlamadinger, et al. (2005). "Value and risks of expiring carbon credits from afforestation and reforestation projects under the CDM." Climate Policy 5(1)

Fearnside, P. M. and R. I. Barbosa (2003). "Avoided deforestation in Amazonia as a global warming mitigation measure: The case of Mato Grosso." World Resource Review 15(3): 352-361

Freibauer, A., N. Höhne, et al. (submitted). "Bio-carbon targets: Proposal for integrating biospheric carbon emissions into a future climate policy regime." Global Change Biology

Geist, H. J. and E. F. Lambin (2001). What Drives Tropical Deforestation? A meta-analysis of proximate and underlying causes of deforestation based on subnational case study evidence. Louvain-la-Neuve, LUCC International Project Office, University of Louvain

Graßl, H., J. Kokott, et al., Eds. (2003). Über Kioto hinaus denken - Klimaschutzstrategien für das 21. Jahrhundert. Sonderbericht. Berlin

Hadley-Centre (2000). Climate Change. An update of recent research from the Hadley Centre. Bracknell Berkshire, UK http://www.met-office.gov.uk/research/hadleycentre/pubs/brochures/B2000/forestation.html

Höhne, N., D. Phylipsen, et al. (2005). Options for the second commitment period for the Kyoto Protocol. Berlin, Umweltbundesamt

ITTO (2006). Status of Tropical Forest Management: Summary Report. Yokohama, International Tropical Timber Organization: 36

Karousakis, K. (2006). Initial Review of Policies and Incentives to Reduce GHG Emissions from Deforestation. Paris, OECD: 20

Lecocq, F. and K. M. Chomitz (2001). Optimal use of

carbon sequestration in a global climate change strategy : is there a wooden bridge to a clean energy future? Washington, D.C., World Bank Development Research Group Infrastructure and Environment

Lepers, E., E. F. Lambin, et al. (2005). "A Synthesis of Information on Rapid Land-Cover Change for the Period 1981–2000." BioScience 55(2): 115-124

López, R. (1996). Policy Instruments and Financing Mechanisms for the Sustainable Use of Forests in Latin America. Washington, D.C., Inter-American Development Bank: 41

Millikan, B., J. Leitmann, et al. (2002). Lessons from the Rain Forest: Experiences of the Pilot Program to Conserve the Amazon and Atlantic Forests of Brazil. Brasília, Ministry of the Environment (MMA) - Brazil, Secretariat for Coordination of the Amazon SCA/MMA), Pilot Program to Conserve the Brazilian Rain Forest, Monitoring and Analysis Project (AMA), The World Bank Brazil Rainforest Unit: 47

Santilli, M., P. Moutinho, et al. (2003). Tropical Deforestation and the Kyoto Protocol: a new proposal. Milan, Instituto de Pesquisa Ambiental da Amazônia – IPAM

Santilli, M., P. Moutinho, et al. (2005). "Tropical Deforestation and the Kyoto Protocol." Climatic Change 71(3): 267-276

Sathaye, J., W. Makundi, et al. (2005). GHG Mitigation Potential, Costs and Benefits in Global Forests:A Dynamic Partial Equilibrium Approach. Berkeley, Lawrence Berkeley National Laboratory: 52

Schlamadinger, B., N. Bird, et al. (in print). "Options for including LULUCF activities in a post-2012 international climate agreement." Climate Policy

Schwartzman, S. (2005). Considerations for choosing an emission target for compensated emission reductions. Tropical Deforestation and Climate Change. P. Moutinho, S. Schwartzman and M. Santilli. Belem do Pará / Washington D.C.: 87-92

Skutsch, M., N. Bird, et al. (2006). "Clearing the way for reducing emissions from tropical deforestation." Environmental Science and Policy 2006(6)

Stern, N. (2006). Stern Review on the Economics of Climate Change. London, UK Cabinet Office - HM Treasury

Trines, E., N. Höhne, et al. (2006). Integrating Agriculture, Forestry, and Other Land Use in Future Climate Regimes: Methodological Issues and Policy Options. The Hague, Netherlands Research Programme for Climate Change (NRP-CC): 186

UNFCCC (2005). Information on greenhouse gas emissions from international aviation and maritime transport, UNFCCC Secretariat: 14

UNFCCC (2005). Reducing emissions from deforestation in developing countries: approaches to stimulate action. Submissions from Parties. FCCC/CP/2005/Misc.1. Geneva

UNFCCC (2006). Report on a workshop on reducing emissions from deforestation in developing countries. Note by the Secretariat. FCCC/SBSTA/2006/10

UNFCCC (2006). UNFCCC Executive Secretary calls for new climate compact to combat global warming. Press release. Bonn, United Nations Framework Convention on Climate Change: 2

Wit, R., B. Kampman, et al. (2004). Climate impacts from international aviation and shipping. State-of-the-art on climatic impacts, allocation and mitigation policies. Bilthoven, NL, Netherlands Research Programme on Climate Change: 110

Wunder, S. (2005). Policy Options for Stabilising the Forest Frontier: A Global Perspective. Belem, CIFOR: 24

Ziesing, H.-J. (2006). Weltweite CO_2-Emissionen auf neuem Höchststand. Wochenbericht Wirtschaft Politik Wissenschaft. 72: 561 - 575

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

- German Technical Cooperation -

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn/Germany
T +49 61 96 79-0
F +49 61 96 79-11 15
E info@gtz.de
I www.gtz.de