

# **Possible role of Land Use, Land-Use Change and Forestry in future climate regimes: An inventory of some options**

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## Summary

The Netherlands hold the presidency of the European Union from July 1<sup>st</sup> until the end of 2004, which is the eve of the next negotiation round under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP), this is if the KP has entered or will enter into force. To keep the political momentum to combat climate change up the Ministry of Agriculture, Nature and Food Quality has commissioned this report in preparation of a workshop on 21 and 22 October 2004 to consider the role of land use, land-use change and forestry (LULUCF) in a future climate regime. The main objectives of this report are to present an overview of the current state of thinking with respect to the possible roles of LULUCF in future climate regimes and review several technical aspects and political dimensions of each of these options. It is *not* within the scope of this report to present an *exhaustive* list of options, nor does the report pre-judge or preclude any possible future options that may arise over the coming year: it aims to frame a distinct number of options which, at a later stage, may be expanded or refined.

The role of LULUCF in achieving a political agreement in Kyoto to strengthen commitments under the UNFCCC was crucial and underestimated to that very moment. Consequently, the decisions taken there came about in a scientifically poorly informed environment. The Special Report of the Intergovernmental Panel on Climate Change (IPCC) on Land Use, Land-Use Change and Forestry (IPCC SR LULUCF) emphasized how different LULUCF can manifest itself in different – sets of – countries, and that therefore, one political decision has multiple types of impacts, depending of the “make-up” of the country in terms of land cover, climate, etc. The rules, modalities and guidelines that have evolved since, to guide the accounting for LULUCF activities reflect these ‘problems’ which has led to a very onerous framework of monitoring, reporting and accounting. Not even all issues are resolved at this very moment and a number of issues that are likely to come back to the negotiating table are:

1. The different importance attached to LULUCF by different parties;
2. The role in the global carbon cycle, which is significant;
3. The exact functioning of the terrestrial carbon cycle is not scientifically well understood yet, and practicable methodologies to factor out direct human-induced changes in carbon stocks from changes that are caused by natural or indirect human-induced effects have yet to be developed, if at all possible;
4. The non-permanent nature of carbon sequestration;
5. The exact quantification of carbon stocks is onerous and costly and that therefore, the capacity of Parties to comply with inventory and reporting requirements will return on the agenda;
6. Knock-on effects of past practices related to LULUCF can last for decades yet these changes in carbon stocks may show up in inventories, with all associated problems;
7. Conflicts between development objectives with respect to LULUCF on one hand and climate change (CC) mitigation objectives on the other hand have led to resistance of

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Parties to accept (too) prescriptive guidance on the sustainable use of natural resources and natural resource management;

8. Differences in inventory systems, both in terms of quality, as well as frequency and design are enormous and lead to differences in data quality and availability; and,
9. Targets should be set after we agree on (i) principles (what do we want to achieve with the inclusion of the LULUCF sector) and (ii) the modalities (what do we count and how do we count it). Only then quantifiable target setting makes sense

Issues that have not been resolved entirely to date include: harvested wood products (HWP), the separation issue (see point 3 above) and the establishment of one new agenda item under the SBSTA to deal with all LULUCF issues.

Various approaches can be taken to designing a climate regime but the result must be environmentally effective, scientifically sound, just in terms of ethics and equity, and (as a consequence) politically acceptable. The regimes that are elaborated in this report are:

1. the “traditional” approach; the way in which the Kyoto Protocol came into existence based on the willingness of countries to make commitments followed by negotiations to take specific ‘wishes’ or national circumstances into account. For the LULUCF part of the regime this led to a limited set of eligible activities under the overall quantifiable target – some of which activities are capped – for a limited set of countries.
2. the “Brazilian Proposal”: individual country ceilings that together indicate the maximum increase in the global mean surface temperature that will be tolerated. The ceilings are calculated on the basis of a temperature reduction target for all participating countries together: a method to share emission reductions amongst countries. It is proposed to attribute responsibilities to countries according to the impact of their historical emissions on the surface temperature change and to share emission reduction efforts proportional to their historical contribution. The approach requires a complex analysis to identify historic emissions and attribute country's contributions to temperature change.
3. a separate LULUCF target for particular countries (which could be a subset of a “global triptych approach”). Some have referred to this as ‘a sinks protocol’. Under such a regime two sub-categories can be envisaged: a system with emission reductions that are fungible with those generated in other sectors (e.g. energy or industry), and/or with emissions/removals in other countries, leading to a matrix of 4 options that will be elaborated.
4. a regime of “contraction and convergence” whereby a global emissions capacity (contraction: to overall level has to come down) is ultimately divided amongst countries on the basis of equity: the same amount per capita. Hence, the distribution of emissions capacity has to move from the current level of emissions per capita towards a per capita volume of emissions that is equal for every person in the world (convergence). Timing the moment of total convergence is likely to be the most complicated aspect of this regime.
5. the “multi-stage regime”: a regime whereby countries gradually increase their level of participation in the regime by moving from one stage to a next depending on their level of development. The stages can be a string of options through which countries can move to total participation at their own pace. Stages could be 1) policies and measures; 2) sustainable development policies and measures; 3) a sectoral CDM; 4)

non-binding emission ceiling; 5) relative emission ceiling; to 6) binding emission ceiling. Or any variation that is deemed desirable. Also with this regime the timing aspect is of the essence: when do countries move from one phase to the next.

The options can be subdivided into 2 clusters:

1. those approaches whereby LULUCF is a module of the overall climate regime: the traditional approach, the approach with a separate target for LULUCF, and the multi-stage regime; or,
2. those approaches whereby LULUCF is incorporated into the basic principle and methodology of the regime: the Brazilian proposal and contraction and convergence.

For all of the options the following issues are discussed: spatial coverage, base year, scope, modalities, accuracy / level of detail and knowledge gaps. The main conclusions are:

A. Coverage	<ol style="list-style-type: none"> <li>a. Least problems occur if all lands are included or hardly any.</li> <li>b. In case of full coverage, no system boundary problems occur that need to be monitored.</li> <li>c. In case of partial coverage, many boundary issues arise.</li> <li>d. In all cases natural (eco) systems and natural phenomena (e.g. fire) would be separated (ideally) in inventory and monitoring activities.</li> </ol>
B. Base year	<ol style="list-style-type: none"> <li>a. A base year or period is always required but can also be the previous year or the previous (commitment) period. In general a more recent base year enhances the chances of reliable data.</li> <li>b. The level of emissions/removals in the base year determines the offset physical potential of the option in terms of how much can be offset. Political decisions reflected in modalities can put a significant filter over the offset potential obviously.</li> <li>c. The accuracy of information in the base year determines the possibilities of loopholes occurring.</li> <li>d. Relative high emissions in the base year means high targets can be negotiated (depending on political will).</li> </ol>
C. Scope	<ol style="list-style-type: none"> <li>a. Least problems occur if the scope is full or very little. In all intermediate cases complications arise. A limited scope complicates because of all the in and exclusions from the system.</li> <li>b. Factoring out particular effects remains an obstacle.</li> <li>c. Symmetry in accounting is important to keep a balance between base year/period and commitment period (unless gross-net accounting is accepted).</li> <li>d. The separate LULUCF target approach and multi-stage regime are best in facilitating differences or changes in scope. The traditional approach can obviously cater for changes as well but it seems harder to accomplish with the KP in place (it is sometimes easier to start from scratch than to change what is there).</li> </ol>
D. Modalities	<ol style="list-style-type: none"> <li>a. Modalities are simplest in case of full coverage and scope.</li> <li>b. The more stages, the more modalities are required. In that respect, the separate targets regime has advantages over the multi-stage regime.</li> </ol>

E. Accuracy / level of detail	<ul style="list-style-type: none"> <li>a. As soon as targets are set, a higher accuracy is required to measure/verify compliance.</li> <li>b. Low targets require a higher accuracy as smaller changes in stocks need to be detected.</li> </ul>
E. Accuracy / level of detail continued	<ul style="list-style-type: none"> <li>c. Tiers can simplify the system.</li> <li>d. Time series consistency is crucial when moving from one stage to the next is an option.</li> <li>e. Options of full or virtually no LULUCF included are simplest; a coarse system versus virtually no system. Less complicated means that less system boundary problems can occur.</li> <li>f. In high-input systems the human interference with carbon stock levels are most important. In low-input systems environmental factors (such as soils and climate) are dominant.</li> </ul>

The main knowledge gaps that are identified now, to be addressed in the upcoming years, are (this list is not exhaustive!):

- a) factoring out different types of effects on carbon stocks (natural, direct and indirect human-induced effects): at what scale can we apply which methodologies, and for what type of LULUCF activities is factoring out actually relevant<sup>1</sup>;
- b) quantification methods for biomass and soil carbon;
- c) assessing the scale of the offset potential of various 3.3 or 3.4 activities in some key non-Annex I countries, if they were to join Annex I;
- d) how can avoiding deforestation be included under the CDM without unduly crediting and violating host country sovereignty;
- e) or should avoiding deforestation not come under the CDM but rather be allowed as (sub-) sectoral target?;
- f) which agricultural activities could be included under the CDM;
- g) how can the sustainable use of natural resources be promoted under the climate regime;
- h) how can carbon stored in wood products and associated emissions be included in the annual inventory reports and assist parties in meeting their Article 3 commitments;
- i) how do forest degradation, devegetation, and deforestation relate to each other and how should they be dealt with in future commitment periods;
- j) can levels of standing stock or area per vegetation type be monitored on a larger scale, e.g. pan-European;
- k) should SD objectives be integrated in a climate change regime, and if so, how;
- l) can synergies between the Rio-conventions be integrated in a future climate regime;
- m) how can adaptation strengthen the article 2 objective of enhancing sinks and reservoirs and how can sinks contribute to adaptation measures;
- n) develop appropriate thresholds for a multi-stage regime
- o) ...

<sup>1</sup> Effects such as nitrogen deposition, elevated CO<sub>2</sub> concentrations, higher temperatures are of influence on removals, not on emissions. Effects will be harder to distinguish from one another in existing vegetation cover. In newly established planting growth will be mainly due to the fact the vegetation has been established. In the case of avoiding emissions from logging, harvesting or deforestation leading to the decay of biomass, factoring out is not relevant as emissions are not influenced by these phenomena (see also Annex I).

Very early conclusions with respect to the various regimes are listed in the table below.

	<b>Traditional Regime; Kyoto continued</b>	<b>Brazilian Proposal</b>	<b>Separate LULUCF targets</b>	<b>Contraction and Convergence</b>	<b>Multi-Stage Regime</b>
<b>Environmental effectiveness</b>	<b>+</b>  Sinks are only allowed to a limited extend and could contribute more	<b>++</b>  If LULUCF is an integral part of both the historic emissions and in the way those can be mitigated, the proposal scores very good	<b>++</b>  If the scope and spatial coverage is high, and either option B or maybe option C are applicable, this regime scores very good	<b>++</b>  If LULUCF is an integral part of the regime, the proposal scores very good	<b>?</b>  it is too early to assess: the MSR could be either strong or weak: that determines the environmental effectiveness of the regime
<b>Scientific soundness</b>	<b>-</b>  the LULUCF component is more politically and economically driven then based on science	<b>++</b>  as above: if LULUCF is an integral part of the regime, it scores very good	<b>++</b>  because LULUCF is isolated from other sectors under this regime, any mistake in design is limited to LULUCF	<b>++</b>	<b>0</b>  the thresholds for LULUCF will be more based on what is feasible and desirable then on science
<b>just in terms of ethics and equity</b>	<b>+/-</b>  ethics: yes (Parties agreed to it), equity: less so (Parties that drove a hard bargain got more in terms of LULUCF, e.g. 33 Mt for Russia).	<b>+/-</b>  Equity: yes, but ethically it puts a high burden on Parties that industrially developed rapidly since 1850 when climate change didn't 'exist' yet. <sup>2</sup>	<b>++</b>  country-specific targets for LULUCF can honour both.	<b>+</b>  Equity yes, but ethically.... this will depend on who you ask and when convergence needs to be achieved. <sup>7</sup>	<b>+</b>  Ethically yes, provided thresholds and incentives for 'early action' are designed properly. Equity depends on thresholds and may impact differently on different LULUCF situations.

<sup>2</sup> Here, the question cannot be answered just for the LULUCF part of the regime as LULUCF is an integral part of the base of the regime.

	<b>Traditional Regime; Kyoto continued</b>	<b>Brazilian Proposal</b>	<b>Separate LULUCF targets</b>	<b>Contraction and Convergence</b>	<b>Multi-Stage Regime</b>
<b>politically acceptable</b>	<b>-</b> the LULUCF component remains controversial	<b>-</b> with respect to the LULUCF component, targets may need to be adjusted through negotiations	<b>++</b> separating LULUCF from the rest does offer a lot of opportunities to negotiate a deal that is politically acceptable	<b>-</b> the LULUCF part is locked inside the regime which may not help <sup>7</sup>	<b>+/-</b> the LULUCF thresholds may be a burden to some parties and a blessing to others

++	very good score	+/-	some aspects score 'plus', some aspects 'minus'
+	moderately good score	-	moderately poor score
0	neutral / or not applicable	--	very poor score

Obviously there is a very serious degree of (subjective) judgment in this assessment as scores cannot be measured but have to be reasoned. Overmore, different individuals experience one criterion to be more important compared to another. For instance, someone who works on the Brazilian Proposal might find the underlying science of critical importance, whilst an advocate of the contraction and conversion option may find equity issues of overruling importance. In addition, it must be very clear that the political will in all of this is crucial and if parties support an option and take ownership of the architecture and contents of a regime, it doesn't matter how it scores on any of the criteria above.

Likewise, the weight given to the different criteria (listed in the 1<sup>st</sup> column) is very important. For instance, although the score of the multi-stage regime on environmental effectiveness may be hitherto unknown and lack in terms of scientific basis, it still has a lot to offer as an option simply because Parties may take ownership of it once it is in its final design stage (thresholds).

Overall, from a LULUCF perspective, the "separate target for LULUCF" seems most promising. But to put this comment in perspective, it has to be understood that there is a serious degree of (subjective) judgment in this assessment.

### **Relation between Sustainable Development and LULUCF**

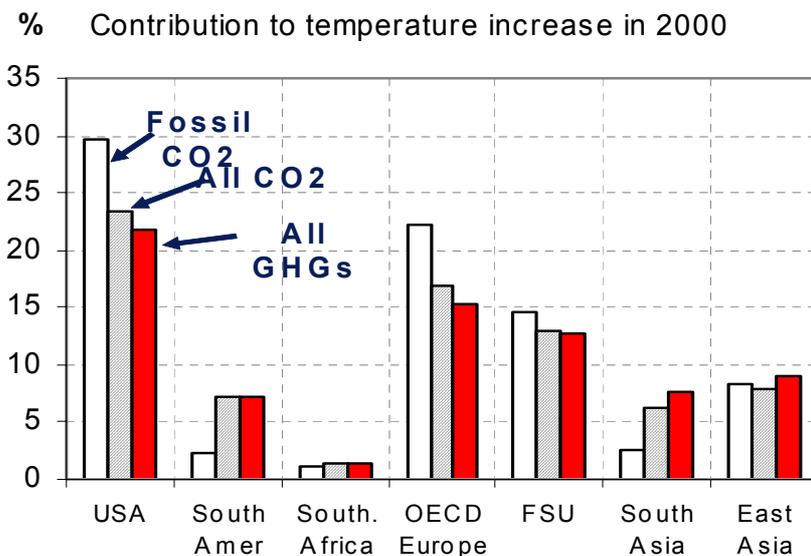
The interfaces between Sustainable Development (SD) and Climate Change (CC) are manifold and there are linkages in either direction (development also impacts on emission profiles). Those linkages need to be strengthened where it concerns addressing both SD and CC simultaneously, irrespective of whether the linkage is positive (a synergy) or negative (a conflict, e.g. over resource use). The toolbox that is at our disposal to establish and/or strengthen the linkages also contains many options/tools: capacity building, technology transfer (including innovation), technology switches, financial management, establishing institutional frameworks, etc. etc. However, there is no clear agenda yet how to best handle the issue.

Linkages between SD and LULUCF are in particular clear in the areas of biodiversity, natural resource management, wildlife and recreation (and hence, tourism), “quality of life” (landscape aesthetics, recreation), income generation (jobs in agriculture and forestry, bio-prospecting, non-timber forest products), watershed management (incl. water availability), combating desertification and salinisation, nutrient cycling, soil fertility and water retention (sustainable agriculture and avoidance of soil degradation and/or erosion), and adaptation (see below).

In many developing countries the issue of CC is overshadowed by a number of immediate development priorities. Although CC is not a direct priority, it is clear that developing countries are more vulnerable to CC and are more concerned with the synergies and conflicts between SD and CC mitigation measures.

**SD, LULUCF and the ultimate objective of the Convention (Art.2)**

A broader look at SD brings around Art.2 of the Convention: “...stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”. And one look at the make-up of the global emissions profile teaches us that emissions from the land-use change and forestry sector are globally a significant player. Hence, we cannot ignore the land-use change and forestry (LUCF) sector in the development of a (survival) strategy. The figure below illustrates the relative contribution to temperature increase in the year 2000 for the different GHGs.



It is known from modeling exercises that if we want to achieve acceptable levels of GHG concentrations (e.g. 450 or 550 ppmv), we have to bring the LUCF emissions into the equation. An important notion is that the choice of stabilization level is far more important than the type of regime that is chosen to achieve that level. Furthermore, the participation of Parties is crucial. For instance, stabilization at 550 ppmv would require a substantial reduction from the baseline in middle income non-Annex I regions by 2025 already.

A number of options that have been presented recently that seem promising to integrate LULUCF and in particular the conservation and enhancement of sinks and reservoirs globally are elaborated in the body text of the report and are:

1. “Compensated Reductions”
2. “Soft Capping”
3. “Flat rate baseline”

These approaches are not mutually exclusive, on the contrary the “compensated reduction approach” and the “soft capping approach” are variations on the same theme and the “flat rate baseline proposal” is dealing with just one facet of establishing a business as usual scenario, something that has to be done in all cases.

Many areas remain that can be studied and that should be studied. But a few messages have become very clear:

- Deterioration of sinks and reservoirs currently contributes significantly to the increase of GHG concentrations in the atmosphere;
- Not just CO<sub>2</sub> is important in this respect but all GHGs;
- We need to include the sinks and reservoirs in our effort to stabilise GHG concentrations in the atmosphere at low(er) levels that will help us to meet our Art.2 commitment; and
- Reducing emissions from LULUCF **in all geographic regions of the world, and particularly in the tropics** is key if we want to achieve stabilisation levels of GHG concentrations in the atmosphere that avoid dangerous interference with the climate system!

### **Relation between Adaptation and LULUCF**

The question whether adaptation is a sweetener to help swallow a bitter pill, or whether the link with LULUCF and mitigation is the savior for adaptation, remains unanswered. However, both adaptation and mitigation are engrained in the UNFCCC, so linking the two in a future regime seems logical.

A fortunate advantage of activities in the LULUCF sector happens to be that in some cases mitigation of CC is achieved, whilst at the same time the activity also assists in adapting to CC: both the avoidance of deforestation and the protection and enhancement of existing carbon reservoirs leads to the mitigation of CC, the reduction of vulnerability to CC (e.g. reduce the chances of landslides, reduce peaks in water run-off, regulate local climate, retain water and soil fertility, etc.), and the adaptation to CC (e.g. mangrove forests in coastal areas that are periodically subject to inundations, and the enhancement of system’s resilience). The direct link to SD is evidently here.

### **Linking SD, LULUCF and Adaptation**

Land-use systems allow for a combination of the two, both serving adaptation and mitigation, ultimately leading to SD. And when a closer look is taken adaptation may well be the best strategy that leads to mitigation.

On one hand it is clear that more mitigation leads to less CC, which in turn leads to less damage with the same adaptation *or* the same damage with less adaptation. Reversely, more adaptation leads to less damage from the same CC *or* the same damage from less mitigation *or* more CC. This offers an interesting perspective. So far, we have been calculating the costs of adaptation versus the costs of mitigation, whilst what should be calculated is the costs of residual impacts *plus* the costs of ‘net’ adaptation versus ‘net’ mitigation (‘residual’ are the costs after adaptation and ‘net’ includes accounting for co-



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benefits and 'co-damages'). This assessment could plot the most optimal strategy of dividing (financial) efforts between adaptation and mitigation.

The bottom line is that there is a trade-off between mitigation (SD) and adaptation, but they are interlinked in a stronger fashion than the CC negotiators have been willing to accept to date. Obviously it is less direct; to fight CC through adaptation, but it should be a good complementary option besides mitigation.

Measures that are suggested in the LULUCF sector that both promote SD and assist with adapting to CC are (this list is not exhaustive!):

- Primary forest systems should be protected through e.g. indemnification of logging companies (leakage control is of crucial importance in this option!) by international partnership with e.g. the World Bank, GEF, large conservation NGOs etc;
- Enhancement of secondary forest systems through the support of sustainable forest management, possibly with the aid of the same type of partnerships as outlined above;
- Continued development cooperation with an increased effort on assisting the rural poor to improve their livelihoods through improved and adapted natural resource management;
- Increase the support for the protection and enhancement of wetlands for watershed management and the avoidance of water table fluctuation in peat lands that lead to harmful emissions from non-CO<sub>2</sub> greenhouse gases;
- Continue and improve efforts to translate the synergies between the Rio-family of conventions and the Ramsar convention into tangible projects and activities in the field and the development of implementable policies aimed at the field-level activities;
- Develop frameworks to establish all of the three following links: 1) climate policy and development policy; 2) adaptation policy and development policy; and 3) mitigation policy and development policy;
- Continue to pursue international agreements on the sustainable use of natural resources but continue to work at the same time at grass-root level;
- Continue to improve knowledge on practicable methodologies for soil management and organic farming (also in developed countries!);
- Extend the scope of the CDM with activities that fall under the categories agriculture and conservation, which enables the implementation of such projects in developing countries;
- Increase efforts to collaborate with fora working on coastal defenses to apply where possible mangrove forests as tidal defenses;
- ....
- ....

----- END of SUMMARY -----

# 1. Introduction

## 1.1 Background and purpose of the Option Paper

The Netherlands hold the presidency of the European Union from July 1<sup>st</sup> until the end of 2004, which is the eve of the next negotiation round under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP). At the moment of finalising this report it is very likely that the KP will indeed enter into force with the approval of the Russian Duma on the 22<sup>nd</sup> of October, 2004, and the signature of President Putin on 5 November 2004. A KP that has entered into force will drive the political momentum to combat climate change into a new era where the effectiveness and adequacy of the agreements will be reviewed in the years to come.

But already before these recent developments the Ministry of Agriculture, Nature and Food Quality took the initiative to start the debate or considerations on the role of land use, land-use change and forestry (LULUCF) in a future climate regime which led to this option paper and a workshop for the EU LULUCF Experts, held on 21-22 October 2004, in Baarn, the Netherlands.

The aim of the workshop was to advance discussions on this subject and possibly to prepare a draft work programme to come to an initial EU position on future regimes with respect to LULUCF. This document supported the October workshop in presenting the options under discussion now and the possible implications of choosing a particular option. After the workshop it has been updated with some relevant considerations that were discussed at the workshop.

The main objectives of this paper are to present an overview of the current state of thinking with respect to the possible roles of LULUCF in future climate regimes and review several technical aspects and political dimensions of each of these options. Although the objectives of a climate regime, per definition, would contain some sort of commitment, be it quantifiable or qualitative or in combination, this report deals specifically with the role of LULUCF in relation to other sectors under the proposed climate regimes and not with overall regimes (although it cannot be avoided to discuss some overall regimes in some detail before diving deeper into the LULUCF aspects). Hence, options consisting of agreements between nations that are e.g. limited to policies and measures, international carbon tax agreements, price-capped targets, etc. are not discussed here, even though they may have merits.

The report builds to some extent on interviews that were taken at COP9 with representatives of countries that have been key in the negotiation process to date, and several international experts. But it also expands on some other options that are around in this early stage of thinking on the subject, including those discussed in the EU Expert Group on LULUCF and the EU Expert Group on Future Action.

Hence, it has to be stated that it is *not* within the scope of this report to present an *exhaustive* list of options, nor does the report pre-judges or precludes any possible future options that may arise over the coming year: it aims to frame a distinct number of options which, at a later



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stage, may be expanded or refined. This paper aims to kick-start the learning curve policy makers will jointly undergo over the coming years and does not reflect the EU position on specific matters.

## **1.2 Outline of the Options Paper**

After this introductory chapter 1, chapter 2 provides some history to the LULUCF agreements to date and reviews how some elements are still under discussion or negotiations.

Chapter 3 describes in some detail how targets can be set for climate regimes. Although it is said in the previous section that this paper specifically deals with the role of LULUCF in relation to other sectors under particular climate regimes, a background has to be provided to the overall target setting, as LULUCF can be an integral part of the basis of a regime, such as in the case of “contraction and conversion”, or be kept as a separate module within a framework, such as in the current approach under the KP. This is elaborated in more detail in the chapter itself.

For each of the options several aspects are reviewed in chapter 4, such as: coverage, scope, base year issues, (national or project site) inventory requirements, accounting issues, and the ramifications of the choice for one particular option (e.g. sectoral leakage, unbalanced accounting). In addition, gaps in knowledge that can be identified are listed, which may need to be addressed in the years to come.

Chapter 5 discusses some sustainable development and adaptation issues related to LULUCF, including the issue of protection and enhancement of existing carbon stocks leading to the reduction of emissions from ecosystem degradation and/or deforestation. And although the paper does not draw any distinct conclusions in relation to the options at this stage, simply because it is too early to dismiss any option (yet), chapter 6 raises some points of discussion and provides some further ‘food for thought’.

## 2. History and Outstanding Issues

### 2.1 How it happened

It was not until in Kyoto itself in December 1997 that it became clear that the role of LULUCF in achieving a political agreement in how to strengthen commitments under the UNFCCC was crucial and underestimated to that very moment. Consequently, the decisions taken there came about in a scientifically poorly informed environment. After that, it took a number of years to clarify what was agreed in Kyoto and what the consequences were of those decisions. If we are to be successful in future with respect to LULUCF issues it is worth noting some of the history and rationale for the decisions made at the time, see how they relate to the current debate, and highlight the still open-ended issues that are to be addressed in the years to come.

The most important document that was produced to assemble, assess, and explain some of the science related to LULUCF and that reviewed the consequences of taking particular interpretations of the Kyoto language is the Special Report of the Intergovernmental Panel on Climate Change (IPCC) on Land Use, Land-Use Change and Forestry (IPCC SR LULUCF). It also emphasized how different LULUCF can manifest itself in different – sets of – countries, and that therefore, one decision has multiple types of impacts, depending of the “make-up” of the country in terms of land cover, climate, etc. Forests, forest use, land use and agriculture are simply very different in different locations.

The fact that the Kyoto language wasn’t clear on all points and the fact that the impact of decisions are different, depending on the situation they are applied to, led to the formulation of quite a substantial number of rules, modalities and guidelines laid out in principles in the Bonn Agreements (2001) and elaborated in the Marrakesh Accords (2001).

It is beyond the scope of this report to describe the nature of the LULUCF agreement in much detail here, as this report is written for experts who are assumed to be familiar with the subject matter, but the key features are presented in the box below. A more detailed description of the contents of the Marrakesh Accords can be found on the UNFCCC website (<http://unfccc.int/issues/lulucf.html>).

**Box 1: Key features of the LULUCF agreement as laid out in the Marrakesh Accords**

At COP 7 (Marrakesh, October/November 2001), Parties were able to take a decision on LULUCF and related issues. The rules for LULUCF activities, agreed as part of the Marrakesh Accords, include three main elements:

1. A set of principles to govern LULUCF activities;
2. Definitions for Article 3.3 activities and agreed activities under Article 3.4; and
3. A four-tier capping system limiting the use of LULUCF activities to meet emission targets.

The principles in the Marrakesh Accords respond to concerns that the use of LULUCF activities should not undermine the environmental integrity of the Protocol. These principles underscore, for example, the need for sound science and consistent methodologies, as well as the importance of conserving biodiversity. They also specify that naturally-occurring removals, including removals as a consequence of indirect anthropogenic effects, should be excluded from the system and that any re-release of greenhouse gases (e.g. through forest fires) must be promptly accounted for.

The extent to which Parties can account for emissions and removals from specific LULUCF activities, for the first commitment period, is limited by the following four-tier capping system:

**Tier 1:** If a Party's afforestation, reforestation and deforestation activities result in more emissions than removals, then the Party may offset these emissions through forest management activities, up to a total level of 9 megatons of carbon per year for the five year commitment period.

**Tier 2:** The extent to which forest management activities can be accounted for to help meet emission targets beyond 9 megatons of carbon per year is subject to an individual cap for each Party, listed in the Marrakesh Accords. This cap includes joint implementation projects involving forest management.

**Tier 3:** Emissions and removals from cropland management, grazing land management and revegetation can be accounted for to help meet emission targets on a net basis (e.g. changes in carbon stocks during 1990, times five, will be subtracted from the changes in carbon stocks during the first commitment period, in the lands where these activities will take place).

**Tier 4:** Only afforestation and reforestation projects are eligible under the clean development mechanism. Greenhouse gas removals from such projects may only be used to help meet emission targets up to 1% of a Party's baseline for each year of the commitment period. Definitions and modalities for the inclusion of afforestation and reforestation activities under the CDM will be developed by the SBSTA, with a view to recommending a decision to COP 9.

Source: <http://unfccc.int/issues/lulucf.html>

## 2.2 What we have learned

One of the main issues in relation to the current LULUCF agreement is the structure of the accounting system which is quite onerous, as can also be seen from box 1 above: only particular activities can be taken into consideration, only since 1990, and some only up to a certain level or cap. In addition, for some activities net removals in the commitment period

can be used to compensate emissions in the base year without taking emissions or removals in the base year from that same activity into consideration (the “gross-net approach”).

Hence, the system is not always encompassing all emissions and removals in the LULUCF sector in a country. This leads to the occurrence of many system boundaries, which in itself leads to problems. Obviously this is the result of the compromise that had to be found in the negotiations but it has led to a regime that in terms of LULUCF is not ideal. The different impacts on different – groups of – Parties led to discord in the past and is likely to do so in future, when the Parties will try to rectify or remedy problems in the accounting regime.

Looking at the tract record of the LULUCF debate, and if one tries to list issues that are likely to come up in future debate, the following issues will most likely be amongst them:

1. The varying importance of LULUCF: not only from Party to Party, but also from region to region and even from person to person. It is a very diverse subject matter with many different stakeholders. This has proven hard to reconcile in an international treaty. Sinks are very diverse in terms of: functionality (arable land, forest), climatic region (boreal to tropical), structure (plantations vs. natural forests), speed of growth (8 year rotation of e.g. eucalypt vs. 180 year rotations of e.g. beech), carbon content (grassland or arable land vs. rainforest on peat land), economic importance (zero value vegetation types (but possibly with high carbon contents) vs. high value land covers), co-benefits (watershed protection, erosion control, coastal protection, biodiversity, desertification, etc.), etc.
2. The role of LULUCF in the global carbon cycle. This role is significant: since the industrial revolution approximately 270 Gt C has been emitted as CO<sub>2</sub> into the atmosphere through fossil fuel burning and cement production, and about 136 Gt C as a result of land-use change, predominantly from forest ecosystems [which is mainly due to deforestation. Ed.]. However, during the period 1980-1998 terrestrial ecosystems may have served as a small net sink for CO<sub>2</sub> (IPCC, 2000). Hence, LULUCF, although part of the problem, can be a part of the (temporary) solution as well.
3. The exact functioning of LULUCF is scientifically still being debated. Some argue it is not clear cut and further research is needed on some aspects before they can be modelled with sufficient certainty – for instance, separating direct human-induced impacts on carbon reservoirs from indirect human-induced and natural impacts is still considered by some as a black box – whilst others, also scientists, argue that on some scales it can be modelled. But in general it can be stated that the scope for political manoeuvring reduces when technical and scientific knowledge increases and solutions are at hand. Therefore, it is important to continue that scientific and technical work on LULUCF.
4. Sinks and reservoirs are subject to unpredictable changes in carbon stocks: insect attacks, fire, illegal logging, land-use policy, political upheaval, etc. all influence their fate. Therefore, and by its sheer nature, issues such as e.g. non-permanence will remain an issue and the reversal of sequestration a liability when tied to (legally binding) quantified commitments.
5. Exact quantification of carbon stocks and fluxes can be done but is extremely onerous and costly. The capacity to quantify may prove to be an issue for Parties where LULUCF plays a minor role or for Parties that are at a lower level of economic development in comparison to Annex II Parties. Hence, the capacity of Parties to comply with inventory and reporting requirements will return on the agenda in future rounds of negotiations.

6. Knock-on effects of past practices related to LULUCF can last for decades and impact on terrestrial sinks and reservoirs without any clear human intervention. Yet these changes in carbon stocks may show up in inventories and therefore, in annual reports that are subsequently used to assess compliance with emission reduction targets.
7. Rural people, especially the poor, are often dependent on particular land-uses and practices that may not be the best strategy from a climate change mitigation perspective. Hence, conflicts between different developmental objectives of developing countries have sometimes led negotiators to resist too prescriptive guidance on the sustainable use of natural resources and natural resource management;
8. Differences in inventory systems, both in terms of quality, as well as frequency and design are enormous and lead to differences in data quality and availability; and,
9. Targets should be set after we agree on (i) principles (what do we want to achieve with the inclusion of the LULUCF sector) and (ii) the modalities (what do we count and how do we count it). Only then quantifiable target setting makes sense.

## 2.3 Outstanding issues and the way forward

A few subjects, also discussed at the time and more recently, were simply too complicated to deal with or politically “too hot to handle”; for instance, how to deal with harvested wood products (HWP<sup>3</sup>). Hence, some subjects were ‘parked’ until after COP6 and are yet to be resolved. The way in which the trade aspects of HWP are dealt with, may well influence – or be influenced by – how emissions from international transport or bunkers are dealt with now or in the future, as there are parallel aspects between the two areas.

Another issue is the “separation issue”, or how to factor out the direct human-induced impacts on carbon stocks from natural impacts or indirect human-induced impacts on carbon stocks (e.g. nitrogen deposition, elevated CO<sub>2</sub> concentrations, rising temperatures, etc.). The IPCC concluded recently that the science on the separation issue has not matured enough to develop “practicable methodologies”, as the SBSTA invited to IPCC to develop. However, the Subsidiary Body for Scientific and Technological Advice (SBSTA) hasn’t abandoned the issue yet – not in the last place because some scientists disagree with the IPCC’s conclusions on this matter – and the SBSTA that will take place in conjunction with COP10 (December 2004, Buenos Aires) may well decide to have one integrated agenda item in future related to the future treatment of LULUCF where all LULUCF-related issues are discussed, including this one.

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<sup>3</sup> HWP is an awkward abbreviation. If one goes back long enough, you will find that the initial title of the item was “emissions from harvesting and wood products”, but this was later shortcut into “harvested wood products”. But aren’t wood products always derived from harvested wood? The initial item was to debate the issue of having to account a 100% emissions for all biomass in the year of harvesting/logging, an accounting rule established by the 1<sup>st</sup> IPCC Inventory Guidelines, whilst only a smallest proportion of carbon is released at the time of logging/harvesting and most carbon is either stored in wood products or released over time in dead wood left to decompose in the forest, or by wood products over long periods of time going through a longer life cycle.



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Other recently resolved issues are how degradation and devegetation needed to be dealt with. However, it can be anticipated that this may come back to the table when possible targets are discussed for future commitment periods for particular countries that are now non-Annex I Parties. E.g. if Brazil, India, or China are to take on targets, how are emissions and removals by sinks going to be treated? Will this lead to a revival of the “avoiding deforestation” debate? And if so, where is the border between forest degradation and deforestation? And if deforestation will be included, then why not degradation as well? Many questions will be triggered when this issue comes to bear. These are just examples of questions that will impact on the architecture of a future climate regime.

To deal with issues such as these above, some Parties have advocated at the SBSTA session in June 2004 that all LULUCF agenda items are concluded or transferred to one new agenda item to be established, where all issues related to the future treatment of LULUCF are being dealt with. This would include the separation issue as a minimum. Outcomes under that agenda item will together contribute to, if not determine the architecture of LULUCF under a future climate regime. As for now, a decision on the establishment of such a SBSTA agenda item has been postponed to COP10 pending the resolution of several outstanding issues such as the common reporting format for annual inventories.

## 3. Possible future climate regimes and LULUCF

In December 2003 the Ministry of Agriculture, Nature and Food Quality took the initiative to take stock of the current thinking of policy makers of key countries and representatives of Intergovernmental (IGOs) and non-governmental organisations (NGOs) on the possible role of LULUCF in future climate regime and the type of regime in which such a role could manifest itself. Through a series of interviews a number of options were identified; a list that has been expanded to cover some options and regimes that have emerged in other fora in recent times. This chapter will describe some of the possible climate regimes and options that are considered most promising if we approach the issue from the perspective of a possible role of LULUCF in those regimes. However, before the LULUCF aspects are reviewed, one step back is required to assess different types of regimes and how LULUCF relates to those overall regimes.

### 3.1 Designing an acceptable climate regime

In order to design a climate regime various approaches can be taken. But before an approach is chosen it's useful to first discuss overarching principles: what is it we are trying to achieve.

Obviously the core element of any climate regime should be that it is environmentally effective in what it tries to do: "stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (the objective of the UNFCCC as reflected in article 2 of the convention: UNFCCC, 1992). But this criterion is closely followed by the prerequisites that the regime is supported by a critical number or set of countries that together have the ability to prevent that interference.

For a climate regime to be environmentally effective it needs to be based on sound science. But even inside such boundaries various choices can be made that can all be considered sound, e.g. a regime based on emissions, per capita emissions, or a regime based on temperature rise, etc. Although initially one could argue that all approaches should ultimately lead to the same global target, assumptions that need to be made along the way (e.g. life times of GHG in the atmosphere, feedback systems that need to be modelled, radiative forcing capacity, etc.) may lead to differing outcomes of what needs to be done to achieve the ultimate objective, all being 'sound' in their own right.

Besides this top-down scientific element of designing a climate regime, the diversity of countries that need to participate in the regime call for the need of the regime to have the ability to deal with all sorts of ethical considerations and country-specific circumstances. This bottom-up input to the design is a crucial one, as well as a very complex one. Many views

exist as to what is 'fair' in terms of sharing the burden and taking on responsibility for 'the problem'. It is beyond the scope of this report to review all different perceptions of equity and fairness but it is justifiable to conclude here that a regime needs to be **environmentally effective, scientifically sound, just in terms of ethics and equity, and (as a consequence) politically acceptable**.

## 3.2 Setting targets: possible regimes

Once a choice is made for the basis of a climate regime and an overall target is set, a discussion can evolve as to who should do what, because it is obvious that to stabilise GHG concentrations in the atmosphere countries will have to take action: but who should take action, what sort of action and how much action is needed? These questions of who should take on what commitments needs to be reassessed in the current geopolitical situation, whereby the world's largest emitter (the US) has withdrawn from the Kyoto Protocol, and the state of economic development that can be expected to occur in the nearby future in some key countries, whereby absolute emission levels will supersede the current level of emissions of the US by 2020 (e.g. China, and India – although the levels of per capita emissions between the US on one hand and India and China on the other hand may still diverge further).

The process of negotiating the Kyoto Protocol has provided us with much insight in what countries consider important. Aspects such as costs of mitigation, stringency, flexibility and complexity of the regime, equity/burden sharing, consideration for country-specific circumstances and levels of development, respect for countries' sovereignty, adaptation, etc. are all considered important and countries have different ranking preferences for these criteria depending on their specific situation. If we combine the criteria mentioned in section 3.1 – a regime needs to be environmentally effective, scientifically sound, just in terms of ethics and equity, and (as a consequence) politically acceptable – we can already assume that any proposal for a future regime should be able to be all of that – at least to some degree – if it wants to be successful. Hence, any regime for which the environmental effectiveness cannot be predicted within reasonable degrees of certainty may raise objections. Likewise, any regime that is purely based on environmental effectiveness, without taking due consideration of equity issues, or cost effectiveness, etc. is also likely to lead to complicated negotiations.

The options for 'how' to set targets that are elaborated in this report are:

1. the "traditional" approach; the way in which the Kyoto Protocol came into existence based on the willingness of countries to make commitments followed by negotiations to take specific 'wishes' or national circumstances into account. For the LULUCF part of the regime this led to a limited set of eligible activities under the overall quantifiable target – some of which activities are capped – for a limited set of countries.
2. the "Brazilian Proposal": individual country ceilings that together indicate the maximum increase in the global mean surface temperature that will be tolerated. The ceilings are calculated on the basis of a temperature reduction target for all participating countries together: a method to share emission reductions amongst countries. It is proposed to attribute responsibilities to countries according to the impact of their historical emissions on the surface temperature change and to share

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emission reduction efforts proportional to their historical contribution. The approach requires a complex analysis to identify historic emissions and attribute country's contributions to temperature change.

3. a separate LULUCF target for particular countries (which could be a subset of a "global triptych approach"<sup>4</sup>). Some have referred to this as 'a sinks protocol'. Under such a regime two sub-categories can be envisaged: a system with emission reductions that are fungible with those generated in other sectors (e.g. energy or industry), and/or with emissions/removals in other countries, leading to a matrix of 4 options that will be elaborated.
4. a regime of "contraction and convergence" whereby a global emissions capacity (contraction: to overall level has to come down) is ultimately divided amongst countries on the basis of equity: the same amount per capita. Hence, the distribution of emissions capacity has to move from the current level of emissions per capita towards a per capita volume of emissions that is equal for every person in the world (convergence). Timing the moment of total convergence is likely to be the most complicated aspect of this regime.
5. the "multi-stage regime": a regime whereby countries gradually increase their level of participation in the regime by moving from one stage to a next depending on their level of development. The stages can be a string of options through which countries can move to total participation at their own pace. Stages could be 1) policies and measures; 2) sustainable development policies and measures; 3) a sectoral CDM; 4) non-binding emission ceiling; 5) relative emission ceiling; to 6) binding emission ceiling. Or any variation that is deemed desirable. Also with this regime the timing aspect is of the essence: when do countries move from one phase to the next.

As can be noted, all options discussed in this report are options that involve quantified targets at some stages. Options such as those based on carbon taxes or solely involve policies and measures are not discussed separately in any detail although they may have merits.

The options above can be subdivided into 2 clusters:

1. those approaches whereby LULUCF is a module of the overall climate regime: the traditional approach, the approach with a separate target for LULUCF, and the multi-stage regime, together reflected in section 3.3; or,
2. those approaches whereby LULUCF is incorporated into the basic principle and methodology of the regime: the Brazilian proposal and contraction and convergence, both reflected in section 3.4.

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<sup>4</sup> The global Triptych approach will not be discussed separately as it relates to targets for various sectors that are grouped together for each country. Sinks would be a subset of one of these clusters.

## **3.3 LULUCF as module of an overall climate regime**

### **3.3.1 The “Traditional Approach”**

With the “traditional approach” is meant the regime as it has been designed under the Kyoto Protocol: quantifiable targets, for a limited set of countries, for a limited set of activities, and the use of offsets from particular activities being capped. This approach could be taken again in future, which would lead to countries ‘pledging’ what they are willing to do, followed by negotiations.

Under this regime industrialised countries and countries with an economy in transition have taken on “quantified emission limitations and reduction commitments” (QELRC). These QELRCs, listed in annex B of the Kyoto Protocol, can be offset by the use of the flexible mechanisms (the Clean Development Mechanism (CDM), Joint Implementation (JI), and Emissions Trading (ET)) and LULUCF: if a particular country acquires carbon credits or enlarges its carbon stocks or reduces the losses of biomass, by undertaking eligible LULUCF activities, it creates an allowance to emit more in the sectors listed in Annex A of the Kyoto Protocol (energy, industrial processes, solvent and other product use, agriculture, and waste).

When it comes to LULUCF, offsets can only be generated with particular activities. For Annex I countries these activities are: afforestation, reforestation, deforestation, forest management, cropland management, grazing land management and revegetation. Reporting on afforestation, reforestation and deforestation activities in these countries is obligatory under the Kyoto Protocol. Using and reporting on forest management, cropland management, grazing land management and revegetation to offset emissions is optional in the 1<sup>st</sup> commitment period (2008-2012) and mandatory thereafter. Forest management is capped at country-specific levels.

In non-Annex I countries afforestation and reforestation projects can be undertaken but the use of the credits resulting from such activities by Annex I countries to meet QELRCs is limited to 1% of the base year emissions per year for each acquiring Party.

### **3.3.2 Separate targets for the LULUCF and non-LULUCF sectors under one protocol or accord**

One of the main criticisms on the role of LULUCF under the Kyoto Protocol has always been that emissions that cannot be reversed from any of the annex A sectors, are compensated by removals in the LULUCF sector that are or may well be temporary. The counter argument has been that the LULUCF sector is globally responsible for a significant quantity of



emissions and removals<sup>5</sup> and that it therefore, would be unwise to leave this sector outside the regime. This controversy exists to date, has yielded significant debate in the past and may well continue to do so in the future.

The here described regime provides for separate targets under the same Protocol or Accord: one for the Annex A sectors and one for LULUCF.<sup>6</sup> Emissions and removals under both targets could either be inter-exchangeable (fungible) between countries (or not) and between sectors (or not). Depending on that choice a truly new regime is designed with real separated targets, or the regime would come close to the “traditional approach” again.

<b>Fungibility</b>		<b>Sector to sector</b>	
		<b>Yes</b>	<b>No</b>
<b>Country to country</b>	<b>Yes</b>	<b>A</b>	<b>B</b>
	<b>No</b>	<b>C</b>	<b>D</b>

Figure 1: Fungibility

This option can also be employed in the multi-stage regime discussed later, as it leaves the option open of not taking on any target for LULUCF, or conversely take on a target just for the LULUCF sector and not for other sectors.

Under option A credits could move around most liberal: countries are free in how they meet their target.

Under option D credits could not move around and only the country itself could benefit from initiatives undertaken in the domestic LULUCF sector. This has ramifications for JI or CDM type arrangements and LULUCF eligibility under such mechanisms. In this option the geographic location of the country also impacts on the extend to which the LULUCF sector could contribute to meeting emission reduction targets as forest growth for instance is much slower in boreal and temperate regions.

Option B would allow credits to be transferred between countries but not between sectors. This would facilitate a cost-effective mitigation strategy within the LULUCF sector but without offsetting emission in non-LULUCF sectors.

Finally, option C would prohibit credits from moving between countries, but would allow for using domestically generated offsets. This has the same disadvantage as described under option D.

If a prediction of the political acceptance was made on the basis of the above, it can be anticipated that option A & D would score low. Under the conditions describe under option A there is no need for a separate target as offsets would be fully fungible. Under option D some countries would be put at such a competitive disadvantage that the option would be opposed. Option C leads to a complicated tracking system where offsets can be exchanged

<sup>5</sup> Estimates run as high as 2.4 Gt C y<sup>-1</sup> emissions due to land use changes and as high as 3.6 Gt C y<sup>-1</sup> for the residual terrestrial carbon uptake. (IPCC 2000)

<sup>6</sup> Currently Agriculture is in Annex A, including non-CO<sub>2</sub> emissions from LUCF and excluding CO<sub>2</sub> emissions and removals from both agriculture and LUCF. The problems associated with this divide will be resolved as soon as the new IPCC Inventory Guidelines are completed in 2006 because those will be merged into one volume dealing with Agriculture, Land Use and Forestry.



sector to sector, but LULUCF offsets could not leave the country. This leaves option B, whereby LULUCF credits are kept separate from all other types of credits but can be traded country to country, most likely as the politically most promising option. The question then raises who would be the user of the credits, which is an interesting area to explore. It would basically only be helpful if countries with major emissions in the LULUCF sector would take on targets in such a way that they could compensate their own emissions with credits from countries that enhance their sinks and reservoirs.

<b>Fungibility</b>		Sector to sector	
		Yes	No
Country to country	Yes	--	++
	No	+	--

Figure 2: possible political acceptance score of all options

Obviously all of the options should be discussed in conjunction with modalities under the flexible mechanisms: e.g. if it is the intention to prevent particular transactions by an agreement on the fungibility but the same transaction is possible via one of the mechanisms (e.g. choosing option C but allow for JI LULUCF projects), the purpose of the exercise is defeated.

### 3.3.3 The multi-stage regime

One way of facilitating easier participation in a climate regime for countries that have not taken on QELRCs under the Kyoto Protocol to date is to design a multi-stage regime whereby countries can move from one stage to the next at an appropriate point in time, depending on country-specific circumstances. Hence, this is a regime whereby countries gradually increase their level of participation in the regime by moving from one stage to a next depending on their level of development.

The different stages together form a string along which countries can move towards total participation at their own pace. Stages could be 1) policies and measures; 2) sustainable development policies and measures; 3) a sectoral CDM; 4) non-binding emission ceiling; 5) relative emission ceiling; to 6) binding emission ceiling; or any variation that is deemed desirable.

For each of the transition moments whereby a party moves from one stage to the next, thresholds need to be determined. Hence, there are many points that require a decision/consensus amongst Parties: a major challenge of finding acceptable thresholds that also lead to an environmentally effective and ethically/politically acceptable regime. And even if those thresholds are found (which in itself is a daunting task), it may well be unclear whether that design leads to the environmental effectiveness that we require to “prevent dangerous interference with the climate system”.

Obviously the regime needs to be strong enough to move Parties from one stage to the next because the risk occurs that Parties may not be inclined to move from one stage to the next



if it only means taking on a tougher target. One examples of an incentives that could be incorporated in the regime e.g. for a developing country is that if it decides to take on a voluntary target for a particular sector, it can receive technical and financial assistance to compile a base inventory for that sector, or design that part of its national system (although some may argue that this is not an incentive but rather softening the pain for taking on a voluntary target).

### **3.4 LULUCF as integral part of the base of the overall climate regime**

#### **3.4.1 The Brazilian Proposal**

The basis for the Brazilian Proposal is the assumption that annual emissions are not a measure of climate change. Therefore, the Brazilian Proposal differs from the current regime under the Kyoto Protocol as it focuses on temperature increases caused by individual countries rather than their (current and/or historic) emission levels. This proposal takes account of the different impact of emissions in relation to the moment they occur: the actual climate change induced by the emissions. This is fundamentally different from the way that responsibilities are divided among countries under the Kyoto Protocol right now: on the basis of current emissions.

According to the Brazilian proposal, industrialized countries will have an individual ceiling that indicates the maximum increase in the global mean surface temperature that will be tolerated. This individual ceiling will be calculated taking as a basis the temperature reduction target for all developed countries together. It is proposed to attribute responsibilities to countries according to the impact of their historical emissions on the surface temperature change and to share emission reduction efforts proportional to their historical contribution. Hence, the overall reduction target will be divided into individual targets for the reduction of the temperature increase predicted for each industrialized country, according to the actual responsibility of each country for causing the greenhouse effect (Meira Filho and Domingos Gonzalez Miguez, 1998). The approach requires an analysis to identify historic emissions and attribute country's contributions to temperature change.

To operationalise this regime, Parties must start to report their 'historic' emissions, 'historic' relating to a certain period of time. Indicators that will be used for the attribution to climate change are: cumulative emissions, concentrations, integrated concentrations with climate response, radiative forcing due to increased concentrations, integrated past radiative forcing, integrated future radiative forcing, temperature increase, rate of temperature change, and sea level rise (IISD, 2003).

At present it is unclear how the LULUCF sector would be incorporated on both the historic emissions side, as well as the commitment period side of the equation.

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### **3.4.2 Contraction and Convergence**

A regime of “contraction and convergence” is a regime whereby a global emissions capacity (contraction: because the overall emission level has to come down) is ultimately divided amongst countries on the basis of equity: the same amount per capita. Hence, the distribution of emissions capacity has to move from the current level of emissions per capita towards a per capita volume of emissions that is equal for every person in the world (convergence).

The single most important political dimension of this regime is determining the moment that total convergence needs to be achieved, followed closely by the determination of the modalities on how the convergence needs to be achieved; through what mechanisms. It does open a window of opportunity as well, to combine a regime that scores well on the equity axis, with a process that may lead to political acceptance of the regime when modalities are designed that take account of national circumstances and cost aspects. To fix some of the rigidity of the approach, an initial divide of allowances could be followed by negotiations.

This option scores high conceptually in terms of equity but politically and practically it is more complicated for various reasons, e.g.; the regime takes no account of national circumstances. In addition, some countries will not need all their allowances directly from the beginning and emissions trading will then have to cater for a redistribution of those emission allowances. This will lead to quite a substantial transfer of finances without any environmental benefit. And although it seems a merit that all countries will participate from the moment the regime comes into force, it also means all parties will have to have quite sophisticated national systems in place from the start, e.g. inventory and monitoring systems, registries, etc. But in general, the approach is simple, transparent and easy to understand, and might be tempting to developing countries that receive a ‘commodity’ to trade.

## **3.5 Contemplations on compliance**

Compliance, as in the past, will be a crucial element of the whole package of negotiations and will be looked at in conjunction with the targets. Looking at the approaches discussed above, various options for compliance can be seen as well. For instance, if a Party takes on a voluntary target in a particular regime it may well be a brave first step. If a compliance regime would be very rigid and a possibility would be that the country straight away falls out of compliance with serious ramifications, that country would be reluctant to take that first step. Hence, voluntary steps may need to be accompanied by soft compliance measures.

Likewise with the targets: they can be binding or non-binding. But as the experience with the negotiations under the Kyoto Protocol has demonstrated, it doesn’t make much of a difference whether targets are binding or non-binding; the compliance procedures will be triggered in any case, if they exist. Only the type of ramifications can soften the consequences of non-compliance.

In particular in the cases of the multi-stage regime and the separate targets for LULUCF and non-LULUCF, different compliance regimes can be useful. In the other cases one compliance regime would suffice.

## 4 Quantification, reporting and verification issues related to LULUCF

### 4.1 Introduction

All regimes introduced in this report set targets for some combination of sectors and for some point in time in the future against some base year or period. And as soon as a target is set (in whatever way), a quota system arises, creating a tradable commodity. Aiming for a target implicitly means that quantification, reporting and verification will follow. This section will elaborate these issues for the regimes introduced earlier by discussing the issues of: spatial coverage, base year, scope, modalities, accuracy / level of detail and knowledge gaps. A general discussion for each issue will, if and when appropriate, be followed by comments specific to a given regime. But before going to those topics, one general statement has to be made that relates to symmetry of accounting.

Quite a number of problems that occur in the context of the Kyoto Protocol are caused by the fact that first targets were negotiated and after that the rules, modalities and guidelines for accounting for LULUCF were discussed. This led to some accounting procedures that are rather awkward: for instance the gross – net accounting whereby emissions/removals from a particular activity in the commitment period can be accounted whilst they are not included in the base year inventory. Therefore, one lesson that can be drawn is that whatever the architecture of the regime may be, symmetry of accounting related to the spatial coverage (also in base year versus commitment period), scope, accuracy and level of detail is importance: a pool or activity should not be left out from either side of the equation, both in base year versus reference period, as well as in terms of removals and emissions.

In the recent Accords, some exceptions have been made. For instance, Parties do not need to account for a given carbon pool if it can be demonstrated that this is not a source of emissions. This is not really unsymmetrical accounting but rather conservative accounting since it is known that the pool is not a source before deciding to exclude the pool from accounting. However, in principle and in first instance symmetry should be the point of departure for accounting for changes in carbon stocks and non-CO<sub>2</sub> emissions.

The box 2 below elaborated the different accounting approaches that are available.

## Box 2: Accounting Approaches

### Accounting approaches

Three mechanisms exist for the biosphere to contribute to climate change mitigation, namely: 1) conservation, 2) sequestration, and 3) substitution. The text of the Kyoto Protocol concentrates on number two, although implicitly mechanism three will be accounted as well but only through reduced use of fossil fuels.

The Kyoto Protocol covers only subsets of the total land instead of covering the land 'wall-to-wall'. Furthermore, the Kyoto Protocol requires reporting of carbon stock changes in the pools 'aboveground, belowground, litter, dead wood and soil organic matter'. This is close to full carbon accounting, which would cover wood products as well.

Still, within this given nomenclature for land and pools, carbon stocks fluctuate, i.e. a stored tonne of carbon does not stay in that pool for ever. To deal with these fluctuations several accounting approaches have been designed:

- The stock change calculates the difference between the stock of carbon in year  $t$  minus the stock in year  $(t-1)$ . In case a baseline is applied, the amount of carbon sequestered according to this baseline has to be subtracted as well.
- Average stock change: deals with the strong annual fluctuations by simply averaging the stocks over all years of a determined period. In this way most cases of a coincidence of low or high stocks in years of commitment would be dealt with.
- Temporary crediting approach: In this approach, credits that are awarded for afforestation or reforestation projects under CDM are only valid for a finite period of time. This means that once the validity of the credits has expired, the purchaser of the credits has to look for sources to replace them, in order to maintain the emission level. In document FCCC/CP/2003/6/Add.2 the COP has adopted two specific types of temporary credits called the tCER which has a period of validity of 5 years, and ICER which expires at the end of the crediting period of the project.

Many of the above mentioned aspects of accounting will come back in any new regime.

## 4.2 Spatial Coverage

**Note:** with spatial coverage in this context is meant the area of land that is covered by the regime, i.e. to what degree the land is included from 'wall-to-wall'. In section 4.4 the scope will be discussed that deals with activities and carbon pools that are included. If all activities and all pools are included this is referred to as "full carbon accounting".

Although there are three mechanisms to influence the carbon cycle in terrestrial systems (conservation, substitution and sequestration), the sink perspective of the regimes focuses on conservation and sequestration only<sup>7</sup>. Two choices are important: (1) which land uses and activities are included under the regime (coverage); and, 2) what level of detail is required for the reporting on those lands and activities. The spatial coverage of land under a regime obviously influences the level of completeness obtained in the regime.

<sup>7</sup> Substitution effects of e.g. bio-energy are recorded at the fossil fuel consumption side.

In general, a first division is made between managed and natural systems (although the difference between “managed land” and “land management” has sometimes led to problematic discussions as no firm definitions are agreed under the FCCC or KP). In both systems carbon can be conserved and stored but in managed systems the direct human influence on the carbon cycle needs to be taken into account. A further division in managed systems is mainly based on the vegetation cover (e.g. forest, grassland and arable land) and the type of management (grazing, no-till, etc.).

The traditional (current Kyoto) regime is a partial regime for the LULUCF sector. Only areas subjected to specific land uses are eligible (ARD, additional activities in agriculture and forestry, revegetation, the same activities under JI and afforestation and reforestation under the CDM). Certain land uses or activities are only eligible if they are initiated after a certain date (the ‘since 1990’ clause). On those pieces of land, in principle all carbon stock changes are monitored, but depending on the activity, only certain parts are accounted if they are capped, e.g. forest management. For agriculture a net increase in sink since 1990 is required.

Through this regime, gradually the area of “Kyoto land” increases. For most Annex I countries the ARD area will be very small and will stay within levels of 5 % of the total land area as a sum after 15 – 20 years. Current annual rates in forest area change for boreal and temperate countries are with 0.018% a minor fraction of the total land area (UN-ECE FAO, 2000).

With respect to the new regimes, different expectations arise. E.g. it is not clear yet whether LULUCF will be included under a regime designed on the basis of the Brazilian Proposal or the Contraction and Conversion approach. Here the discussions at this stage are still very much focused on target setting, not so much on how to achieve the targets. Including LULUCF under the Contraction and Conversion approach could well have a serious advantage: full contraction and convergence over a very short period of time, will lead to numerous transfers of allowances without any environmental benefits. This can be reduced by including the LULUCF sector, since this sector will include 1.6 – 2.4 Gt C emissions from non-Annex I countries, and it will include LULUCF in the temperate and boreal zone. This is not to say that this is the potential credit, not at all, as ultimately the deviation from the initial target is what counts, but it will limit the number of allowance transfers without environmental benefits.

For the other regimes – multi stage and a separate target for LULUCF it can be expected that the spatial coverage of the LULUCF sector will only increase compared to the traditional regime: in particular when targets are split by sector, which reduces the loophole argument that was always used against LULUCF. The coverage of the LULUCF sector in the multi-stage regime can vary from nil to the full inclusion of the sector, possibly under various accounting approaches, but it is clear that the coverage will increase over time. How much and by when is unclear.

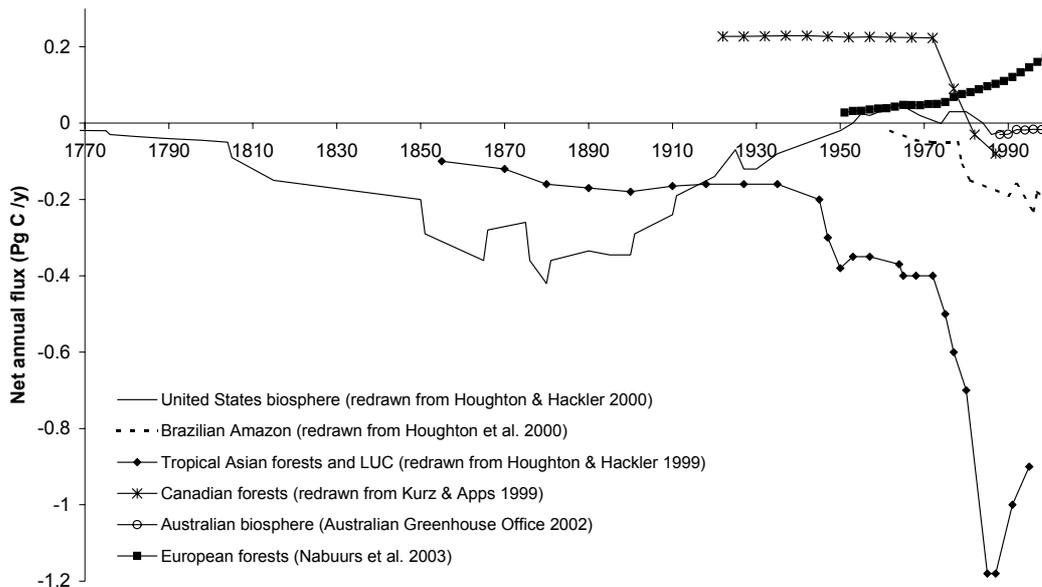
### **4.3 Base year**

When setting a reduction target it needs to be a reduction in comparison to a certain initial year (or period). This can take on many forms or shapes. The selection of the base year or period is crucial as it will determine the potential of the target and future options, as well as

the amount of “tropical ‘green’ air” in the case of reducing emissions from deforestation on a national scale (if a base year with a high deforestation rate is chosen as base year, it is easier to improve performance).

The quality of data and the availability of data on the basis of which to assess the situation in the base year or period will impact on the potential and options because a large uncertainty in the base year estimation will also have consequences for the potential contribution of the sector. The accuracy of the base year data will to some extent determine the emission reduction potential as refinements to the system need to be related to the base year.

In the Brazilian Proposal the base year, or rather the period over which the ‘historic’ emissions are calculated, is very important and can be negotiated to vary by country. This will increase complexity and the vagueness of base year can potentially create loopholes. The year at which you start to sum emissions in this approach will be very important. For example the year 0 A.D. will give the EU large LULUCF emissions, whilst the year 1800 will result in large LULUCF emissions for the USA. On the other side, 1970 will result in large emissions from LULUCF in developing countries (Figure 3.1). This can become a major obstacle in international negotiations.



**Figure 3:** Historic functioning of the biosphere per continent or large country (sink = positive) for six global regional case studies. Note that for Canada the net flux is the result of changes in natural dynamics, while for the other continents the dynamics are the result of land use changes and vegetation rebound (Nabuurs 2004).

All other regimes have comparable issues with respect to the base year. Taking into account certain sinks or sources for the base year should entitle them to account them for achieving the target as well. A final and important aspect of the choice of base year is the fact that the higher the emission in the base year, the higher the target that can be negotiated for the commitment period.



## **4.4**      **Scope**

**Note:** scope in this context is used to describe what activities and carbon pools are included or excluded for the landholdings that are included. If all activities and all pools are included this is referred to as “full carbon accounting”. In section 4.2 the spatial coverage has been discussed, which deals with the area of land that is covered by the regime, i.e. to what degree the land is included from ‘wall-to-wall’.

The scope of a regime (increasing scope meaning including more activities or pools associated with the included land-use types) may have an intermediate range where the scope is rather complex: with very few activities in the scope, reporting may be simple (as a small subset of UNFCCC reporting (see Box 3 on reporting)), whilst at the other extreme (including the whole LULUCF sector) reporting may again be rather simple as it is equal to UNFCCC reporting. Especially the intermediate stage can be very complex and difficult to monitor, certainly when specific accounting rules need to be applied. In particular when non-Annex I Parties are joining more stringent reporting systems when they would take on commitments, this is something to consider: it cannot be expected that such Parties have a sophisticated inventory and monitoring national system in place as of day one.

### Box 3: Reporting

#### **Annex I Parties**

COP 5 & 8 adopted the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”, also referred to as the UNFCCC reporting guidelines. According to these guidelines, Annex I Parties are requested to use the revised 1996 IPCC Inventory Guidelines to estimate and report on anthropogenic emissions by sources and removals by sinks of GHGs not controlled by the Montreal Protocol (decisions 3/CP.5 and 18/CP.8).

The SBSTA endorsed the IPCC good practice guidance (GPG) for non-LULUCF categories as an elaboration of the 1996 IPCC Inventory Guidelines and concluded that they should be used for inventories due in 2003 and beyond. Annex I Parties with economies in transition may phase in the IPCC GPG two years later than other Annex I Parties. According to the new UNFCCC reporting guidelines (decision 18/CP.8), Annex I Parties are requested to use the IPCC GPG in order to improve transparency, consistency, comparability, completeness and accuracy of their GHG inventories. The latest addition to the list of guidelines is the GPG 2003 which is good practice guidance for LULUCF. For Annex I Parties it is mandatory to use these as of 2005, except for inventory work related to Kyoto Protocol activities: for those elements the GPG 2003 is mandatory for the inventory conducted in 2008.

#### **Non-Annex I Parties**

The original guidelines for the preparation of initial communications by non-Annex I Parties, adopted at COP2 specified that non-Annex I Parties should use the 1995 IPCC Guidelines or the simplified default methodologies adopted by the IPCC, as appropriate and to the extent possible, in the fulfilment of their commitments under the Convention.

SBSTA 4 encouraged non-Annex I Parties to apply the 1996 revised IPCC Inventory Guidelines and at SBSTA 12 non-Annex I Parties were encouraged to apply the IPCC GPG for non-LULUCF (“encouraged” means it is not mandatory to use them).

The COP adopted revised guidelines for the national communications by non-Annex I Parties at COP8 and these new guidelines specify that non-Annex I Parties should use the revised 1996 IPCC Inventory Guidelines and encourage non-Annex I Parties to use the IPCC GPG for non-LULUCF to improve transparency, consistency, comparability, completeness and accuracy in inventories. With respect to LULUCF, non-Annex I Parties are encouraged to use the GPG 2003 for LULUCF for their inventories covering the year 2005 and beyond.

The Kyoto Protocol requires reporting of carbon stock changes in the pools ‘aboveground, belowground, litter, dead wood and soil organic matter’. This is close to full carbon accounting (FCA), which would cover wood products as well, when it is applied on the level of full spatial coverage.

Factoring out direct human-induced from natural and indirect human-induced effects on carbon stocks will in most cases be difficult, if not impossible. The IPCC claims that the current scientific knowledge is not sufficient to single out e.g. the effects of changes in temperature, precipitation, elevated CO<sub>2</sub> concentrations and nitrogen deposition on the carbon budget. However, the Parties have committed to “factoring out” in the preambular paragraphs of the LULUCF decision. For the 1<sup>st</sup> commitment period this is solved by applying a discount rate of 85% to increases in carbon stocks under forest management and the overall use of the credits is capped at individual country levels. But the issue remains to be solved in a more structural approach.

It has been argued now that if you practice FCA, you would not need to do *factoring out*. It has to be made clear here that these two terms represent different issues that in principle have no relation to each other, namely FCA is a matter of which pools you count, whereas

factoring out is a matter of which underlying processes you count. Only if Parties agree to do net-net accounting on an FCA basis, irrespective of the reason for the stock changes, then factoring out is no more an issue. (see also Annex I).

Under the traditional regime only specific activities in the LULUCF sector are to be accounted. This is the case for Annex I countries as well as for the CDM project activities in non-Annex I countries. Detailed guidelines for accounting additional activities, and how to deal with leakage etc. were recently adopted in the good practice guidance (GPG) for LULUCF elaborated by the IPCC. New inventory guidelines for all sectors are due in 2006, which will have a new structure: agriculture, forestry and land use. However, for the 1<sup>st</sup> commitment period the 1996 revised inventory guidelines of the IPCC and the GPG will need to be used by Annex I Parties.

The scope on the emissions side of the Brazilian proposal is very wide; all anthropogenic historic emissions. This implies that all sinks and sources are to be reported and accounted in a wall to wall, full accounting approach, in order to be able to establish a target on the basis of that information.

Variations can be thought of where only the emissions of particular sectors are taken into account. For example, when opting for emissions related to deforestation, only emission reductions (both CO<sub>2</sub> and non-CO<sub>2</sub>) obtained via afforestation and reforestation would apply. Taking up (parts of) the LULUCF sector will make the Brazilian proposal increasingly more complex as historic data of land use and land-use changes will be required.

Concerning scope, the 'separate target for LULUCF' and the 'multi stage regime' are the most flexible whereby separate targets are set for the LULUCF sector. In the multi-stage regime this can further be subdivided in individual (sub)sectors, GHGs or activities, and gradually tighter targets can be set when moving from one stage to the next, or from one commitment period to the next in the case of the separate targets regime. This will mean that in terms of scope each Party, and each part of the LULUCF sector can be in a different stage. This again will increase the complexity.

## **4.5 Modalities**

Rules, modalities and guidelines are used to define the boundaries of the regime and should be designed in such a way that negative effects/loopholes to other systems or sectors are avoided. Full inclusion of the LULUCF sector with simple tracking of stock changes and non-CO<sub>2</sub> emissions requires least modalities as it is equal to UNFCCC reporting.

In the traditional (Kyoto) regime some examples of modalities to define system boundaries are the baseline, leakage, project-based reporting, etc. In general as more goals, thresholds, caps or system boundaries are introduced, the system becomes more complex. One way to avoid this is a stepwise approach (tiers) allowing simplified modalities for small scale projects or for groups of countries (e.g. least developed countries).

The regime with a separate target for the LULUCF sector is open to different modalities for different sectors. Different sub-targets for sub-sectors as in the multi-stage regime, may lead to an exponential increase in modalities needed however: different modalities how to report and at what level of detail for each stage is required. In that respect the separate target regime – with possibly one set of modalities for all countries – is less complicated compared to the multi-stage regime.



If contraction and convergence is also applied to the LULUCF sector, then country-specific circumstances start to play a major role. Contracting current emissions and then converging to equal levels amongst Parties will cause discussions on how to cater for country-specific circumstances, e.g. natural disturbances that cannot be controlled, speed of growth of forest due to climatic differences, etc. This implies that many different modalities may be needed in order to take this into account.

#### **4.6 Accuracy and level of detail**

Accurate information is crucial under all regimes and in all reporting systems. Certainly under the current Kyoto Protocol in which Annex I countries have emission reduction targets of a few percent only, highly accurate reporting is required: small changes in large gross emissions have to be detected. Currently the reporting is organized by Tiers. Applying a higher Tier in general means higher accuracy, i.e. higher level of detail, more country-specific data. Depending on country-specific circumstances and the significance of a source, a country can choose to report at a particular Tier level.

In all new regimes the above mentioned will most likely stay the same, considering the Good Practice Guidance and Inventory Guidelines of the IPCC have either been just adopted (those for LULUCF) or are in the process of being updated (the 1996 revised guidelines will be re-published in 2006 in several Volumes). Refinements of existing data collection and registration systems should allow for comparison with the initial system to maintain time series consistency, which applies also when moving from one stage of a regime to another. However, new regimes can be simplified by either not accounting for biospheric sinks, or by including the biosphere entirely in all countries. The latter allows for coarser scale sampling, and avoids the search for pieces of land that fall under the regime. In addition, it avoids leakage if all countries are included under the regime.

Inventories of carbon stocks and activities related to the carbon cycle should preferably make use of existing (national) data collection systems. At a global scale the FAO data base provides qualitative information that can be used at the lowest Tiers. Depending on the importance of a certain sector for a country more detailed information is usually available, of course within the range of capability and capacity of the country. It should be kept in mind that none of the existing data systems (including soil and land use/cover inventories) were designed to assess carbon levels in these systems.

Information needs for the reporting systems are: area, activity, biomass, soil carbon, dead wood, litter, the relation between the activity and carbon contents, relation between the activity and the area, etc. For agriculture the farming/cropping system would be a first level of entry (FAO data). This farming/cropping system approach allows for nested country/region-specific refinements.

Mapping activities in agricultural systems is not done on a regular basis normally. For forests, most European countries have a detailed and ongoing forest inventory system. In Western European countries alone, these are carried out through regular field visits of over 420,000 plots. In former eastern European countries, these inventories were carried out as well, not on a sampling plot design, but through field visits with visual assessments on all stands (full tally).

Accuracy is not only a matter of better and more sophisticated techniques but will also require a detailed understanding of processes and activities related to the carbon cycle. In

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high input systems human interference is the overruling factor which determines the carbon emissions. In low input/natural systems environmental factors (soil and climate) are the determining factors. In general more complex systems require a higher level of detail and certainty. When for example factoring out direct and indirect effects are crucial in the regime, this will require detailed mapping of e.g. nitrogen deposition and activities.

In the traditional regime separate areas of “Kyoto land” need to be monitored in a geographically explicit way with a maximum assessment unit size of 1 ha. Rather sophisticated data collection methods are required to reach a low uncertainty level for annex I countries due to the complexity of the regime. Methods need to be consistent over time but quite some flexibility is left to the countries regarding land-use classes and there is no fixed level of accuracy prescribed, as long as the tier level that is applied is determined by an assessment of key categories.

#### **4.7 Knowledge gaps**

It is the large natural spatial and temporal variability that is so characteristic for the LULUCF sector that will continue to challenge accurate quantification, monitoring and reporting. This is partly related to data quality, e.g. data on agricultural and forest soil management, but is also related to the insufficient scientific understanding of the underlying processes. At higher Tiers, large knowledge gaps will still remain even with huge investments in science and monitoring. Given the high variability, policy makers should take this into account when designing a regime. Certainly for the Parties that have a large source or sink, higher Tiers are required and knowledge gaps remain.

It is not realistic to expect from all individual countries, especially the least developed countries, that a stand-alone data collecting system for carbon is available or will be developed. Using proxies and/or models to assess changes in carbon stocks and non-CO<sub>2</sub> emissions, could in such cases be a possible way to achieve an acceptable level of detail and accuracy. National, geographically non-specific data, as collected by the FAO, represents the other end of the spectrum, and is often more applicable to larger scales with less complexity.

At this stage it is unclear to what degree the LULUCF sector may be included in future regimes and whether specific knowledge requests in relation to a particular regime will arise, but some areas are already well known. The list below, which is only addressing issues associated with the LULUCF sector (and not for instance; what are “safe” levels of emissions to avoid dangerous interference with the global climate system, etc.), doesn’t claim to be exhaustive but is a start of listing knowledge gaps that warrant attention in the years to come. The list should remain a “living” list that can be modified and to which can be added.

Knowledge gaps identified here and to be address in the upcoming years:

- a) factoring out different types of effects on carbon stocks (natural, direct and indirect human-induced effects): at what scale can we apply which methodologies, and for what type of LULUCF activities is factoring out actually relevant<sup>8</sup>;
- b) quantification methods for biomass and soil carbon;
- c) assessing the scale of the offset potential of various 3.3 or 3.4 activities in some key non-Annex I countries, if they were to join Annex I;
- d) how can avoiding deforestation be included under the CDM without unduly crediting and violating host country sovereignty;
- e) or should avoiding deforestation not come under the CDM but rather be allowed as (sub-) sectoral target?;
- f) which agricultural activities could be included under the CDM;
- g) how can the sustainable use of natural resources be promoted under the climate regime;
- h) how can carbon stored in wood products and associated emissions be included in the annual inventory reports and assist parties in meeting their Article 3 commitments;
- i) how do forest degradation, devegetation, and deforestation relate to each other and how should they be dealt with in future commitment periods;
- j) can levels of standing stock or area per vegetation type be monitored on a larger scale, e.g. pan-European;
- k) should SD objectives be integrated in a climate change regime, and if so, how;
- l) can synergies between the Rio-conventions be integrated in a future climate regime;
- m) how can adaptation strengthen the article 2 objective of enhancing sinks and reservoirs and how can sinks contribute to adaptation measures;
- n) develop appropriate thresholds for a multi-stage regime
- o) ...
- p) ...

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<sup>8</sup> Effects such as nitrogen deposition, elevated CO<sub>2</sub> concentrations, higher temperatures are of influence on removals, not on emissions. Effects will be harder to distinguish from one another in existing vegetation cover. In newly established planting growth will be mainly due to the fact the vegetation has been established. In the case of avoiding emissions from logging, harvesting or deforestation leading to the decay of biomass, factoring out is not relevant as emissions are not influenced by these phenomena (see also Annex I).

## 5 LULUCF, Sustainable Development and Adaptation

### 5.1 *Relation between Sustainable Development and LULUCF*

The interfaces between Sustainable Development (SD) and Climate Change (CC) are manifold. Examples of some parts of the overall developmental pathways of e.g. developing countries that are associated with CC are: food supply, water availability, environment, biodiversity, poverty alleviation, and in general rural and economic development. But it has to be clear that there are linkages in either direction (development also impacts on emission profiles) and that those linkages need to be strengthened where it concerns addressing both SD and CC simultaneously, irrespective of whether the linkage is positive (a synergy) or negative (a conflict, e.g. over resource use).

The toolbox that is at our disposal to establish and/or strengthen the linkages also contains many options/tools: capacity building, technology transfer (including innovation), technology switches, financial management, establishing institutional frameworks, etc. etc.

At this moment all these subject are studied and being written about but a clear agenda is yet to evolve. This section is not bringing to bear the golden bullet but rather elaborates on some of the inter-linkages between SD and LULUCF. At the end of the chapter some of the issues will be brought together after the adaptation perspective has been discussed.

#### **General linkages between SD and LULUCF**

When SD is discussed automatically many of us think about developing countries, but there is an industrialised country perspective to SD as well: the strategies for developing and industrialised countries in relation to SD and CC are different. In simplistic words the strategies for developing countries will be inclined towards fast development with an emphasize on the economic aspects, a reduction in vulnerability to CC, and a reduction of the impact damage of CC, whilst industrialised countries will tend to emphasize an enhancement of welfare and wealth, limit the (economic) impact of CC policies, enhance local air quality and the general 'quality of life', etc.

In many developing countries the issue of CC is overshadowed by a number of immediate development priorities. Although CC is not a direct priority, it is clear that developing countries are more vulnerable to CC and are more concerned with the synergies and conflicts between SD and CC mitigation measures.

Linkages between SD and LULUCF are in particular clear in the areas of biodiversity, agriculture, forestry, natural resource management, wildlife and recreation (and hence, tourism), "quality of life" (landscape aesthetics, recreation), income generation (jobs in agriculture and forestry, bio-prospecting, non-timber forest products), watershed



management (incl. water availability), combating desertification and salinisation, nutrient cycling, soil fertility and water retention (sustainable agriculture and avoidance of soil degradation and/or erosion), and adaptation (which will be discussed in the next section).

Quite a number of the interfaces between SD and LULUCF are covered by the family of Rio Conventions and the Ramsar Convention on Wetlands. Hence, the cooperation between these conventions has received ample attention. This cooperation has not led to any effective initiatives or measures in the field yet but on organizational and expert level some progress has been made. Inevitably this will take time.

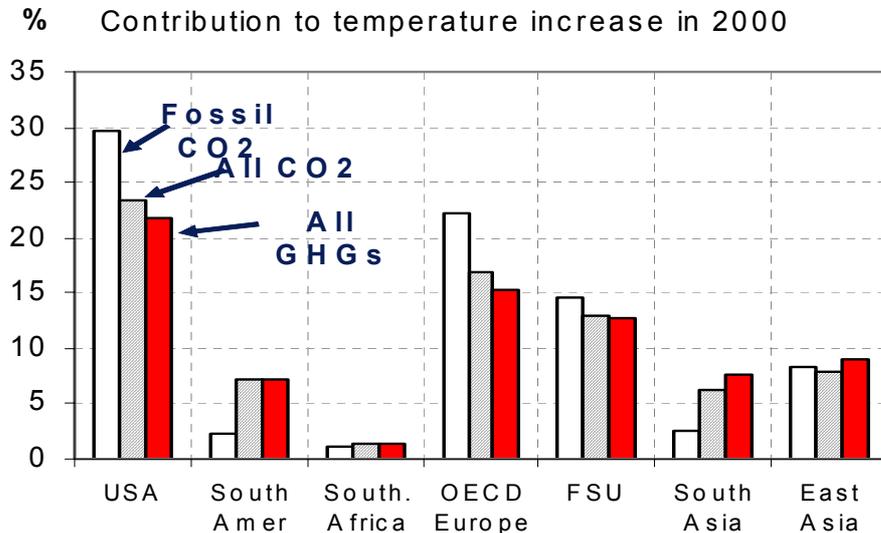
From a developing country perspective it can be stated that emission reduction and carbon sequestration should improve livelihoods and should not compete with food security and biodiversity goals. Competing claims for the scarce land resources could result in a decrease of productive agricultural land and force people out of their livelihood. On the other hand, rural development programmes aiming at long-term sustainability can benefit when taking climate variability and climate change into account and the additional information on CC and climate variability may help in targeting already scarce resources more efficiently. Payments for carbon may also be an extra incentive for carbon friendly management in marginal areas where people depend for their livelihood on the natural resource base. This will, however, only work when the rules are such that those who work the land are allowed to benefit. Therefore, environmental and social safeguards are required to avoid detrimental impacts of climate change mitigation objectives; this will also require systems/partners that will be able to enforce rules and regulations.

Besides environmental and social safeguards financial mechanisms are needed to reach resource-poor households. In order to allow carbon offset project to be additional to the income of individual households a transparent financial structure is required. The mechanism used to reach the rural poor will also have consequences for monitoring and verification, e.g. a high level landscape/regional approach for instance, will allow free riders behavior. To allow individual land managers to gain from the carbon market an activity-based or project-based inventory system is the most logical option, although an implication of this would be the requirement of a high level of detail in terms of inventory and monitoring activities.

### ***SD, LULUCF and the ultimate objective of the convention (Article 2)***

If a broader look is taken at the issue of SD, the ultimate objective of the convention laid down in Article 2 comes into the equation which decides that we need to stabilise GHG concentration in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. This is a strong message: our planet, with mankind as its citizen, cannot continue to develop in this fashion: our survival is – amongst other things – dependent on stabilising the GHG concentrations. And one look at the make-up of the global emissions profile teaches us that emissions from the land-use change and forestry sector are globally a significant player. Hence, we cannot ignore the land-use change and forestry (LUCF) sector in the development of a (survival) strategy.

Figure 4 shows the relative contribution to the increase in temperature by the year 2000 for the different geographic regions (Den Elzen et al., 2004)



**Figure 4:** Relative contribution to temperature increase in the year 2000 (Den Elzen *et al.*, 2004)

The emissions from the LUCF sector are predominantly occurring in the tropics (16.1 million ha yr<sup>-1</sup> of deforestation in the 1990s (FAO, 2001 (Forest Resource Assessment)). In that same period the contribution of land-use change was calculated to be 1.6 + 0.8 GtC yr<sup>-1</sup>, which is about 25% of the global total (IPCC, 2001). Furthermore, it is known from modeling exercises of e.g. the RIVM that if we want to achieve acceptable levels of GHG concentrations (e.g. 450 or 550 ppmv), we have to bring the LUCF emissions into the equation. Not only from a point of view of reducing the global GHG concentration in the atmosphere we need the LUCF sector, but also looking at it from an economic perspective: it would simply become too expensive to let emission in the LUCF sector perpetuate as they are doing now and compensate them with reducing emissions in the other sectors. To put it plainly: without LULUCF integrated low stabilization levels cannot be reached. In that respect an important notion is that the choice of stabilization level is far more important than the type of regime that is chosen to achieve that level. Furthermore, the participation of Parties is crucial. For instance, stabilization at 550 ppmv would require a substantial reduction from the baseline in middle income non-Annex I regions by 2025 already (Berk, 2004).

So, what options do we have to include the emissions from land-use change and forestry (amongst others deforestation) into a future regime? Some handles have already been offered in previous chapter, but a major positive contributor would be if emissions from deforestation or forest degradation (or other unsustainable land uses) could be reduced or avoided. This basically boils down to the **wise management and maintenance of existing carbon stocks**, or as article 4.1(d) of the Convention refers to it: “**Promote sustainable management, and promote and co-operate in the conservation and enhancement, as appropriate, of sinks and reservoirs.....**”. This does not exclusively relate to forests, but also to peatlands, agricultural lands, etc.: any system with carbon contents. The article lists



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indeed "...biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems".

### **Avoiding deforestation**

In the past the discussion was focussed on among others the inclusion of what was referred to as "avoiding deforestation" under the CDM. As there were many operational problems with the inclusion of that activity under the CDM, it was rejected as an eligible option. Now, we acknowledge that this issue needs to be taken up in a broader context than that of 'just' deforestation and a more suitable name would need to be put forward. In that respect the original formulation of Article 4.1(d) may offer a solution: "conservation and enhancement of sinks and reservoirs". Recently several approaches have been brought forward to deal with some of the issues that were problematic in the past. Three of those will be mentioned here.

#### 1. "Compensated Reductions"

The idea originates from a Brazilian NGO called IPAM, but is supported by other organisations such as the Ministry of Environment of Brazil and Environmental Defence of the USA. The idea is that a country reduces the national deforestation level during the 1st commitment period below for instance the level that occurred between 1980 and 1990. The country will then post facto be compensated with temporary credits as we now know them under the CDM (tCERs). Once the country has been compensated it needs to agree that it will maintain that level of land-use change or reduce it even further. This idea basically boils down to a voluntary national baseline for deforestation. In the original proposal base years of periods can be varied per Party, depending on their performance in this area. And if hardly any deforestation occurs, the current stocks can be used as a baseline.

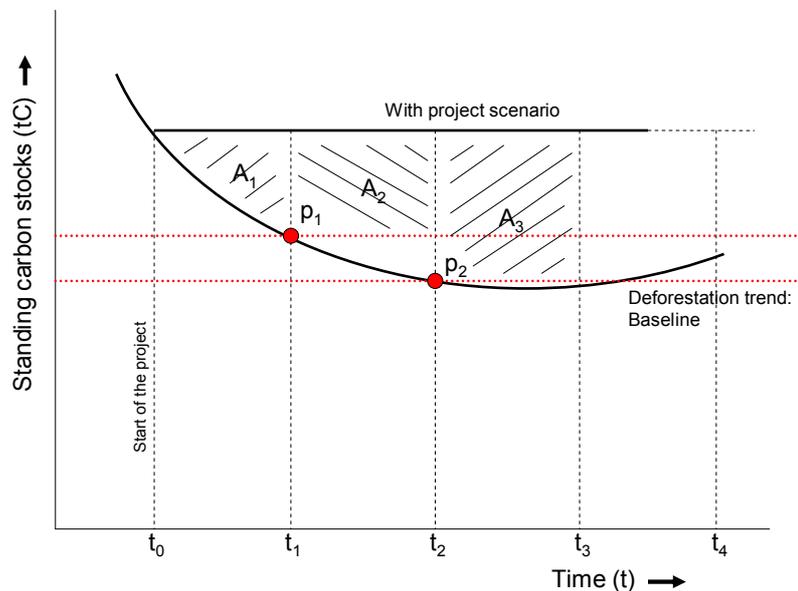
#### 2 "Soft Capping"

A proposal made by Ian Noble from the World Bank. This proposal allows a country to select a region (e.g. whole country, province, smaller area) and determine the most likely future trend of deforestation, after which a baseline the baseline is fixed and assessed by independent 3rd parties. The country would then negotiate a target for a fixed period of time. If it performs well, then credits can be issued which are set aside in a "buffer" or reserve. Such a reserve could be used if deforestation is resumed and performance against the baseline is not adequate. If the reserve has a 'safe size', excess credits can be sold on the market. Hence, in years or periods that the performance is below the target, credits are taken from the reserve and trade is not allowed. This system would also use the tCER concept to deal with permanence issues.

#### 3 "Flat rate baseline"

This proposal predominantly deals with the criticism of issuing credits against a baseline that predicts a future trend whereby deforestation increases. Some have argued that this would incentivise "bad behaviour" before projects are initiated. That way the potential for gaining carbon credits in future is enlarged because the business as usual scenario is more dramatic (deforestation rates are high). To avoid this, a flat deforestation rate could be set for fixed periods of time. For instance, if commitment periods continue as five year periods, one could make an estimate what deforestation level is likely to occur in the 1st year of the commitment period and take that as the rate to apply to all 5 years in that commitment period. At the end of the commitment period a new level could be set, against which credits can be earned.

This proposal can be combined with the Soft Capping Proposal without any problem. Figure 5 illustrates the idea.



**Figure 5:** Flat rate crediting against a periodically updated baseline (Trines, 2004)

It has to be emphasised here that the 3 approaches presented in this section are not mutually exclusive, on the contrary the “compensated reduction approach” and the “soft capping approach” are variations on the same theme and the “flat rate baseline proposal” is dealing with just one facet of establishing a business as usual scenario, something that has to be done in all cases. So, for future analysis, one option would be to bring all these ideas together and see what problems still remain.

Obviously there are numerous areas that warrant further thinking and would benefit from some additional development efforts:

1. The compensated reduction proposal is basically a (sub-) sectoral target and the Soft Capping proposal a regional baseline. Both could probably fit well with the Multi-Stage Regime of the separate sinks target regime.
2. National Baselines and monitoring systems for sinks avoid the problems of leakage, additionality and permanence on a national level (international leakage remains an issue), but they are very hard to determine or agree upon.
3. What is the level of hot air that we create and how does that relate to the overall objective of the Convention (article 2): do we want to give a strong incentive for the wise management and maintenance of existing carbon stocks or not?
4. Continued deforestation ultimately leads to zero emissions when there is no forest left to deforest. Meaning: deforestation will go down eventually in any case given time, which may lead to windfall credits if the baseline doesn't reflect this. One solution that has been

- brought forward here is the use of a relative baseline: expressing deforestation as a percentage of the remaining forest. Is this a real option for all this type of activities?
5. What is the exact interaction between the degradation of systems and deforestation? Not always does deforestation come in one go. Often areas / vegetation has been (seriously) degraded over a period of time that can stretch over a decade before the final step to deforest occurs. How would this be monitored, and credited?
  6. How would income generated by Parties with the sale of credits resulting from a national baseline be slotted back to the actual land users, or those that have realised the reduced deforestation?
  7. Is the Soft Capping Proposal a good way for developing countries to take on a voluntary target for a safe region; a region that they can administer / control? Would this tempt non-annex I Parties to increase their level of participation in a regime?
  8. And what about the sovereignty issue? Is that solved once the country itself can propose its baseline or the region that will be used for the voluntary target? Or is it still an issue?

Many areas remain that can be studied and that should be studied. But a few messages have become very clear:

- Deterioration of sinks and reservoirs currently contributes significantly to the increase of GHG concentrations in the atmosphere;
- Not just CO<sub>2</sub> is important in this respect but all GHGs;
- We need to include the sinks and reservoirs in our effort to stabilise GHG concentrations in the atmosphere at low(er) levels that will help us to meet our Art.2 commitment; and
- Reducing emissions from LULUCF **in all geographic regions of the world, and particularly in the tropics** is key if we want to achieve stabilisation levels of GHG concentrations in the atmosphere that avoid dangerous interference with the climate system!

### **Specific comments on the linkage between SD, LULUCF and the CC regimes**

In all regimes positive effects on sustainable development are anticipated; halting deforestation and land and vegetation degradation, contributing to conservation and combating desertification, etc. The positive environmental effects are expected to provide a sound basis for the wise use of the natural resources thus even generating an economic momentum and so providing job opportunities.

On the other hand the fear of reducing development options in land use (e.g. expansion options for agriculture and forestry) may be a barrier for countries to join a climate regime. The time frame for which partners have to commit to e.g. a carbon project (for instance > 10 years) may hamper other (perhaps better) options in the future. This barriers will be lowest in systems with wall to wall accounting and high levels of flexibility, e.g. with respect to moving from one stage to the next. In general regimes need to allow for changes related to the local development priorities.

In any regime that includes LULUCF, countries with large areas under agriculture and forestry and that do not strongly depend on these sectors for their development, LULUCF may open new opportunities to enter new markets. The same may be true for marginal areas that are stunted in development because agriculture and forestry do not provide enough income or opportunities for further development and other options (industry, services) are not available. In those cases additional revenue of money from carbon offset

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projects may provide the option to afford the necessary inputs to lift agricultural production and production stability.

In general forestry generates less job opportunities than agriculture. Therefore, the effect of LULUCF in terms of jobs and income will be limited. But even when small amounts (e.g. 3 \$ per tonne) are paid for carbon it can have a significant effect on the income of individual households in poor regions and contribute to the development of these regions.

In general, the rules and guidelines for the regimes and their enforcement will determine whether positive effects are not counter-balanced by negative side effects. Especially when a market-oriented approach is adopted differences between land owners and those that depend for their livelihood on the land will become important: the rules on how carbon is accounted for will to a large extent determine the effects on the biophysical environment and which groups of individuals will benefit.

Reducing emissions will require changes in managed systems and new management and technologies will need to be developed. Such low and high-tech options may trigger new development pathways and open opportunities.

The cost effectiveness of projects is unclear, initial costs in reforestation are expected to be relatively high. In agriculture adjustments in farm management may be easier/simpler to embed in current farm management. Monitoring activities will, however, be complicated, and the chances and speed of reversal significant.

## **5.2 Relation between Adaptation and LULUCF**

Push or pull? Is adaptation going to be a sweetener to help swallow a bitter pill, or is the link with LULUCF and mitigation the savior for adaptation. Both adaptation and mitigation are engrained in the UNFCCC, so linking the two in a future regime seems logical. To anticipate who will push and who will pull it is helpful to realize that developing countries are the most vulnerable to impact of CC and hence, find adaptation of critical importance, whilst developed countries find mitigation the most important aspect of the two, pushing some developing countries to start reduce emissions as well.

But adaptation will gain importance, because even if a mitigation policy would lead to zero emissions growth, impacts will continue for decades and even centuries. Unfortunately a scenario of zero emissions growth is not possible and industrialized countries remain responsible for the greater part of the emissions, leading to impacts that are felt most in developing countries. Hence, adaptation remains not only necessary but it is also the right thing to do in terms of equity and ethics. A fortunate advantage of activities in the LULUCF sector happens to be that in some cases mitigation of CC is achieved, whilst at the same time the activity also assists in adapting to CC: both the avoidance of deforestation and the protection and enhancement of existing carbon reservoirs leads to the mitigation of CC, the reduction of vulnerability to CC (e.g. reduce the chances of landslides, reduce peaks in water run-off, regulate local climate, retain water and soil fertility, etc.), and the adaptation to CC (e.g. mangrove forests in coastal areas that are periodically subject to inundations, and the enhancement of system's resilience). The direct link to SD is evidently there.

### **How to link adaptation and LULUCF**

A simple strategy to combine the two could be to allow countries to benefit from mitigation only when a clear adaptation strategy is defined. Obviously the other way around could also apply: allowing benefits for adaptation when a clear mitigation strategy is defined.

The level of detail at which the strategy should be defined will depend on: i) the regime choice and ii) the development level of the country, as any approach including adaptation will be more critical for resource poor, vulnerable countries (coastal areas, small island states, semi-arid regions).

Options to invest in adaptation measures in vulnerable countries can be stimulated in line with the way that is done for mitigation: actions should focus on high impact areas and sectors and investments in adaptation can follow the same principle.

When aiming for wider participation in a new regime, LULUCF is essential simply because some countries have no alternative sectors allowing them to participate. In any case LULUCF offers opportunities to combine mitigation and adaptation strategies taking into account local development objectives making it an interesting arena to combine CC and SD goals.

Adaptation strategies to climate change can not be seen separate from immediate development priorities (e.g. food and water security, health, water quality) developing countries are facing. The “who pays” discussion focusing on incremental costs or additionality is an essential issue that needs to be resolved to move forward on the adaptation agenda. At the moment the reasoning seems to be in an impasse and a pragmatic approach to break the deadlock is needed.

Developing countries have difficulties in addressing pressing development issues; targeting adaptation options related to climate change seems to be beyond their current reach. Working in a SD context implies a long term vision on local development priorities in which short and medium term goals can be defined. When taking this approach, investments in infrastructure and public works, technology transfer, investing in human and social capacity, institutional capacity building in a sustainable development pathway are directly linked to adaptation. Unraveling the two seems illogical.

Trying to assess the cost effectiveness of mitigation versus adaptation is disqualified as a serious way of looking at the issue. A pragmatic approach could be to assume that incrementality is related to the type of project and the development status of a country. There is no lack of theoretical frameworks to assess the current situation and capacities. How to prioritize actions and how to implement actions in a ‘learning by doing process’ is lacking. In land use synergies between mitigation, adaptation and sustainable development are manifold which will become clear in a more pragmatic sustainable development approach. Such approach could however result in a weakening of the CC agenda because it is overshadowed by immediate development priorities.

Adaptation will be a necessity for developing countries, mitigation not, at least not for most. Faster developing countries with large populations such as China and Brazil, or middle incomes such as South Korea and Israel, obviously are now becoming a group of countries in the CC debate that require a separate approach. When both adaptation and mitigation are not linked, a voluntary response to take on mitigation targets by developing countries is unlikely. When adaptation is not put on equal terms with mitigation developing countries are less likely to engage, continue or strengthen the commitment to the UNFCCC process. But this should not be the sole reason for industrialized countries to push this envelope: in

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particular the EU has committed to the “polluter pays” principles and in that respect adaptation can be seen as the price to pay for our economic development.

So far the private sector has not been clearly involved in the process of adaptation and mitigation in LULUCF. Globalization will strongly influence production and flows of agricultural commodities in some case strengthening the position of the private sector at the cost of the powers of individual nations. A market driven strategy will need to strengthen the competitiveness of agricultural commodities. Sustainable production, including addressing CC considerations, may prove to be the starting point of these strategies. Investments in technology transfer, human and social capacity or institutions should benefit both the competitiveness and SD objectives.

### **5.3 So, what about an agenda for SD, LULUCF and Adaptation?**

Good question! For countries that rely for their development on climate-sensitive sectors, adaptation is more important than mitigation, mitigation being strongly related to development in general and preferably to make development more sustainable. So far, although both are part of the UNFCCC, the adaptation agenda has lagged behind the mitigation agenda and as said before, industrialized countries have put a strong emphasis on emission reductions, using a market-oriented approach. This has resulted in a stalemate in which developing countries are possibly not willing to continue the debate without a correction of this disparity in the treaty. Land-use systems will allow for a combination of the two, both serving adaptation and mitigation, with the potential to make development more sustainable.

The latter is an important aspect. Although they seem miles apart, adaptation may well be the best strategy that leads to mitigation. On one hand it is clear that more mitigation leads to less CC, which in turn leads to less damage with the same adaptation *or* the same damage with less adaptation. Reversely, more adaptation leads to less damage from the same CC *or* the same damage from less mitigation *or* more CC. This offers an interesting perspective. So far, we have been calculating the costs of adaptation versus the costs of mitigation, whilst what should be calculated is the costs of residual impacts *plus* the costs of ‘net’ adaptation versus ‘net’ mitigation (‘residual’ are the costs after adaptation and ‘net’ includes accounting for co-benefits and ‘co-damages’). This assessment could plot the most optimal strategy of dividing (financial) efforts between adaptation and mitigation, realizing that resolving this issue should be driven by more than internalizing costs. The bottom line is that there is a trade-off between mitigation and adaptation, but they are interlinked in a stronger fashion than the CC negotiators have been willing to accept to date/*or* able to work out to date.

One of the main problems is that there are many sectors and stakeholders involved in adaptation that do not have CC as a prime concern. But assisting those sectors and stakeholders in adapting to CC and develop sustainably ultimately leads to decoupling development and emission curves.

#### **Measures to contemplate in the LULUCF sector to promote SD and Adaptation**

Measures should be taken both in industrialized and developing countries. Some are listed here but again, this list doesn’t claim to be exhaustive.



- 
- Primary forest systems should be protected through e.g. indemnification of logging companies (leakage control is of crucial importance in this option!) by international partnership with e.g. the World Bank, GEF, large conservation NGOs etc;
  - Enhancement of secondary forest systems through the support of sustainable forest management, possibly with the aid of the same type of partnerships as outlined above;
  - Continued development cooperation with an increased effort on assisting the rural poor to improve their livelihoods through improved and adapted natural resource management;
  - Increase the support for the protection and enhancement of wetlands for watershed management and the avoidance of water table fluctuation in peat lands that lead to large emissions from non-CO<sub>2</sub> greenhouse gases;
  - Continue and improve efforts to translate the synergies on paper between the Rio-family of conventions and the Ramsar convention to tangible projects and activities, in the field and the development of implementable policies aimed at the field-level activities;
  - Develop frameworks to establish all of the three following links: 1) climate policy and development policy; 2) adaptation policy and development policy; and 3) mitigation policy and development policy;
  - Continue to pursue international agreements on the sustainable use of natural resources but continue to work at the same time at grass-root level;
  - Continue to improve knowledge on practicable methodologies for soil management and integrated natural resource management;
  - Extend the scope of the CDM with activities that fall under the categories agriculture and conservation, which enables the implementation of such projects in developing countries;
  - Increase efforts to collaborate with fora working on coastal defenses to apply where possible mangrove forests as tidal defenses;
  - ....
  - ....

## 6 Discussion

### Assessment of issues

The regimes that are presented in this report are different in the way the targets are set as explained in chapter 3: in one group of regimes LULUCF is a module of the overall climate regime, and in another group of regimes LULUCF has (or has not!) been incorporated into the basic principle and methodology of the regime.

With respect to the second group, in this report consisting of the Brazilian Proposal and the Contraction and Convergence approach, one has to assume that the scope (pools and activities) and spatial coverage (area) is 100% in both the base year/period, as well as in the period during which the commitment has to be fulfilled, in case LULUCF is in the basic design. Theoretically some areas, pools or activities could be excluded but the data collection that is required to determine historic or current emission levels is already so complex that the additional burden of separating out particular areas, pools or activities is barely feasible.

With respect to the first group a sliding scale can be envisaged whereby both the scope and the spatial coverage (both globally and nationally) differ between regimes as well as over time under the same regime. The clearest example in that respect is the multi-stage regime whereby gradually the scope and spatial coverage will increase over time at a rate that is determined by external factors such as GDP, overall emissions, etc.

The spatial coverage will not only increase over time within one country, but it can be assumed that the global spatial coverage will also increase as more and more parties start to participate in the regime. If the intention of parties is to ultimately include both scope and coverage for a full 100% percent, modalities can be designed to arrive at that point. And if so desired, parties could agree to a moment in future where this has to be realised.

In table 1 below the main issues are summarized for all of the items discussed in chapter 4.

**Table 1: Main Issues**

A. Coverage	<ul style="list-style-type: none"> <li>a. Least problems occur if all lands are included or hardly any.</li> <li>b. In case of full coverage, no system boundary problems occur that need to be monitored.</li> <li>c. In case of partial coverage, many boundary issues arise.</li> <li>d. In all cases natural (eco) systems and natural phenomena (e.g. fire) would be separated (ideally) in inventory and monitoring activities.</li> </ul>
B. Base year	<ul style="list-style-type: none"> <li>e. A base year or period is always required but can also be the previous year or the previous (commitment) period. In general a more recent base year enhances the chances of reliable data.</li> <li>f. The level of emissions/removals in the base year determines the offset physical potential of the option in terms of how much can be offset. Political decisions reflected in modalities can put a significant filter over the offset potential obviously.</li> <li>g. The accuracy of information in the base year determines the possibilities of loopholes occurring.</li> <li>h. Relative high emissions in the base year means high targets can be negotiated (depending on political will).</li> </ul>
C. Scope	<ul style="list-style-type: none"> <li>i. Least problems occur if the scope is full or very little. In all intermediate cases complications arise. A limited scope complicates because of all the in and exclusions from the system.</li> <li>j. Factoring out particular effects remains an obstacle.</li> <li>k. Symmetry in accounting is important to keep a balance between base year/period and commitment period (unless gross-net accounting is accepted).</li> <li>l. The separate LULUCF target approach and multi-stage regime are best in facilitating differences or changes in scope. The traditional approach can obviously cater for changes as well but it seems harder to accomplish with the KP in place (it is sometimes easier to start from scratch than to change what is there).</li> </ul>
D. Modalities	<ul style="list-style-type: none"> <li>m. Modalities are simplest in case of full coverage and scope.</li> <li>n. The more stages, the more modalities are required. In that respect, the separate targets regime has advantages over the multi-stage regime.</li> </ul>
E. Accuracy / level of detail	<ul style="list-style-type: none"> <li>o. As soon as targets are set, a higher accuracy is required to measure/verify compliance.</li> <li>p. Low targets require a higher accuracy as smaller changes in stocks need to be detected.</li> <li>q. Tiers can simplify the system.</li> <li>r. Time series consistency is crucial when moving from one stage to the next is an option.</li> <li>s. Options of full or virtually no LULUCF included are simplest; a coarse system versus virtually no system. Less complicated means that less system boundary problems can occur.</li> <li>t. In high-input systems the human interference with carbon stock levels are most important. In low-input systems environmental factors (such as soils and climate) are dominant.</li> </ul>

### **Very early conclusions on the main issues table**

As the experience with the Kyoto Protocol has shown, things can become rather complicated. And the more complicated the regime and the modalities, the more unexpected outcomes or loopholes may occur. Therefore, striving for simplicity has merits. From table 1 several conclusions can be drawn, although this needs to be done cautiously at this early stage of thinking through the various options. However, the early conclusions are:

1. full coverage or very limited coverage cause least system complications;
2. a recent base year with accurate base year estimates of emissions and removals;
3. full scope of activities and gases and symmetry in accounting are recommended;
4. modalities should be available in different tiers (as we have now in the GPG); and,
5. higher targets are preferred where a lower accuracy is relatively less harmful in comparison to systems with lower targets.

### **Assessment of criteria scores for the different regimes**

Chapter 3 concluded that it is justifiable to say that a regime needs to be **environmentally effective, scientifically sound, just in terms of ethics and equity, and (as a consequence) politically acceptable**. Other researchers have come to similar conclusions when approaches for climate regimes were evaluated in more general terms; for all sectors. For instance, in their research report 201 41 255 called "Evolution of commitments under the UNFCCC: Involving newly industrialized economies and developing economies" Höhne *et al.* assess 8 regimes on 4 areas of criteria: environmental, political, economic, and technical. For each of these areas 2 questions are put forward and the regimes can score from double minus (--) to double plus (++), ranging from 'criterion completely not met' to 'completely met', with a few variations. The questions are very interesting (see Annex II) but to be relevant to the LULUCF debate, they would need to be modified. Hence, this assessment is conducted on the basis of the 4 areas mentioned above: environmental effectiveness, scientific soundness, just in terms of ethics and equity, and political acceptability.

Obviously there is a very serious degree of (subjective) judgment in this assessment as scores cannot be measured but have to be reasoned. Overmore, different individuals experience one criterion to be more important compared to another. For instance, someone who works on the Brazilian Proposal might find the underlying science of critical importance, whilst an advocate of the contraction and conversion option may find equity issues of overruling importance. Hence, table 2 below, that reflects the assessment needs to look at with that in mind. In addition, it is only presented as an opening for discussion and not with the intend to conclude on the issue here.

The scores used in the table are similar to those applied by Höhne *et al.* but slightly modified:

- (double minus): very poor score
- (single minus): moderately poor score
- ++ (double plus): very good score
- + (single plus): moderately good score
- 0 (zero): neutral score which means that the criterion is not applicable
- +/- (plus/minus): some aspects of the regime score moderately good and some poor

**Table 2:** Score board for possible future climate regimes related to LULUCF

	<b>Traditional Regime; Kyoto continued</b>	<b>Brazilian Proposal</b>	<b>Separate LULUCF targets</b>	<b>Contraction and Convergence</b>	<b>Multi-Stage Regime</b>
<b>Environmental effectiveness</b>	<b>+</b>  Sinks are only allowed to a limited extend and could contribute more	<b>++</b>  If LULUCF is an integral part of both the historic emissions and in the way those can be mitigated, the proposal scores very good	<b>++</b>  If the scope and spatial coverage is high, and either option B or maybe option C are applicable, this regime scores good	<b>++</b>  If LULUCF is an integral part of the regime, the proposal scores very good	<b>?</b>  it is too early to assess: the MSR could be either strong or weak: that determines the environmental effectiveness of the regime
<b>Scientific soundness</b>	<b>-</b>  the LULUCF component is more politically and economically driven then based on science	<b>++</b>  as above: if LULUCF is an integral part of the regime, it scores very good	<b>++</b>  because LULUCF is isolated from other sectors under this regime, any mistake in design is limited to LULUCF	<b>++</b>	<b>0</b>  the thresholds for LULUCF will be more based on what is feasible and desirable then on science
<b>just in terms of ethics and equity</b>	<b>+/-</b>  ethics: yes (Parties agreed to it), equity: less so (Parties that drove a hard bargain got more in terms of LULUCF, e.g. 33 Mt for Russia).	<b>+/-</b>  Equity: yes, but ethically it puts a high burden on Parties that industrially developed rapidly since 1850 when climate change didn't 'exist' yet. <sup>9</sup>	<b>++</b>  country-specific targets for LULUCF can honour both.	<b>+</b>  Equity yes, but ethically.... this will depend on who you ask and when convergence needs to be achieved. <sup>7</sup>	<b>+</b>  Ethically yes, provided thresholds and incentives for 'early action' are designed properly. Equity depends on thresholds and may impact differently on different LULUCF situations.

<sup>9</sup> Here, the question cannot be answered just for the LULUCF part of the regime as LULUCF is an integral part of the base of the regime.

	<b>Traditional Regime; Kyoto continued</b>	<b>Brazilian Proposal</b>	<b>Separate LULUCF targets</b>	<b>Contraction and Convergence</b>	<b>Multi-Stage Regime</b>
<b>politically acceptable</b>	<b>-</b>  the LULUCF component remains controversial	<b>-</b>  with respect to the LULUCF component, targets may need to be adjusted through negotiations	<b>++</b>  separating LULUCF from the rest does offer a lot of opportunities to negotiate a deal that is politically acceptable	<b>-</b>  the LULUCF part is locked inside the regime which may not help <sup>7</sup>	<b>+/-</b>  the LULUCF thresholds may be a burden to some parties and a blessing to others

++	very good score	+/-	some aspects score 'plus', some aspects 'minus'
+	moderately good score	-	moderately poor score
0	neutral / or not applicable	--	very poor score

Even after completing the score board it must be reiterated that the political will in all of this is crucial and if parties support an option and take ownership of the architecture and contents of a regime, it doesn't matter how it scores on any of the criteria above.

Likewise, the weight given to the different criteria in the 1<sup>st</sup> column is very important. For instance, although the score of the multi-stage regime on environmental effectiveness may be hitherto unknown and lack in terms of scientific basis, it still has a lot to offer as an option simply because Parties may take ownership of it once it is in its final design stage (thresholds).

Overall, from a LULUCF perspective, the "separate target for LULUCF" seems most promising. But to put this comment in perspective, it has to be repeated that there is a serious degree of (subjective) judgment in this assessment.

### **Some final comments and points of attention**

There are a few general comments that need to be made here, that haven't found another 'home' in the report but that are important enough to list here. Without reflecting any order of importance:

- A serious downside from the multi-stage regime is that the design of such a regime requires a significant amount of decisions that need to be negotiated. This is caused by the high amount of possible variations: there are many. On the upside, it is probably the best approach to engage Parties that have been reluctant to date into participating in an intergovernmental climate regime, as it takes country-specific circumstances into account to a degree that none of the other approaches can come close to. If, however, country-specific targets are set under the separate LULUCF target approach, the benefits of the multi-stage regime are getting closer without the complications of many thresholds.

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- It is not clear for all regimes when the point is reached whereby dangerous interference with the climate system is avoided. E.g. the speed with which parties move from stage to stage in the MSR depends on the developmental pathway of the economy of that party. And in the case of the contraction and convergence option, the moment of total contraction needs to be established to know when this crucial 'zero risk' moment in time is reached. This may prove to be a serious consideration when regimes are discussed in future. Some Parties will find that important, whilst others may find it more important to 'get going' or rather 'keep moving'.
  - In the situation of having a separate target for LULUCF, the geographic location of the country is important. It determines to a serious degree how much the LULUCF sector could contribute to meeting emission reduction targets in that country because forest growth for instance is much slower in boreal and temperate regions compared to tropical regions. This may put some Parties at a competitive disadvantage if fungibility is limited in the final architecture of the regime.
  - It has to be emphasized once again that LULUCF can not deliver a full solution for the climate change problem. What it can do is buy time; time to switch to cleaner technologies, or to develop better technologies; time to prepare our economies to change or adapt, etc. So, although LULUCF is not the panacea, it does belong in a package of environmentally effective climate change mitigation measures, not in the last place because it is engrained in the convention.

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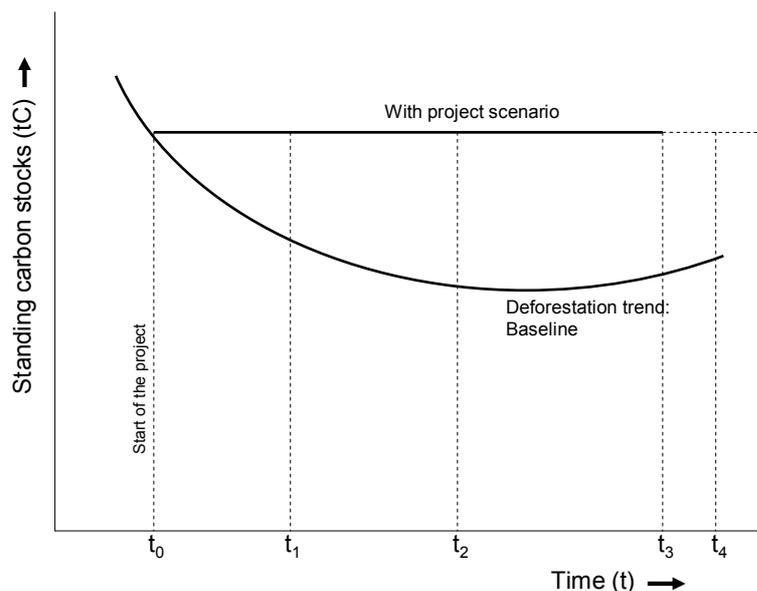
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## Annex I:

# Avoiding emissions from deforestation, choosing a baseline, and “factoring out”: how do they relate and is *factoring out* necessary?

The choice of baseline on a national level can have a major impact on the integrity of an international climate baseline. But as decided for the operationalisation of the Kyoto Protocol, baselines shall be project-specific. And fortunately project baselines can be much more precise than national or regional baselines. Figure 4 below illustrates a project reducing emissions from deforestation.

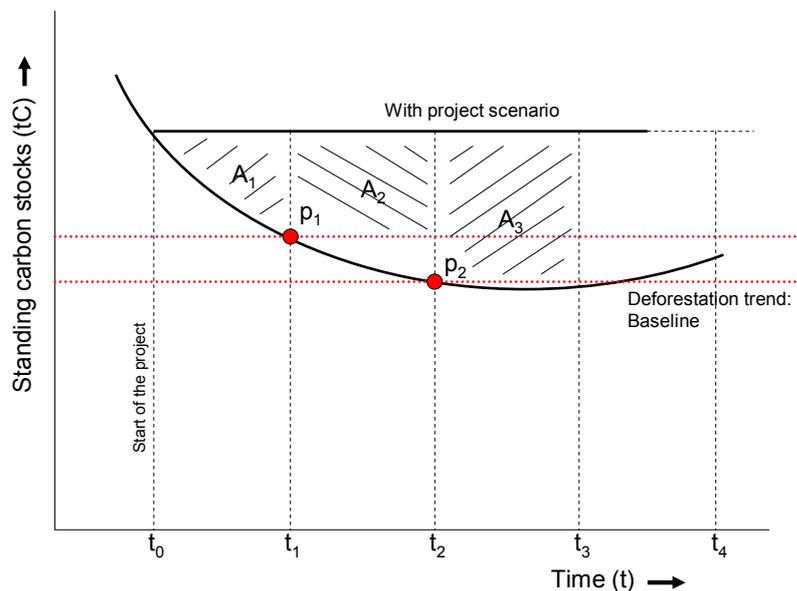


**Figure 4:** Schematic representation of a project reducing emissions from deforestation.

The curve describing the deforestation trend gradually levels off at  $t_2$  and ultimately comes up after  $t_3$ , as in most regions deforestation slows down at some stage due to the depletion level of the resource: there simply isn't any more forest to deforest. The project's lifetime and the estimated time that this will occur are obviously key in a project's performance and the appropriate crediting period and scheme. Obviously deforestation trends covering larger areas are not represented by a fluent curve, but more often by an old worn saw-tooth profile as demonstrated in figure 3 in chapter 4.

One criticism with respect to baselines for avoiding deforestation projects has always been that bad performance of a country in terms of deforestation, is awarded with better opportunities for projects avoiding it. E.g. if credits are issued against a baseline looking for instance 30 years ahead, more credits will be issued if the prognoses for deforestation are high in that region.

This could be overcome to some extent by 2 modalities: (1) updating the baseline periodically, e.g. every 5 years, and (2) by taking the level of deforestation at the time of updating the baseline as the level to credit against, and not the incremental deforestation curve that is to be expected over the entire period. This is illustrated in figure 5 below with the lines running through  $p_1$  and  $p_2$ .



**Figure 5:** Flat rate crediting against updated baseline at periodic intervals

In the first period after initiating the project, credits could be issued against the baseline as estimated at the time of writing the Project Design Document (PDD). The amount of credits would equal  $A_1$ . At the start of the next period at  $t_1$  the level of deforestation could be assessed and be taken as the level over the entire period running from  $t_1$  to  $t_2$ . The amount of credits would then equal  $A_2$ , and so forth.

If this approach was taken, modalities would require the establishment of a reference case where deforestation levels in the region would be indicative for the baseline of the project.

This approach would deliver a baseline that is the closest proxy to the deforestation trend in the absence of the project, and it refrains from crediting possible bad performance in future.

But the question arises whether we need to factor out the natural and indirect effects on the growth of forest from direct human-induced effects when looking at avoiding deforestation on



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project level. And the answer is a simple 'no': we do not need modalities to factor out on a project level because we credit against a baseline of *emissions* from deforestation.

In practice, the with-project scenario does not include growth: it will be a fixed number that is the average storage capacity of the vegetation type that normally occurs on that particular spot. *E.g.* a particular forest type belonging to the high tropical forest belt in the example of the Mount Elgon National Park in Uganda contains approximately 220 tC ha<sup>-1</sup>. If deforestation in the baseline scenario is *e.g.* 2% per year, this would result in a gross amount of offsets of 4.4 tC ha<sup>-1</sup>. There is no enhanced *growth* in any of these numbers as we deal with stocks and not with fluxes and therefore, no growth that can be influenced by natural effects or indirect human-induced effect. Obviously it is a different case for areas where deforestation already took place and claims are made for the natural forest vegetation growing back: this is a totally different issue.

Also in the case of forest management we are dealing with an entirely different situation. If biomass stocks increase as a result of the improved management strategies, we would need to correct the offset claim for natural uptake, indirect effects of human activities, past management practices, etc. But in the case of avoided deforestation we do not need to factor out.

There might be a chance that the average storage capacity for natural forest is influenced by environmental circumstances, such as higher temperatures etc. but the atmosphere is oblivious to that: what counts are the emissions. And avoided emissions are pure emissions. If it was desirable, the average storage capacity could even be adjusted downward to compensate for possible higher values due to these natural and indirect human-induced effects, adjusting the estimate of emission conservatively. But in principal, factoring out is not an issue in the case of avoiding deforestation on project level.

----- E N D of A N N E X I -----

## Annex II:

# Common Assessment Criteria to test the suitability of climate regimes.

### **Environmental Criteria:**

- **Environmental effectiveness:** Can the approach reach stringent global emission targets to safeguard the fulfilment of the ultimate objective of the Convention?
- **Encouragement of early action:** Are countries that do not yet have binding commitments encouraged to keep emissions as low as possible?

### **Political Criteria:**

- **Equity principles:** Are the three equity principles *need*, *capability* and *responsibility* covered?
- **Agreement with fundamental positions of all major constituencies:** Could the approach be acceptable for all constituencies given their current positions?

### **Economic Criteria:**

- **Accounting for structural differences between countries:** Are national circumstances accounted for?
- **Minimizing adverse economical effects:** Does the approach allow distribution of commitments so that the global costs are minimized and gives countries sufficient flexibility to reach their commitments?

### **Technical Criteria:**

- **Compatibility with the structure of the UNFCCC and the Kyoto Protocol:** Is the approach compatible with the existing international structures of the Convention and the Kyoto Protocol?
- **Moderate political and technical requirements of the negotiation process:** Is the approach simple and requires a low number of separate decisions by international bodies and are all necessary data and tools available and verifiable?

----- END of ANNEX II -----

----- END of REPORT -----