A Shared Research Agenda for Landuse, Landuse Change, Forestry and the Clean Development Mechanism

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A Shared Research Agenda for Landuse, Landuse Change, Forestry and the Clean Development Mechanism

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EXECUTIVE SUMMARY

About 20% of global greenhouse gas emissions are from landuse, landuse change and forestry (LULUCF). Most of these are from deforestation in the tropics. In March 2001 the Center for International Forestry Research facilitated an international workshop to identify a global agenda of high priority research questions key research areas related to the Clean Development Mechanism (CDM) and LULUCF.

Capacity building and information sharing are critical for building popular support and political will for backing LULUCF projects. At the national level, capacity is needed to develop sustainable development indicators and LULUCF projects. Sustainable development will require local capacity for developing project proposals and for monitoring, verifying and certifying projects by accredited third parties. NGOs and the private sector need good practice guidelines and training programs regarding project design. The unilateral, bilateral and multilateral approaches to CDM architecture need to be researched, together with an assessment of the dynamic effect of competition on the three regimes.

Scale was identified as a main issue in the current negotiation process. A global review and evaluation of the potential for different CDM options is needed to provide insight into scale issues. Estimates of each country's capacity to produce certified emissions reductions (CER) could be combined to create a 'global CER supply curve.' The tool could help to develop policy options that promote equitable distribution of opportunities to participate in and benefit from CDM activities. A key research output would be a review and evaluation of the potential for different CDM options within each country's socio-economic and environmental contexts. Supply estimates would consist of an assessment of CDM options for each country, taking into account the volume of potential CER, the cost of producing CER, the risk factors involved, and the timing.

The need to reduce costs was identified and set up as the main agenda for further research. Transaction costs were considered most important, given that they increase the cost of doing business, reduce the magnitude of transactions, and therefore reduce efficiency. Both social and environmental costs require further consideration, as they are major issues. Of primary importance is the initial identification of social benefits, techniques to measure them and the development of sustainable development indicators. Also important is the need to address the inadequate understanding of community needs from the project and the problem of the equitable distribution of benefits. Outcomes should include: a method for the choice and measurement of benefits, assuming likely trade-offs between types and levels of benefits; a synthesis of existing information on indicators, minimum criteria and project benefits; a participatory assessment of community

needs for individual projects; an initial list of stakeholders, individual benefits and methods on capturing overall project benefits; and finally, a process to develop/adapt existing valuation methods.

Solving the problem of permanence is crucial if forestry projects are to be included in the Protocol. Particular challenges associated with this include: establishing a value for the non-permanent capture of carbon; considering how best to equate the benefits of projects of different duration; assessing whether emission reductions in the LULUCF sector are fungible, in both economic and environmental terms, with emission reductions and removals in non-LULUCF sectors; establishing the various responsibilities and liabilities of investors and beneficiaries for the different components of a project over an extended lifetime. Overall, there is an urgent need to evaluate the range of possible carbon crediting procedures taking these issues into account. Risk assessment methods also need to be developed to forecast with a sufficient level of accuracy and precision the loss of carbon due to social and environmental factors.

Leakage is one of the main concerns raised by negotiators and other stakeholders opposed to the inclusion of LULUCF in the CDM. Detailed quantitative information is needed indicating the mechanisms and rough scale of leakage for several general project types to serve as a framework to synthesise available leakage research into a policy-relevant form. The information would be a complete listing of the possible mechanisms by which leakage might occur, how much leakage might occur through each mechanism, and some indication of variability and risks for this project category. The next step would be to develop guidance and 'best practices' for the design of projects. Projects must be able to monitor whether any leakage has occurred. Monitoring and measurement methods must be developed at the project level.

The production of forest carbon requires consistent, reliable, accurate and verifiable monitoring. The lack of standards for LULUCF limits the progress that can be made in refining and applying methods. Critical questions on standards relate to acceptable levels of uncertainty, types and frequency of measurement and the relative roles of modelling, measurement and assumption. Improvements in monitoring methods relate primarily to increases in efficiency. The collation, synthesis and dissemination of existing information on methods, allometric relationships, decomposition and mortality rates and wood density would also help reduce the costs associated with monitoring and verification.

A reliable, verifiable and cost-effective baseline is needed to calculate the additional CER accruing from CDM projects. A research programme could deal with: methods for quantifying baselines ; the cost-effectiveness of methods; building technical capability to develop baselines in CDM host countries; the integration of development benefits for host countries into the baseline assessment; the determination of investment additionality with emphasis on barriers to project investments; the evaluation of the US proposal on performance thresholds for additionality determination in terms of its applicability to LULUCF projects; and the integration of stakeholder points of view in baseline determination in the process of validation.

A number of broader research topics were identified. No clear guidelines exist for assessing whether and how a particular activity contributes to 'sustainable development.' Indicators of sustainability are needed that could help governments make choices, including what and how to measure sustainability. Similarly, standard methods for setting baselines, monitoring results and assessing leakage are required. Setting threshold criteria that landuse change and forestry projects must meet to be considered for CDM approval may help reduce other transaction costs. Better inventories are essential to address the setting of baselines, the precision and accuracy of monitoring and the measurement of leakage. In the short term, there is a particular demand for better estimates of the technical and economic potential for emissions avoidance and carbon storage projects including realistic analysis of the potential geographic distribution.

1. INTRODUCTION

Climate change is possibly the greatest environmental threat to sustainable forest management, biodiversity and local livelihoods in the tropics. While most of the human-induced causes of climate change come from the combustion of fossil fuels, some 20% of global greenhouse gas emissions are from landuse, landuse change and forestry (LULUCF). Most of these net emissions are from deforestation in the tropics.

Opportunities for mitigating a small proportion of global emissions through changes in landuse and forestry have long been seen as a means for tropical countries to contribute to the concurrent goals of slowing climate change and contributing to sustainable development.

Landuse, landuse change and forestry climate change mitigation options through the Clean Development Mechanism (CDM) continue to be constrained by a lack of knowledge and consensus. Issues such as duration, baselines, leakage and institutional constraints have not yet been comprehensively resolved. In some cases, this is because the international political process has not yet made the necessary decisions to move forward with what is now known. In other cases, we have neither a clear understanding of the key issues nor solutions to the problems we already understand.

While the number of studies on forest carbon has increased dramatically over the last decade, many important questions remain. Recognizing the need to develop a more complete research agenda that defines research needs, the Center for International Forestry Research (CIFOR) facilitated an international workshop of 70 scientists, climate change policymakers, and private sector and donor representatives from 19 countries to identify key research areas related to the CDM and LULUCF. The original workshop design was focused on research needs subsequent to The Sixth Conference of the Parties (COP 6). However, continuation of COP 6 and increases in the probability that the Kyoto Protocol may not be ratified soon (or if ratified may not include LULUCF in Article 12) have in some ways complicated the identification of research needs. As a result, the workshop sought to focus on research topics that would contribute to both the CDM and other bilateral and multilateral alternatives.

This summary does not include all of the detail of the full workshop report. That report can be obtained through any of the contact persons listed on the back cover of this summary. It is the hope of workshop sponsors that this summary will be seen as a living document taken forward by institutions that have volunteered to lead coordinated research efforts. We also hope it will be seen as a useful guide to those who seek to support renewed research on LULUCF issues.

1.1 Workshop Objectives

The primary workshop goal was a global agenda of high priority research questions related to LULUCF and the CDM. CDM is limited to countries without emission reduction commitments, primarily developing countries. As most but not all of these countries are in the tropics, the workshop focused mainly on tropical conditions.

The workshop, held 6-8 March 2001, was based on the following objectives:

- To share and assess the state of the art in terms of political processes, ongoing research activities and the state of knowledge in key research areas.
- To identify critically required research outputs and questions to advance international processes and enhance the interdisciplinary understanding of these key research problems.
- To identify key actors and stakeholders in those research areas and come up with future opportunities for collaborative research.
- To identify opportunities for donor funding of collaborative research.

The primary workshop outputs were a matrix of key research questions, their relevance in terms of mitigation action and forest type, and a listing of research institutions that are either conducting research, or are committed to future research on these topics. These matrices can be seen in Annex I.

1.2 Workshop Process

The workshop was structured along the objectives. The workshop tried to recognise the different interests of the main stakeholders and adequately represent those in the programme and the content of the workshop. The main organisers set a frame, which was further refined and adapted through comments from participants before the workshop and through a 'process steering group' at the workshop. This group consisted of a cross-section of the participants and stakeholders who represented the whole group.

In the first main phase, the frame of the discussions was set by keynote speakers who provided an overview of the issues related to the CDM and LULUCF. Key issues from these presentations were distilled, clustered and set up as guidance for further discussions.

The second phase of the workshop dealt with these key issues through working groups that discussed the COP 6 core research areas of social costs and benefits, permanence, leakage and monitoring, and baseline/additionality issues, as described in more detail under section 1.3. Additional institutional and scale issues and crosscutting aspects that were not to be adequately considered at the COP 6 were also discussed in the second phase of the workshop.

The third phase worked towards a synthesis and dealt with issues related to funding and collaborative research efforts.

1.3 Working Group Issues

Social costs and benefits
Forestry and large-scale estate crop plantation operations in the tropics often have unintended social costs and inequitable distributions of benefits. There are legitimate concerns that large-scale CDM project activities will, in some circumstances, further disadvantage resource-poor people dependent on forested or marginal agricultural lands. There are also fears that small landholders will not be able to compete in a CDM project market that is dominated by large projects that take advantage of the economies of scale and lower transaction costs.

Permanence
Permanence is the longevity of a carbon pool and the stability of carbon stocks given the impacts of environment and management that modify these stocks. In many LULUCF uses, this term implies duration. For some users of the term, it suggests permanent stocks, which are a biophysical impossibility. Irrespective of the definition applied, the conceptual and practical problems related to permanence continue to dominate part of the LULUCF CDM debate. To date, solutions for fixed-term certified emissions reductions (CER), ten-year accounting and discounted crediting have been considered but inadequately studied. The capacity of international crediting processes to compare LULUCF-derived credits with energy sector credits and to equitably allow for LULUCF projects of varying length is limited by the lack of a clear understanding of solutions to the issues of permanence/duration.

Leakage
Leakage is the decrease in greenhouse gases (GHG) that occurs outside the project GHG accounting boundary as a result of project activities. While there is general agreement that leakage is an important concern, the significance of leakage at the project level is highly variable and often poorly understood, in part due to a lack of understanding of the drivers of leakage and the relative importance of supply and demand elasticities in influencing management decisions (particularly for harvest).

Monitoring

Methods for the monitoring and verification of GHG benefits have been developed by scientists from NGOs, research institutions and private sector firms. To date, technical and political consensus does not yet exist on standards for precision, or on which carbon pools to measure or on what combination of methods are acceptable. The costs of monitoring, the size and rate of change in carbon pools, and the levels of heterogeneity pose not only sampling design questions, but also broader issues related to the degree of acceptable uncertainty in estimates. In some cases, there are important interactions between these factors and the activity type (reforestation, forest management, agroforestry, etc.).

Baselines/additionality

Baseline assessments are essential in the determination of greenhouse gas emission reductions due to project activities. At present, no standard methods are in use for determining baselines, although a number of approaches are presently in use in pilot LULUCF projects. In order to guide policymakers, research must pay additional attention to questions of fixed or adjustable baselines, the quantification of carbon stock changes in proxy areas, and the use of modelling to predict counter-factual reference case scenarios.

2. INSTITUTIONAL ISSUES

(For matrix, see Annex I Table 1)

2.1 Introduction

There are three major institutional/organizational dimensions surrounding LULUCF projects. All three dimensions are likely to interact and influence project performance. They are as follows:

- The functioning of institutions at the national level and their implications for LULUCF projects.
- The need for information dissemination and capacity building among national organizations and communities involved in LULUCF projects.
- The so-called 'architecture' of the Clean Development Mechanism (CDM) and the implications of the various structures proposed on conduct and performance.

2.2 Local and National Institutions

The potential for sustainable development achievements through South-North carbon credit transfers generated by LULUCF projects under the CDM of the Kyoto Protocol will depend inter alia on institutions, regulatory frameworks and organizational capacity.[1] There are many unresolved questions surrounding appropriate regulatory frameworks and the implications of less than robust institutions in developing countries for achieving sustainable development goals through CDM LULUCF projects. For instance:

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[1] The economic literature distinguishes institutions from organisations. Economic institutions are defined as the rules (the legal system, financial regulations and property rights) that nurture, protect and govern the operation of a market economy (North 1990). By contrast, organisations refer to universities, extension services, non-governmental organisations and so forth that carry out specific missions in society (Eicher 1999). The Nobel laureate in economics, Douglass North (1998) has argued that the greatest challenge facing poor countries in Africa, Asia and Latin America is the development of consistent and transparent institutions, which are essential for the effective performance of organisations.

- Using standardised methods of financial analysis, how are transaction costs affected by differences in institutional arrangements?

- What are the implications of local and national institutions for project design (individual smallholders versus collective action projects, forest plantation projects, community forestry, etc.)?

- What type(s) of incentive structure(s) are most likely to result in project participation and local ownership (e.g., cash, payments in kind, social infrastructure such as schools and dispensaries)?

- What are the implications of underdeveloped insurance and reinsurance institutions on options for dealing with the risk of project failure?

- What are economically and socially optimal means for mitigating this risk?

- What will be the role of the government versus the private sector?

- What can be learned from experiences to date?

2.3 Capacity Building and Information Dissemination

Capacity building and information sharing is critical for building popular support and political will for backing LULUCF projects. This must occur at three levels. At the national level, the issue is the capacity to develop and prioritise nationally acceptable sustainable development indicators and to develop capacity within some controlling authority for regulating, evaluating and validating acceptable LULUCF projects.

At an intermediate level, generating sustainable development will require local capacity for developing project proposals and for monitoring, verifying and certifying projects by accredited third parties. NGOs and the private sector need good practice guidelines and training programs regarding project design and formulation including leakage and duration issues, and baseline development. There is also a need for developing the capacity to apply indicators of sustainable development. Where underdeveloped legal, land tenure, and property right institutions exist in conjunction with low levels of entrepreneurial skill, capacity building among entrepreneurs wishing to participate in these markets may be required.

2.4 Institutional Architecture

The initial implicit assumption for CDM architecture was a 'bilateral' structure. This concept consists of an Annex I[2] investor seeking CERs for either its own reduction targets or to sell them on a carbon market, and a non-Annex I partner, either a public/private company/entity or a partner in business in the host country for implementation.

The so-called 'unilateral' option is also under consideration in which a non-Annex I entity would undertake an eligible activity on its own, e.g., without an Annex I investor, and then sell its carbon credits on the international market. It is hypothesised that the unilateral case is more likely in countries with significant domestic investment capacities and dynamic local entrepreneurs.

Equity concerns over benefits in settings where institutions are not well developed has led to a 'multilateral' proposal for implementing LULUCF projects; the launching by the World Bank of its Prototype Carbon Fund (PCF) has given some body to this option. This structure entails an investment fund managed by a specialised institution, guaranteeing investors that they will be granted a predefined amount of carbon credits from higher cost LULUCF CDM projects but with high co-benefits in terms of local development, poverty alleviation and biodiversity. Several investment funds can coexist at the same time, with specific focus in different activities.

Each architecture should be considered in respect of its most likely effects on key issues such as equity, efficiency, transaction costs and sustainable development.

The bilateral model is hypothesised to be the most efficient for many LULUCF activities, since project identification, design and implementation will benefit from entrepreneurial initiative and know-how. In some projects, carbon revenues will eventually be mixed with commercial revenues (i.e., timber sales) and the market institutions for commodities production and trade are already robust. However, there is also a significant risk that under the bilateral model only a narrow range of projects (i.e., the industrial large-scale plantation of fast growing species) would be undertaken in a limited number of countries.

The unilateral model might take advantage of the same entrepreneurial initiative and in addition be more likely to fit specific non-Annex I private sector needs (e.g., a wood industrialist willing to secure long-term supply with given species-type plantations in a situation where land tenure rights are not secured). However, it is quite unlikely to favour certain types of project that are less cost-effective.

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[2] Annex I countries are parties to the United Nations Framework Convention on Climate Change (UNFCCC) and are also referred to as Annex B Parties to the Kyoto Protocol. A list of Annex I countries is provided in Annex II of this document.

The multilateral approach could theoretically avoid these drawback effects and be more effective in promoting small-scale projects or projects involving numerous smallholders. However, it is also likely that, under this regime, transaction costs (especially for contracting and monitoring) will be higher as the number of actors involved is higher.

From a research perspective, an in-depth assessment of the implications of each structure needs to be addressed with a multiple criteria analysis. Studies of similar arrangements in other contexts could provide useful insights. The bilateral model can be analysed by reference to joint venture endeavours. The unilateral structure might be compared with parastatal forest companies or marketing board experiences (e.g., SODEFOR in Côte d'Ivoire). Meanwhile, experiences drawn from the literature on primary commodity agreements (coffee, tin, cocoa, etc.) can shed light on the multilateral scheme, alongside the World Bank PCF and Global Environmental Facility (GEF) experience.

The following synthesis of the analytical framework is proposed (hypothesised effects are found in matrix cells):

	Bilateral	**Unilateral**	**Multilateral**
Transaction costs	Low?	Very low?	High?
Institutional capacity	Medium?	Low?	Medium/High?
Equity	Negative?	Weak?	Positive?

It is likely that CDM will be implemented under an 'open architecture', namely a coexistence at the country level of the three abovementioned models. In such a case, an assessment of the dynamic effect of competition (or the room for coexistence) on the three regimes is indicated. What institutional arrangements could be imagined, at different scales, to ensure, if needed, a mutual coexistence of the three regimes, each with its specific advantage? In connection with the 'competition' issue, the prospect for reducing transaction costs in the multilateral model through a combination of different sources of funding (Official Development Assistance (ODA) and private investment) seems not to have been addressed adequately in the Kyoto Protocol. There is an understandable concern about price distortion on commodity markets (e.g., the timber market) if

some countries were to take advantage of several sources of funding to increase their share into a competitive market. At the same time, if it could be shown that this increase was the result of a market failure (i.e., the correcting of prices to include carbon services), then WTO sanctions should be avoidable. If CDM is to be considered first and foremost as a sustainable development instrument, there are strong arguments for allowing a mix of both ODA and private funds for activities with low impact on international commodities prices, as agroforestry, community or smallholder plantations, wood fuel plantations etc. The same reasoning would apply to GEF projects targeting biodiversity. The investigation of possible combinations of CDM and already existing instruments was called for by the Convention on Biological Diversity in its Note to the COP 6 and the Subsidiary Body for Scientific and Technological Advice (SBSTA) (27 October 2000).

3. SCALE ISSUES

(For matrix, see Annex I Table 2)

3.1 Introduction

Scale was identified as a main issue in the current negotiation process. In implementing the Kyoto Protocol, there are widespread concerns about the relative magnitude of abatement between Annex B and non-Annex B countries via the CDM; between sink and non-sink projects within the CDM; and about the equity of distribution of opportunities for the CDM between countries. Various concerns have led to calls for quantitative restrictions (caps) on emissions trading and the CDM, and restrictions on project type eligibility under the CDM. The design of CDM rules will have impacts on distribution between regions, between project types, and possibly for the standard of sustainability of financially viable projects.

A research agenda can be easily identified. A global review and evaluation of the potential for different CDM options is needed to provide insight into scale issues related to the CDM, and LULUCF activities in particular, and to take into account each country's socio-economic and environmental contexts. Estimates on each country's capacity to produce certified emissions reductions (CER) could be combined to create a 'global CER supply curve' This would show the potential CDM volume under each project type and country as a function of the international permit price, and as a function of the eligibility criteria. Combined with estimates of Annex II demand for emission offsets from the CDM, this could form the basis of an analytical tool for the scenario analysis of different policy proposals. The tool could help to develop policy options that promote equitable distribution of opportunities to participate in and benefit from CDM activities, and/or to help identify outcomes that are politically palatable.

The key research outputs would be required in a short timeframe, since scale issues have figured prominently in the negotiations leading up to COP 6-bis. In the longer term, research could focus on the possibilities and consequences of developing countries adopting emission targets. The gathering of data would need to be both timely and reasonably accurate. As a first step, a group of participants is proposing to conduct a review of the potential for LULUCF activities cited in the IPCC Special Report, using data sources that have become available since the completion of the report.

3.2 Critical Issues

Scale issues were a major 'sticky' point at the negotiations in The Hague, and continue to figure prominently in the ongoing negotiation process. Five key aspects of scale in the current negotiations relevant to LULUCF in the CDM can be identified:

- Share of CDM-the balance between reducing emissions domestically in parties, and investing in carbon offsets in developing countries through the CDM.
- Share of LULUCF-the ratio between LULUCF and non-LULUCF activities within the CDM.
- Geographical equity-the difference in the potential volume of CDM projects within and between countries and regions.
- Sustainability-the relationship between the cost of carbon reduction and the sustainability of CDM activities.
- 'Cherry picking'-the CDM, using easy and cheap options first.

These concerns have led to calls for both caps on emissions trading and/or CERs from CDM, and limits on eligibility of project types.

The first issue relates to concerns about party countries avoiding domestic action by using the CDM. It is argued that CERs from the CDM are less certain than emission reductions achieved in Annex B countries; that the CDM leads to reduced incentives to develop new technologies in Annex B countries; and that there should be limits on industrialised countries 'buying their way out' of their obligations to address climate change. This has led to calls for a quantitative limit (cap) on the use of Kyoto mechanisms and the CDM in particular. A number of policy proposals have been put forward in the supplementary debate.

The 'share of LULUCF' issue encompasses concerns that the CDM market might be dominated by LULUCF projects, which are likely to provide carbon credits at lower cost than many other project types; and by concerns that the problems in monitoring, verification, permanence, and possible adverse social and local environmental impacts may be greater in LULUCF than in other projects. As a result of these concerns there have been calls to limit the proportion of sinks in the CDM, or to exclude certain types of (or all) LULUCF projects from the CDM.

The issue of geographical equity is closely related to project eligibility. The potential for CDM projects in any given category depends on the characteristics of countries and varies substantially.

For example, there tends to be large potential for LULUCF projects in humid Latin American, whereas options to reduce emissions from energy are generally limited. By contrast, in countries such as India and China the potential in the energy sector is far greater. Therefore, the degree to which countries and regions can benefit from the CDM depends heavily on eligibility rules and caps.

The question of sustainability and scale relates to the fact that if the price of CERs in the international markets is low, higher-cost CDM projects will not be feasible. If there is a systematic positive relationship between the cost of carbon reduction and the sustainability of CDM activities, this means that rules that lead to CER at a lower cost may also lead to CDM projects that are financially viable having an overall lower standard of sustainability.

The issue of 'cherry picking' refers to the likelihood of the CDM making use of easily achievable, low abatement options first. This may turn out to be a disadvantage in later commitment periods when developing countries take on targets. This issue is therefore of longer term concern, and has not yet been widely addressed.

3.3 Research Outputs

A key research output would be a review and evaluation of the potential for different CDM options, over time, within each country's socio-economic and environmental contexts. This could lead to an estimate of the global supply of CDM credits, which could form the basis of a tool to analyse policy proposals on CDM caps and the eligibility of project types.

Information about the supply potential for the CDM is probably the most important requirement to adequately assess the concerns and policy proposals relating to scale issues within the CDM. Supply estimates would consist of an assessment of CDM options in disaggregated project categories for each country (or group of countries), taking into account the volume of potential CER, the cost of producing CER, the risk factors involved, and the timing, namely when the CER can be created.

To create estimates with sufficient detail and accuracy to inform the policy debate, a number of factors would need to be assessed. For LULUCF projects, for example, the list of factors includes land suitability; land availability (technical, social and legal aspects such as land tenure and competing uses); the technical capacity for implementation; the implementation cost; the biophysical risk (fire, pest, El Ninõ); sovereign risk (illegal logging, institutional failure, legal uncertainty); additionality; and sustainability criteria.

With regard to sustainability standards, a relevant research output would be an analysis of the relationship between project cost per carbon unit and the sustainability impacts of the project.

This could be used to assess any potential tradeoff between trading restrictions, eligibility rules and minimum sustainability standards.

A tool for scenario analysis under different policy proposals would combine the global estimates of CDM supply with estimates of Annex I demand for CDM credits, which in turn can be derived from cost estimates of domestic abatement in parties. Such a tool could provide insight both into the geographical distribution of CDM activities between countries (equity) and the proportion of CERs likely to be achieved in different project types, under any particular set of rules. The tool could be used to assess if policy proposals on caps and eligibility are: a) needed to address a specific concern, b) likely to succeed in addressing that concern. It could also be used to assess the likely side effects.

3.4 Practical Approaches

The key research outputs would be required in a short timeframe, given the prominence of scale issues in the negotiations leading up to COP 6-bis. Research outputs could also filter into the expected post-COP 6-bis Subsidiary Body for Scientific and Technological Advice (SBSTA) process. However, a question was raised regarding the relevance of technical research for highly political issues such as that of scale.

In order to be relevant to policymakers, the data gathered would need to be relatively accurate, which realistically would only be achieved on a comprehensive scale in the medium to longer term. The research could synthesise and build on completed and ongoing research, such as the World Bank's 'National Strategy Study' program.

In the short term, efforts to review and compile estimates of LULUCF supply potential under the CDM will be useful to inform the policy debate. As a first step, a group of participants is proposing to conduct a review of the potential for LULUCF activities cited in the IPCC Special Report, using data sources that have become available since the completion of that report.

4. SOCIAL COSTS AND BENEFITS

(For matrix see Annex I Table 3)

4.1 Introduction

The need to reduce costs was identified and set up as the main agenda for further research. Depending on the type of cost, different institutions and different methodologies and strategies will have to be developed in order to meet this objective.

4.2 Costs

The following social and production costs were identified:

Production costs
These are costs directly related to the production process of a specific good, in our case, carbon permits. The major components are implementation, operation and maintenance costs, the opportunity costs of land, and capacity building.

Production costs were not considered a relevant issue for the workshop, given that private cost reduction is an activity that is triggered by the system itself. However, some people felt that developing techniques and methods to reduce production costs for projects with smallholders was a relevant research area.

Transaction costs
These are the costs of doing business or the costs of buying and selling a commodity. Activities such as searching for clients' costs, information costs (costs that occur for measuring the valuable characteristics of a product), enforcement and others were considered part of transaction costs.

Transaction costs were considered important, given that they increase the cost of doing business, reduce the magnitude of transactions, and therefore reduce efficiency. In regard to transaction costs, the following issues were identified for a research agenda:

- Baselines and additionality test costs, particularly for smallholders.
- Risk mitigation (insurance, risk management, buffering).
- Clean Development Mechanism (CDM) management costs (administration at the local and regional level, including institutions and policy).
- Legal costs and government requirements.
- The validation and certification of carbon.
- Leakage measurement and coverage.
- The monitoring of carbon.
- The measurement of sustainable development.

Social and environmental costs

These costs refer mainly to externalities at the social and environmental level and can be thought of as the impacts on communities and on the physical and ecological environment in the area of a project.

Concerning externalities, both social and environmental costs require further consideration, as they are a main issue being discussed at the negotiations. Further research should consider measuring physical, cultural and activity displacement, assessing and managing issues related to the lack of land for landuse change, inequities in the distribution of social benefits and compensation (including the consequences of a hierarchical set) and the loss of diversification activities that can occur within a plot of land. The issue of compensation to landholders was also discussed and was considered important for project success. More research should be devoted to the opportunity cost of land and discount rates and layout studies to design long-term sustainable projects that end in win-win situations.

In regard to environmental costs, analysis should consider the impacts of biodiversity (specifically when a landuse change occurs or when mono-specific plantations are settled) and ecological disruptions, such as nutrient cycling, water cycling, fire regimes and pests.

At the more general level, the following questions were identified:

- How have development projects minimised transaction, environmental and social costs (particularly in projects that involve smallholders)?

- How will CDM rules for baselines, leakage, monitoring, certification and verification affect transaction and production costs? How do they relate to project type (e.g., projects with many landholders, forest conservation, reforestation, etc.)?

- How can social and environmental costs be internalised in such a way that sustainable development is achieved? (The answer to this question opens itself to a wide range of research agendas which will include aspects such as impact valuation and assessment, criteria development and others)

- How can research reduce production costs? Where will research generate higher benefits on the production side?

Given the wide range of development projects and the long experience of these projects in dealing with externalities and transaction costs, short-term opportunities for gathering information on how these issues have been dealt with might support climate change negotiations. Similar experiences can serve as examples of the best ways to reduce transaction costs, minimise production costs and account for and internalise social and environmental costs.

4.3 Benefits

On the benefits side, wherever destructive forest practices are having negative social impacts, or local livelihoods are strongly restricted by economic and or environmental conditions, LULUCF projects may also have profound and positive social outcomes. Social benefits from LULUCF projects can be financial (mainly profits from the carbon storage service) or environmental (such as in the form of the restoration of degraded land or forest).

A research agenda focusing on the area of social benefits from LULUCF projects needs to address a number of issues. Of primary importance is the initial identification of social benefits, techniques to measure them and the development of sustainable development indicators. It is contended that benefits derived from LULUCF projects are not well understood and that the potential social costs of LULUCF projects have dominated the research agenda.

Also important is the need to address the inadequate understanding of community needs from the project and the problem of the equitable distribution of benefits. Each LULUCF project will have a range of social benefits, and a multi-objective decision making framework needs to be defined to facilitate the selection process. The problem of project permanence or duration is a particular challenge in this area.

The identification of stakeholders and the valuation of benefits are key research issues, despite the fact that they are relatively well understood in methodological terms. The problem will be how to aggregate the range of benefits flowing to communities at a range of scales, from international to local levels.

In dealing with many of these research problems, it is expected that existing experience from rural development, community forestry and Activities Implemented Jointly (AIJ) projects may be used to provide data or insights. The challenge, therefore, will be to modify existing development models to incorporate unique features of carbon projects.

Outcomes that a research agenda should aim to produce include: a method for the choice and measurement of benefits, assuming likely trade-offs between types and levels of benefits; a synthesis of existing information on indicators, minimum criteria and project benefits; a participatory assessment of community needs for individual projects; an initial list of stakeholders, individual benefits and methods on capturing overall project benefits; and finally, a process to develop/adapt existing valuation methods.

5. PERMANENCE ISSUES

(For matrix see Annex I Table 4)

5.1 Introduction

Article 12.5(b) of the Kyoto Protocol requires that the certification of emission reductions resulting from a project be based on their real, measurable and long-term benefits in relation to the mitigation of climate change. There is no agreement on what constitutes 'long-term' in the context of the Protocol, nor on the process by which agreement might be reached. Emission reductions resulting from improvements in the efficiency of industrial equipment, power generation plants and other uses of fossil fuels (or from switching to renewable or non-green house gas (GHG) emitting sources of energy) can be considered permanent, whereas carbon stored in a forestry stand is transient. Plants grow and die, or are eventually harvested for use. Moreover, the rate of increase in carbon storage slows considerably in later years in the growth of a stand, so that the amount of carbon stored effectively reaches an asymptote. Given these temporal dynamics in both the rate of carbon uptake and storage, certified emission reductions (CERs) in the LULUCF sector must be based on units that are some function of time.

5.2 Critical Issues

Solving the problem of so-called permanence is therefore crucial if forestry projects are to be included in the Protocol. Particular challenges associated with this include:

- Establishing a value for the non-permanent capture of carbon;
- Considering how best to equate the benefits of projects of different duration;
- Assessing whether emission reductions in the LULUCF sector are fungible, in both economic and environmental terms, with emission reductions and removals in non-LULUCF sectors;
- Establishing the various responsibilities and liabilities of investors and beneficiaries for the different components of a project over an extended lifetime.

Overall, there is an urgent need to evaluate the range of possible carbon crediting procedures taking these issues into account.

The viability of LULUCF projects will depend ultimately on their capacity to generate long-term social and atmospheric benefits. To secure the environmental and social benefits of LULUCF activities, the projects presumably must be of some minimum duration. How long this is, and how it might vary in different social and environmental contexts, is not known. We also do not know to what extent, or how, projects that are shorter than this minimum time can be evaluated and whether they could be credited. It is unclear how the economic and social development benefits of projects of different duration compare, and how the values of these benefits in turn equate with the opportunity cost of land under alternative landuses. Even within the forest sector, we have little information either on the comparative efficiency with which managed natural forests and plantations could produce both emission reduction credits and social benefits, or the pattern of these benefit streams over time. A better understanding of the likely fixed and variable costs of different kinds and sizes of LULUCF projects and the impacts of these on the financial sustainability of the projects is needed. In particular, we require information on the marginal costs of such projects in developing countries.

In the current absence of a fully developed carbon market, we do not know the actual value of carbon under circumstances of temporary capture and how this might compare with its value under permanent emissions reduction. There is also no clear understanding of how the value of carbon is likely to change with the duration of carbon storage, nor what impact market fluctuations in both the supply of and demand for CERs (and hence price) will have on the long-term viability of LULUCF CDM projects. Analytical tools need to be developed both to enable potential investors to evaluate whether a proposed project will produce enough CERs of sufficient value to ensure a project's financial viability and therefore its attractiveness. Tools are also needed that allow the operational entities to assess more accurately a project's capacity to produce long-term atmospheric and sustainable social benefits.

Precisely how LULUCF projects will function within the CDM is not known. Some insight may come from the existing small crop of AIJ forestry projects, but it is likely that at least some of the details will need to be worked out adaptively as knowledge and experience accumulate. Nevertheless, there are some elements which will need to be agreed upon in the guidelines for such projects. These include the issues of responsibility and liability for the various inputs and outputs of these projects (financing, carbon, sustainable development benefits, and others). Given the inherent asymmetry in the interests, knowledge, skills and experience of the parties to a project, it is questionable whether all these details can be left to be contracted individually through negotiation among the parties. An inequitable agreement at the outset is unlikely to last. The implications of different options for assigning responsibility and liability need to be assessed in terms of the viability and attractiveness of projects to investors and hosts, the gains to both the atmosphere and social development, and project longevity.

With all these uncertainties, the analysis and appraisal of risk becomes crucial. Risk assessment methods need to be developed to forecast with a sufficient level of accuracy and precision the loss of carbon due to social and environmental factors. Whether this is possible, given the uncertainties, remains to be seen. Ideally, such methods should also indicate the potential for risk mitigation, as well as what level of this would ensure an economically viable project.

6. LEAKAGE

(For matrix see Annex I Table 5)

6.1 Introduction

Leakage is one of the main concerns raised by negotiators and other stakeholders opposed to the inclusion of LULUCF in the CDM. Unfortunately, insufficient research is being conducted to address these concerns, relative to efforts on baselines and additionality. Some research on monitoring and validation for individual projects is being conducted but this has not been synthesised and linked to the policy process, and may not have been conducted in sufficient detail or scope.

Four areas of research were suggested:

- A typology of leakage
- Guidance for project design and selection to avoid potential leakage
- Guidance on project measurement boundaries and methods to assess leakage
- Methods to assess leakage occurring beyond the measurement boundary, and to adjust CER accordingly

In addition, it was suggested that the CDM Project Cycle should be analysed to identify where leakage must be addressed in the functioning of the CDM.

6.2 A Typology of Leakage

The Intergovernmental Panel on Climate Change (IPCC) special report on LULUCF included a table indicating the mechanisms and rough scale of leakage for several general project types. This type of table needs to be expanded (at greater levels of disaggregation, and to include more detailed/quantitative information). A typology can serve as a framework to synthesise available leakage research into a policy-relevant form, and can also guide specific research questions.

Project categories should be analysed according to their general type (e.g., avoided deforestation, reforestation), location, total size, and type of landowners/land parcels. The information required for each category would be a complete listing of the possible mechanisms by which leakage might occur (drivers), how much leakage might occur through each mechanism, and some indication of variability and risks for this project category. The appropriate level of disaggregation in developing a typology deserves careful thought.

6.3 Project Selection and Design

Having identified the mechanisms of concern for project categories in the Typology, the next step is to develop guidance and/or 'best practices' for the design of projects. During the design phase, developers can add additional project components or otherwise modify projects to minimise leakage. This guidance would help project developers to anticipate leakage mechanisms before project implementation. In addition, best practice guidelines could be used to evaluate projects submitted to the CDM for registration.

6.4 Measurement Boundaries and Methods

Projects must perform monitoring to measure whether any leakage has occurred. Monitoring and measurement methods must be developed at the project level. These methods must be cost-effective, sufficiently accurate, and rely on obtainable data. Considerable research opportunities exist for developing and testing possible methods, including evaluations of existing projects. Leakage assessment methods should be integrated into the broader project monitoring/ measurement research agenda.

6.5 Leakage Beyond the Measurement Boundary

For some project types, leakage will occur beyond any reasonable monitoring boundary. The first research question is how to clearly identify the mechanisms and magnitude of this type of leakage. If leakage is a problem, then methods must be developed to address it. Three options exist:

- Ignore such leakage (this would be a policy decision that projects are not responsible, or that the level of such leakage is insignificant)
- Make projects that suffer from this leakage ineligible (also a policy decision)
- Develop some estimation methods to adjust the CERs issued

These macro level methods do not currently exist, although the IPCC Special Report does suggest some approaches. It was suggested that the necessary expertise and data to develop these methods lies less in project researchers and more with those researching global/regional trade in forest and agriculture products.

An additional topic that needs research is the cumulative effect of CDM projects on markets to produce leakage. It is suggested that a number of CDM projects in the same market could be sufficient to have an identifiable market effect (leakage), and that this effect might need to be measured and then allocated across projects.

7. MONITORING

(For matrix see Annex I Table 6)

The production of forest carbon requires consistent, reliable, accurate and verifiable measurement. While methods developed by Winrock International and SGS are widely used, they are perceived to be costly. The lack of monitoring standards for LULUCF limits the progress that can be made in refining methods and the application of methods. This also constrains an understanding of the costs of monitoring under various project scenarios.

The determination of both monitoring standards and standard methods of monitoring would reduce uncertainties in the quantification of carbon benefits from LULUCF projects and would help to reduce the costs of measurement and data handling. Additional refinement of methods would help reduce per unit costs of establishment of monitoring, thus reducing overall transaction costs and contributing to greater cost-competitiveness of LULUCF projects relative to other mitigation actions.

Critical questions on standards relate to acceptable levels of uncertainty, types and frequency of measurement and the relative roles of modelling, measurement and assumption. Improvements in monitoring methods relate primarily to increases in efficiency. The collation, synthesis and dissemination of existing information on methods, allometric relationships, decomposition and mortality rates and wood density would also help reduce the costs associated with monitoring and verification.

8. BASELINE/ADDITIONALITY ISSUES

(For matrix see Annex I Table 7)

Article 12.5 of the Kyoto Protocol states that a CDM project must result in carbon credits that are 'additional to any that would occur in the absence of the certified project activity'. Thus, a reliable, verifiable and cost-effective baseline is needed to calculate CER from CDM projects to demonstrate additionality to what would have happened otherwise. So far, research on baseline and additionality determination has focused on the energy sector and neglected LULUCF. While baseline issues have played a relatively minor role at The Hague, they are likely to become more important at The Sixth Conference of the Parties (COP 6–bis) and beyond when methods will be discussed by the IPCC or the subsidiary bodies of the UNFCCC.

We propose a research programme dealing with seven issues:

1. Methods for quantifying baselines
2. The cost-effectiveness of methods
3. Building technical capability to develop baselines in CDM host countries
4. The integration of development benefits for host countries into the baseline assessment. A key issue for developing countries is how to ensure that sustainable development benefits accrue to the host countries of the CDM. However, there is also a fear that an externally imposed sustainable development criteria is not compatible with national sovereignty. Research should explore ways of integrating national sustainable development goals into the baseline determination
5. The determination of investment additionality with emphasis on barriers to project investments
6. The evaluation of the US proposal on performance thresholds for additionality determination in terms of its applicability to LULUCF projects
7. The integration of stakeholder points of view in baseline determination in the process of validation. There is a concern that stakeholders will not have meaningful participation in the process of baseline determination. Research can be done to determine the time and scale of stakeholder participation in baseline determination

Issues 5 to 7 should yield outputs before COP 6–bis as they have a clear political implication while issues 1 to 4 are of a longer-term nature.

9. CROSSCUTTING ISSUES

(For matrix see Annex I Table 8)

9.1 Introduction

Research topics that cut across other synthesis groups were identified, as were research topics that had not been discussed but which were important to landuse, landuse change and forestry. Finally, a discussion was held of the actions to be taken before COP 6 scheduled for July 2001 in Bonn.

9.2 Crosscutting Research Topics

Four crosscutting research topics were identified:

- Identify sustainable development indicators;
- Reduce transaction costs;
- Synthesise experience from other development sectors;
- Build a science-enhanced global inventory.

Identify sustainable development indicators
The CDM was established to help developing countries achieve sustainable development. However, no clear guidelines exist for assessing whether and how a particular activity contributes to 'sustainable development.' Negotiators frequently argue that each country should determine what activities are most important and the rules for assessing their sustainability.

Science can help identify indicators of sustainability that could help governments make choices, including what and how to measure sustainability. Common and meaningful indicators with clear methods and procedures for measurement and reporting would allow the comparison of results over time as governments acquire experience with project implementation. Case studies would be a useful format for showing the effectiveness of indicators.

Reduce transaction costs

The framework for advancing projects under the CDM has been discussed in detail over the past few years. Many questions have been raised about the purpose of the CDM and the administrative procedures that should be set up to oversee the approval and implementation of CDM projects. Currently, landuse change and forestry projects under the CDM appear to face more requirements than other categories of projects. Some fear the transaction costs required for CDM projects to move forward will put CDM projects at a disadvantage compared with Joint Implementation or Emissions Trading projects.

Science can provide standard methods for setting baselines, monitoring results, assessing leakage, and judging the sustainable development of landuse, landuse change and forestry projects. Setting threshold criteria that landuse change and forestry projects must meet to be considered for CDM approval may help reduce other transaction costs.

Small projects face many if not all of the same transaction costs as large projects. Setting default values for small landuse, landuse change and forestry projects with clear sustainable development benefits could help small projects compete with large projects. Unless ways can be found to reduce the transaction costs for small projects, small projects that can produce substantial sustainable development benefits are less likely to be implemented as CDM projects.

Synthesise experience from other development sectors

A review of the development experience from other sectors could help guide policymakers as they evaluate such issues as:

- The efficiency of larger projects versus the equity of smaller projects;
- The use of scarce local capacity for CDM projects rather than more traditional development activities;
- Management systems to distribute benefits among smallholders equitably;
- The cost of building capacity for CDM projects versus projected benefits;
- How to evaluate sustainable development benefits; and
- How to evaluate and monitor unintended positive or negative impacts associated with a particular project (leakage).

Build a science-enhanced global inventory
While the subgroup addressing issues of scale recommended action to develop better inventories, the importance of better inventories cuts across all groups. As more powerful imagery and data management techniques become available each year, science can provide better global inventory data to address the setting of baselines, the precision and accuracy of monitoring, and the measurement of leakage.

Substantial effort has already been put into the development of standard data sets and model scenarios (e.g., the International Geosphere-Biosphere Program (IGBP) data set, the Forestland Oriented Resource Envisioning System (FLORES), the Global Trade Analysis Project (GTAP)) and the science community clearly should seek to enhance existing work and avoid duplication. The compilation and use of better data may proceed more quickly if lead research centres were identified for the coordination of the evaluation and integration of multiple data sources (e.g., official government statistics, timber inventories, university research projects, detailed data gathered for environmental assessments, carbon storage projects, data from new remote sensing tools). Lead centres could set standards for which data could be used, identify data gaps and prioritise new research efforts.

In the short term, there is a particular demand for better estimates of the technical and economic potential for emissions avoidance and carbon storage projects including realistic analysis of the potential geographic distribution. In particular, assessments of technical potential must consider the opportunity costs of alternate uses for land resources.

9.3 Matters Not Discussed during the Meeting

Five areas of potential importance to landuse, landuse change and forestry (LULUCF) that were not discussed during the meeting were also identified:

The integration of biofuel, timber and carbon
Conversations at the meeting focused on avoiding emissions from forest loss and on the carbon storage potential from the development and restoration of forestlands and from changes in land management practices. On a global basis, biomass in the form of timber products and energy already provides benefits to a substantial percentage of global population. Global trade models that integrate potential values for trading in carbon with existing markets for timber and energy could yield useful tools for scenario development and forecasting.

The economic analysis of agent behaviour in developing markets
Most of the models being used to project impacts from market-based trading of CERs assume rational behaviour on the part of landowners and managers. They have not analysed or considered

likely behaviour or looked carefully at possible perverse incentives. Changed market and price scenarios will impact on agent behaviour in more complex ways than can be easily represented in supply and demand analysis. Some landowners will not change management practice no matter how large the incentive. Others may respond disproportionately to small incentives or take action in anticipation of high prices in the future. Better economic analysis could improve estimates of the size of future supplies of CERs from landuse change and forestry projects.

The analysis of cost of capacity building versus potential value of CERs

Estimates of the potential value of CERs varies widely. In general, future buyers of CERs estimate significantly lower prices for CERs than potential sellers foresee. Depending on the actual value of CERs, certain classes of credits may cost more to develop than the credits will be worth. Conversely, the development of effective, low-cost intermediaries that can help develop large numbers of smaller, community-based projects could attract projects to areas where experts feel there is little opportunity.

Could science help define critical skills and know-how across different levels that would be useful not only to the development of landuse change and forestry projects under the CDM but to broader sustainable development objectives?

How does the transfer of 'best practice' technology apply to landuse, landuse change and forestry projects?

One explicit objective of the CDM is to transfer technology from developed countries to developing countries. Does this objective also apply to landuse, landuse change and forestry projects where best practices will often be specific to a particular site and climate? Governments of developing countries are concerned about sovereignty with respect to land management.

Science can help evaluate and disseminate 'best practices' for the management of various classes of land and landuse. The Consultative Group on International Agricultural Research produced an evaluation of the impact of the introduction of higher yielding varieties on greenhouse gas emissions. In its report, higher productivity on some lands reduced the overall land needed to meet global food needs.

Other multilateral environmental agreements

Landuse, landuse change and forestry projects can store carbon and help provide food and fuel as well as serve other environmental objectives. Either by conditionality or through the sustainable development objectives of host countries, the CDM may interact with the biodiversity, desertification, Ramsar or other international conventions. Although proposed CDM projects may produce costs and benefits relevant to other conventions, it is unclear how these multiple benefits could be valued and whether public investments in benefits or official aid-flows under other conventions would preclude the sale of CERs from multipurpose projects.

9.4 Actions Needed Prior to COP 6

Overall, the group felt there was little that could be done to move the process forward in advance of the COP 6 scheduled for July 2001 in BONN. Individuals could prepare materials to address various outstanding issues but the limited time would make it difficult to circulate materials and develop consensus positions.

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ANNEX I. MATRICES

Table 1. Matrix of research issues, outputs and questions for institutions and organizational capacity

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential Donors	Audience
Institutions, organizational arrangements, equity, and transaction costs	Evaluation of host country institutions and their implications for transaction costs and equity	1. How do transaction costs vary with degree of institutional development? 2. How do differing degrees of regulation impact on transaction costs and equity? 3. What size are the tradeoffs between transaction costs and equity and which regulatory framework can minimize these costs? 4. What are the impacts of land tenure institutions on project design, equity and transaction costs? 5. Which existing host country institutions are most important for successful LULUCF projects? 6. What influence do LULUCF project types and institutions have on equity outcomes? 7. How does the set of host country institutions influence the relative roles of private and public sectors? 8. What are the implications of institutions for various means of risk management? 9. How does the choice of a unilateral, bilateral or multilateral project architecture depend on host country institutions? 10. What will be the effect of competition on the evolution of institutional arrangements for carbon projects?	• ASB consortium • IIED • JICA • World Bank • CASRF-Indonesia • CIFOR • IIE-Hamburg • CIRAD • Pelangi Indonesia	• World Bank-PCF • USAID • GEF • AusAID national sector studies for CDM • UNDP • SIDA • SAREC	• Private sector • Local NGOs • Investors • Government decision makers • Multilateral lending institutions

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential Donors	Audience
	Evaluation of CDM architecture (unilateral, bilateral and multilateral)	1. How do host country institutions influence the choice of architecture? 2. What are the equity implications of the various architectures in a competitive global carbon market? 3. What is the relative role of the private and public sectors? 4. What can we learn from existing case studies? 5. What will be the effect of competition on the evolution of arrangements? 6. What safeguards are needed to ensure additionality in terms of ODA? 7. What combination of funding mechanisms (ODA, GEF, private sector) would lead to project designs capable of achieving multiple local and global objectives (biodiversity, C seq., watershed protection, sustainable development etc.)	• CIFOR • IIED • JICA • World Bank • CASRF-Indonesia • IIE-Hamburg • CIRAD • Pelangi Indonesia		• Private sector • Investors • Government decision makers • Multilateral lending institutions
Organizational capacity at local, intermediate and national levels	An assessment of organizational capacity at national and regional levels	1. What is the current status of capacity in organizations involved with LULUCF projects and what are the needs? 2. What are the priorities in terms of capacity building?	• National research partners • CORAF • CATIE • CIFOR • CIRAD • IIED	• USAID • GEF • AusAID national sector studies for CDM • UNDP	• Participating project communities • Local NGOs • Private sector • Investors • Local government
	Guidelines on how to develop and prioritise sustainable development indicators that are relevant nationally and can be effectively implemented by project developers	1. What are the sets of sustainable development criteria and indicators that are likely to be relevant to LULUCF projects? 2. What type of regulatory framework is needed to ensure that SD C&I are effectively applied and used in project evaluation and selection? 3. What are the capacity needs for developing sustainable development indicators in developing countries and how can they be met?	• ASB • Pelangi Indonesia	• SIDA • SAREC	

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential Donors	Audience
	Good practice guidelines and training programs for project selection, design, monitoring, and verification	1. What are the technical capacities needed to prepare and implement a LULUCF proposal? 2. What are the information needs to assist developing country organizations in undertaking LULUCF projects? 3. What combination of teaching, training, and information dissemination techniques, methods and aids are needed to build capacity on LULUCF projects?			
	Capacity and information dissemination at community level on LULUCF projects	1. What information on LULUCF is needed by the various stakeholders to achieve local sustainable development (from communities to policy makers)? 2. What are the best media for targeting information to various stakeholders? 3. What types of participatory tools and approaches are needed to effectively involve local communities, NGOs and local governments?			

Table 2. Matrix of research issues, outputs and questions for scale issues

Issues/problems	Outputs	Research Questions	Research Collaborators
Volume: • Lack of understanding on the volume of CERs in different project types and countries should be allowed or limited	1. Estimation of the global supplies of the CERs by: • Type • Country 2. Assessment of potential volume, costs, risks and time associated with CERs in the market	What is the potential global supply of CERs, and how is it distributed between • project types (LULUCF/non-LULUCF and disaggregation)? • regions/countries?	• Universities • CIFOR • FAO • IGES • GTAP • Other regional forestry research institutions • World Bank
Restrictions and Eligibility: • Policy discussion • Caps on emissions trading • Caps on CDM • Some CDM project types not eligible (avoided deforestation)	1. A tool to analyse the policy proposals 2. Estimates of demand from Annex B countries	What is the global supply of CERs, and global price for CERs, under different • prices for emission reduction credits in international markets (prices are influenced by trade restrictions)? • eligibility rules for CDM project types?	
Equity: • The ratio between LULUCF and non-LULUCF activities • The difference within and between countries, regions (arid Africa vs. humid South America), continents • The balance between reducing domestic emissions and investing in carbon offsets overseas	1. A global review and evaluation of the potential for different CDM options, over time, within each country's socio-economic and environmental contexts	1.1 What factors influence a country's potential to host a particular type of CDM project? 1.2 To what extent are countries willing to be involved in LULUCF and non-LULUCF activities? 1.3 What are the guidelines to ensure the equal distribution of opportunities in LULUCF activities?	
	2. Identification and assessment of the factors influencing the cost of production of carbon offsets in LULUCF and non-LULUCF projects, estimating the costs at the most disaggregated level possible within a country (regional, industrial sector-cf. pilot abatement costing studies)	2.1 What is the framework for the analysis and assessment of costs of production that vary between a region and a country? 2.2 What areas need capacity building in tropical regions to address issues in CDM-LULUCF activities? 2.3 How can the equitable distribution of CDM opportunities be ensured, given the differences across regions and between countries?	

Issues/problems	Outputs	Research Questions	Research Collaborators
	1. Policy options that optimise equitable distribution of the opportunity to participate in and benefit from CDM activities.	1.1 What is the most effective/ politically acceptable proportion of CERs that a country can obtain from overseas to offset domestic reductions in emissions? 1.2 What is the most effective/ politically acceptable proportional distribution of CERs among geographical regions? 1.3 What is the most effective/ politically acceptable proportion of CERs that can be obtained from LULUCF activities? 1.4 What policy incentives could be developed to address the specific circumstances of less developed countries?	
CER price and sustainability-the low price of CERs means that higher-cost projects will not be feasible	Compilation of studies or empirical research on the relationship between project cost per carbon unit and the sustainability impacts of projects	1. Is there a systematic relationship between the cost of carbon reduction and the sustainability of CDM activities? 2. If so, what does this mean for the trade-off between trading restrictions, eligibility rules and minimum sustainability standards?	

Table 3. Matrix of research issues, outputs and questions for social costs and benefits

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential audience	Lead institution
Past lessons and other experiences with development projects in the developing world	Synthesis of lessons learned from other projects and how they have dealt with social costs and benefits	How have development projects dealt with costs and externalities?	• CIFOR • World Resources Institute • Seoul University • University of New Mexico • Union of concerned scientists	• Project developers • Research institutions	WRI: Development of sustainability indicators that are compatible with the CDM LULUCF sector
	Development or adaptation of sustainability indicators for assessing costs and benefits from similar works	Which indicators need to be developed for supporting the assessment of carbon-related LULUCF projects? Which ones can be used from similar disciplines to fit into this new scheme?	• FACE Foundation (Netherlands) • Fundacion Amigos de la Naturaleza (Bolivia) • Fondo BioClimatico (Mexico)	• Project developers • Research institutions	CIFOR: Analysis of mechanisms for reducing transaction costs, implementing best practice for CDM project development, assessing production costs from forestry and agroforestry projects
Cost minimization without compromising quality of projects and derived benefits					Seoul University: Modelling for carbon costing
The presence of transaction costs and the consequent diminishing efficiency in the supply of carbon offsets	Develop cost scenarios for different types of projects and under various rules (both national and international)	How do transaction costs relate to project type (e.g., reforestation, forest management) and project configuration (e.g., smallholders, largeholders)		• Project developers • SBSTA • INVESTORS	ASB: Pilot projects research for costs in general, but focusing at transaction cost reduction, specially for smallholders
	Transaction cost reduction schemes and the role of regulation and policies intended to support this objective	How will CDM rules for baselines, monitoring, leakage, certification and others impact on transaction costs?		• Parties • SBSTA • Project developers	UCS: Assessment of existing valuation methods for environmental costs, application and development of new techniques

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential audience	Lead institution
The role of research for reducing production costs and developing better projects	Assessment of future opportunities and needs for research technologies and techniques for cost reduction of CDM projects.	How can monitoring and implementation costs be reduced with the development of technology?		• Project developers • SBSTA • INVESTORS	
Social and environmental costs: externalities derived from the implementation of projects	Synthesis of impact-valuation and assessment of different methods for impact assessment	How do we account for the trade-offs between benefits, social and environmental costs and the values placed on benefits by different stakeholders?		• Policy makers • Negotiators • SBSTA	
		What is the relation between the size of the project, the number of stakeholders and the general costing (transaction costs, production costs and externalities)?		• Project developers • Local and regional governments	
		How can externalities be internalised in such a way that sustainable development can be achieved?		• SBSTA • COP • Project developers	
Long term benefit assessment and the community					
The need for assuring long-term social and environmental benefits from LULUCF CDM projects	Assessment of community and individual needs for CDM LULUCF projects and the potential flow of benefits into the community	What is the local need for CDM projects and how can they compete against other land uses?		• International negotiators • Local and regional governments	
	Benefit valuation techniques for CDM LULUCF projects; opportunity cost of land analysis	How can collateral, environmental and other types of indirect benefit be compared to the economic direct benefit of carbon offsets?		• Project developers • The government	

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential audience	Lead institution
		What benefits should be considered in order to analyse the viability of a given project? How can they be measured in comparable units?		• Project developers	
		How can a LULUCF project be defined so it addresses local community needs in the long run?		• Project developers • International negotiators	
Equitable and adequate compensation to the community	Definition of the process of benefit distribution	How can different levels of benefits (e.g., international vs. local) be aggregated?		• Project developers • The government (policy makers)	
		How can benefits and compensation be distributed in an equitable and fair way?		• Investors • Project designers and developers	
	Synthesis of benefit distribution of similar projects and the outcomes derived from compensation	What is the community perception of potential benefits?		• The community • The government	
	Methods for estimating and distributing compensation in the long run.	What are the necessary conditions of a project to ensure that local communities receive project benefits and the host country net social gains?		• SBSTA • International negotiators • Project developers	
The need for adequate inclusion of the stakeholders that benefit or are affected by a project.	Initial list of typical stakeholders and their role in the project	Who are the stakeholders, their possible competing interests and the roles in the project and project related activities?		• Project developers • Investors	
		How can conflicts of interest be addressed?		• The community • The government	

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential audience	Lead institution
		Which stakeholders need to be included in the benefit assessment and what level of regional distribution should be assessed?		• The government • The community • Project developers	

Issues/problems	Outputs	Research Questions	Research Collaborators	Potential audience	Lead institution
Smallholders and cost minimization					
The lack of participation of smallholders in profitable CDM projects	Methods and strategies for making CDM projects viable and attractive to smallholders	Which is the best way to aggregate smallholders in projects, so transaction costs, production costs and externalities are minimized?		• Project developers • The government • Investors	
		What level of aggregation and size of projects still have as an outcome viable projects?		• Project developers • The government • Investors	
		How can we assure long-term mitigation and collateral benefits from smallholder projects?		• SBSTA • International negotiators	

Table 4. Matrix of research issues, outputs and questions for permanence issues

Issues	Outputs	Research Questions	Research Collaborators	Potential audience
1. Need for further elaboration of models and information on the range of carbon crediting procedures	Description of approaches that could be used to assign credit for carbon removed from the atmosphere over time	What are the various options for assigning credit for the carbon sequestered over time?	• Edinburgh Institute of Carbon Management (R. Tipper *et al.*) • CIFOR • WRI • Bogor Agricultural University • Dept Forestry	• SBSTA (COP)
		What are the most appropriate measures and units for carbon credits in LULUCF?		• SBSTA (COP)
	A comparison and assessment of the cost-effectiveness of different approaches to assigning credit for carbon sequestered over time	What are the administrative and other costs of the different approaches to assigning carbon credits?	• School of Economic Studies, UNE (Oscar Cacho) • IFRC • Bogor Agricultural University • UPLB • Indian Research Institute • Research Centre for Forest Management, Malaysia • Forest Research Institute of Malaysia	• Other researchers • Selected governments • (e.g., Australia, Indonesia)
		What are the implications of multiple types of CER for the development and efficiency of international C-based markets?		• SBSTA (COP) • Potential investors
		What is the implication of using TCERs on the attractiveness of C-sink projects to investors?		• Potential investors
	An evaluation of the social and economic consequences of adopting different approaches to assigning credit for carbon sequestered over time	Are the transaction costs of pay-as-you-go schemes lower than those schemes in which credit is given for long-term carbon storage?	• School of Economic Studies, UNE (Oscar Cacho)	• Other researchers
		What are the opportunity costs of land under different uses in different agro-ecological zones?	• ASB/ICRAF	• Potential hosts of projects

Issues	Outputs	Research Questions	Research Collaborators	Potential audience
		What are the implications of the different approaches to carbon accounting for the distribution of the income and assets of local people?	• ASB/ICRAF	• Potential hosts of projects
		Who bears the production, market and other risks under different accounting options?		• Potential investors and hosts of projects
	An assessment of the environmental impacts of adopting different approaches to assigning credit for carbon sequestered over time.	What are the impacts on carbon stocks?		• SBSTA (COP)
		What are the impacts on biodiversity?	• WRI • TNC • CI	• SBSTA • Operational Entities
		What are the impacts on other environmental services?	• WRI • TNC • CI	• SBSTA • Operational Entities
2. Liability	Assessment of the responsibilities and liabilities of different stakeholders	Which stakeholders have what responsibilities and liabilities?		• Potential investors and hosts of projects
		How can liability be assured over several decades?		• SBSTA • Potential investors and hosts of projects
		What provisions on liability should be specified in the LULUCF-CDM rules and what should be left to private contracts and other mechanisms?		• SBSTA (COP) • Potential investors and hosts of projects

Issues	Outputs	Research Questions	Research Collaborators	Potential audience
3. Duration of projects	An assessment of the length of projects to ensure long-term atmospheric benefits.	Are emission reductions and/or removals in the non-LULUCF sectors fungible with those in the LULUCF sector in both environmental and economic terms?	• Pew Centre	• SBSTA (COP)
		What methods are needed to analyse and assess the optimum project duration in terms of carbon uptake and storage?	• School of Economic Studies, UNE (Oscar Cacho) • Universities	• Other researchers
4. Valuing carbon	An assessment of the potential value of carbon under different storage regimes	Is there a value in storing carbon temporarily?	• Pew Center	• SBSTA (COP)
		How does the value of carbon change with time of sequestration?		• SBSTA (COP)
		When is the rate of change in the value of carbon small enough to permit its release?		• SBSTA (COP) • Operational Entities
		Will temporary or discounted crediting of projects still attract investors?		• Potential investors
4. Valuing carbon	An assessment of the potential value of carbon under different storage regimes	Is there a value in storing carbon temporarily?	• Pew Center	• SBSTA (COP)
		How does the value of carbon change with time of sequestration?		• SBSTA (COP)
		When is the rate of change in the value of carbon small enough to permit its release?		• SBSTA (COP) • Operational Entities
		Will temporary or discounted crediting of projects still attract investors?		• Potential investors

Table 5. Matrix of research issues, outputs and questions for leakage issues

Issues and problems	Research outputs	Research questions
Limited understanding of when, where, and how leakage occurs.	A typology of leakage that quantifies the range of risks (magnitude) of leakage associated with different project types according to scales, locations and key leakage drivers.	1. What are the macro-economic policies that give incentives and disincentives for leakage according to country or region? 2. What are the project specific factors that influence the degree of leakage in a project according to country or region? 3. Under what project types is leakage more likely to occur? 4. At what temporal scale does leakage begin to surface and when is it possible to detect leakage according to project type?
Limited understanding of how to estimate leakage under various project scenarios and locations.		1. What methods should be used to calculate risk premiums and adjustment coefficients? 2. How do we translate different qualitative indicators and aspects of projects into quantitative factors in leakage adjustment formulas?
Project selection and design phases need to describe, quantify and explore interventions to curb leakage.	Leakage management guidelines for various project types according to geographic regions and scales.	1. Where in the project cycle should leakage be explicitly addressed? 2. Will expanding the project boundaries alone from a project to national level fully address leakage? 3. How do we test the validity of project boundaries to ensure that leakage has been detected or controlled? 4. What impact does bundling of several smallholders into one project versus a few large landowners have on issues such as sustainable development, leakage and transaction costs? 5. How are project boundaries defined and justified?

Issues and problems	Research outputs	Research questions
Constrained capacity to control and curtail leakage under various project scales.	Good practice guidelines for integrating leakage management interventions under various types of projects from different regions and scales.	1. What strategies should be put in place to mitigate leakage under various project scales? 2. What lessons can be learned from AIJ and non-climate change project experience? 3. Can we infer leakage from past experiences in AIJ and non-climate related projects (particularly in community forestry, agro-forestry, sustainable agriculture, improved crop breeding, and non-timber forest products, and forest conservation)? 4. And if so, how do we use such experience to classify the range of leakage which might occur under projects of similar nature in the CDM?
Lack of understanding on cumulative leakage and its impact on the viability of CDM.	1. Predictive models on cumulative leakage generation. 2. Hypothetical scenarios to demonstrate how, when, and under what circumstances cumulative leakage is likely to arise and where it is unlikely to occur. Later, when more project data becomes available, case studies, on how cumulative leakage was detected, addressed, and regulated.	1. How do we address cumulative leakage generated from trans-boundary effects of trade in harvested wood products? 2. What are the key factors driving cumulative leakage? 3. How can cumulative leakage be addressed by the CDM EB, host country CDM clearinghouses and project developers? 4. At what scale and magnitude does leakage become a significant threat to a certain project type?
Lack of understanding about how to address unmeasured leakage.	Classification of the trade offs which are likely to occur under different project types if a project developer / investor decide to accept different levels of precision and error in their MERV system.	1. What do we do when it becomes impractical to measure certain types of leakage? 2. What is the maximum standard of leakage we are willing to accept according to project type?

Table 6. Matrix of research issues, outputs and questions for monitoring issues

Outputs	Research Collaborators	Lead Institution
1. Development of standards for C stock change assessment on lands under Article 3.3, 3.4 or projects.	• IPCC • CIFOR • CRC for Greenhouse Accounting (Australia) • Winrock • NZ-FR* • Standards Australia/ISO	• Aust. CRC-GA
2. Development of standardized methods and models to assess changes in different forest carbon pools and associated uncertainties and costs.	• CIFOR • TSBF • ICRAF • Winrock • NZFR • SGS • Aust. CRC-GA • Aust. Greenhouse Office • LBL	• CIFOR
3. Collation, synthesis and presentation of existing information for estimating carbon stocks.	• CIFOR • ICRAF • USDA-FS • Aust. Greenhouse Office • Winrock • TSBF	• CIFOR
4. Development of integrated, multi-resource forest monitoring and inventory systems.	• USDA-FS, Bureau of Rural Sciences (Australia) • NZ-FR • ASB	• ASB (Alternatives to Slash and Burn Agriculture Program of the CGIAR)

Table 7. Matrix of research issues, outputs and questions for baseline/additionality issues

Issues/problem	Outputs	Research Questions	Research Collaborators	Audience
1. Methods for quantifying baselines	1. Comparison of different approaches to baseline establishment (a) Project-specific vs. generic (benchmarks) (b) Fixed or revisable baselines. If the latter is accepted, recommendations concerning revision period (c) Additionality tests	• How will baselines differ for the same project if different methodologies are used? • How can methods integrate social driving factors on GHG stocks and fluxes? • What data are needed to define benchmarks? • Should baselines be maintained throughout project lifetime or periodically revised? When should baselines be revised?	Basic team: • CIRED/CIRAD (France) • ECOSUR (Mexico) • Forest Agency (Japan) • FORDA • FREM • HWWA (Germany) • IIS (India) • Ministry of Environment (Indonesia) • Tropical Rainforest Research Centre (Indonesia) • UPLB (Philippines) • FAO (for data and networking) Short-term collaboration: • CICERO (Norway) • ECCM (Edinburgh, UK, via ECOSUR) • Ecosecurities (UK) • Forestry and Forest Products Research Institute (Japan) • LBNL (USA) • PROBASE consortium (EU, via HWWA)	• COP 6 negotiators • IPCC (if SR on baselines is to be written) • National CDM institutions in host and investor countries • Certifiers • Project developers • IGBP-LUCC • Forestry research community • Economics research community
2. Cost-effectiveness of methods	2. Accuracy-cost trade off relationship for baselines	• What are the costs of the different baseline methods proposed? • What is the measure of accuracy of the different baseline methodologies?		
3. Building technical capability to develop baselines in developing (host) countries	3. Assessment of training and information needs	• What are the capacity building needs for developing country participation in baseline development?		
4. Investment additionality is often linked to barriers to project investments: Risk perception, discount rate, need to change procedure (psychological barriers)	4. Assessment of barriers to implementation of profitable projects (including the non-monetary ones!): Recommendations for an applicable investment additionality test; Estimates for the share of non-additional projects if no additionality test is prescribed	• Will profitable activities be undertaken anyway? • Which barriers exist? • What factors determine the decisions of project investors? • Which institutional setting could make additionality determination superfluous? • What would be the share of profitable projects accepted under a benchmark? • Is the 'US Proposal' for additionality (2-step) applicable to LULUCF? How? Are there any criteria for a LULUCF threshold?		

Issues/problem	Outputs	Research Questions	Research Collaborators	Audience
5. No correlation of project performance with available quantitative criteria to derive performance threshold for additionality determination as suggested by the U.S. (contrary to energy projects)	Assessment of the applicability of U.S. threshold criterion	• What would be the basis of the criteria? Carbon only or other benefits? • How can we develop a SD baseline? Does this conflict with host country sovereignty about SD criteria? • How will stakeholders give inputs to certifiers? • What is the political acceptability of stakeholder participation in baseline-setting process? • What is the cost of stakeholder participation?	• Tellus Institute (USA, on benchmarks) • Trexler and Associates (USA) • University of Sao Paulo (Brazil, via HWWA) • WRI (USA, on specific regions in Africa) • Wuppertal-Institute (Germany, via HWWA) Medium-term collaboration • BIOTROP • IUFRO • OECD • NASA • Pembina Institute (Canada) • RFF (USA) • TERI (India)	
6. Development benefits for host countries should become part of the baseline assessment	Recommendation on integration of Sustainable Development (SD) aspects in baseline determination			
7. Integration of stakeholder view points in validating baselines, i.e., check by independent body (certifier) as prescribed by Article 12	Recommendations concerning time and scale of stakeholder inputs in baseline			

Table 8. Matrix of research issues, outputs and questions for crosscutting issues

Issues/problem	Outputs	Research Questions	Lead institution
Non Considered Aspects in Science Crosscutting themes 1. Identification of Sustainable Development (SD) indicators 2. Reduction in transaction costs 3. Synthesis of experience from other development sectors 4. Building a science-enhanced global inventory	1. Sustainable Development Indicators Identification of Sustainable Development indicators with explanations on: • how to measure • why it matters Case studies showing how indicators have been used and monitored	• Can we identify and achieve consensus on sustainable development indicators relevant to CDM objectives? • Are there widely accepted ways to measure specific aspects of sustainable development? • Are there any case studies from other fields that show how indicators have been used?	• Seoul National University • CIFOR
	2. Reduce transaction costs Standard methods-monitoring, baselines, leakage, sustainable development. Default values-Reduce transaction cost for small projects and encourage equity	• What are the most attractive ways to reduce transaction costs, especially for small projects that contribute to sustainable development objectives? • Can the setting of threshold criteria help smaller projects?	
	Threshold criteria-provide preferential market access for project most closely linked to sustainable development goals		
	3. Synthesis Synthesis of development experience from other sectors. • Community forestry • Scale-efficiency vs. equity • Cost of capacity vs. projected benefits • Valuation of sustainable development benefits • Leakage	Are experiences from other sectors relevant to the design and measurement of CDM project?	

Issues/problem	Outputs	Research Questions	Lead institution
	4. Global inventory Create inventory framework using existing official sources for carbon stocks and flows since 1990. Integrate data from carbon, timber and environmental surveys. Identify data gaps and prioritise data collection to enhance value of inventory. Prepare spatial analysis of potential carbon benefits.	• How accurate are existing projections of potential CERs? For Annex 1 countries? For non-Annex 1 countries? • Are there other credible sources of data that would enhance existing inventories and projections? • Where could additional resources to conduct inventories be most helpful? • What is the geographic distribution of potential CERs?	
Other issues			
Integration of biofuel, timber, and carbon markets	Global trade models for carbon, timber and biofuel • Global model for carbon drawing on CDM/AIJ • Existing model for timber and fuel markets • Integrated modelling of joint production of fuel and timber Use models to develop scenarios that projects supply, demand and price using various scenarios from UNFCC and World economic conditions Evaluation of precautionary benefits of biofuel in relation to unforeseen thresholds Analysis of how to integrate LULUCF and bio-energy development for achieving mitigation objectives	• What will be the price of CERs over time? • Will the price of shares differ by geographic region? Why? • What are the most influential factors determining the CER prices? • What are the trade-off between (the prices of) carbon credit, timber and fuel? • How will international conventions such as the biodiversity conversion affect the distribution of carbon forest project in the world?	
Economic analysis of agent behaviour in developing markets	Economic analysis of agent behaviour in developing markets	• What are the implications of market-based trading of CERs for equity and efficiency? • How will market-based trading affect ability to achieve sustainable development goals?	

Issues/problem	Outputs	Research Questions	Lead institution
Analysis of costs of capacity building vs. potential value of carbon credits	Geographic distribution for cost of building capacity, potential capacity, potential value of credits, and relationship to sustainable development priorities Estimate of scale of capacity building needed for implementing very large numbers of community scaled LULUCF projects Development of curricula and training materials for use by local institutions who design and implement projects	• What are the opportunity costs of allocating scarce human resources to develop CDM projects? • Are costs for developing capacity by country or within regions of a country justified by the potential value of CERs?	
How does transfer of 'best practice' technology apply to LULUCF	Review of 'best practice' relevant to LULUCF projects • What are differences between Annex 1 and Non-Annex 1 technologies? • What are cost differences? • What incentives can be used to stimulate transfer of 'best practices'?	• Is the concept of "best practices" applicable to LULUCF projects? • Where will "best practices" be found? • What technology is the best/most cost efficient one available/ existing? • Is there room to improve technology for Non-Annex 1 countries? If Yes, where? • How can the technology transfer be arranged/facilitated?	

ANNEX II. ANNEX I COUNTRIES

These countries are parties to the United Nations Framework Convention on Climate Change (UNFCCC) and are also referred to as Annex B Parties to the Kyoto Protocol.

Australia
Austria
Belarus *
Belgium
Bulgaria *
Canada
Croatia**
Czech Republic */* *
Denmark
European Union
Estonia *
Finland
France
Germany
Greece
Hungary *
Iceland
Ireland
Italy
Japan
Latvia *
Liechtenstein**
Lithuania *
Luxembourg
Monaco**
Netherlands
New Zealand
Norway
Poland *
Portugal
Romania *
Russian Federation *
Slovakia */**
Slovenia */**
Spain
Sweden
Switzerland
Turkey
Ukraine *
United Kingdom of Great Britain and Northern Ireland
United States of America

* Countries that are undergoing the process of transition to a market economy.

** Publisher's note: Countries added to Annex I by an amendment that entered into force on 13 August 1998, pursuant to decision 4/CP.3 adopted at COP 3.

ANNEX III. ARTICLE 12 OF THE COP 6 PART 2

1. A clean development mechanism is hereby defined.

2. The purpose of the clean development mechanism shall be to assist Parties not included in Annex 1 in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

3. Under the clean development mechanism:

   (a) Parties not included in Annex I will benefit from project activities resulting in certified emission reductions; and

   (b) Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emis sion limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol.

4. The clean development mechanism shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Protocol and be supervised by an executive board of the clean development mechanism.

5. Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of:

   (a) Voluntary participation approved by each Party involved;
   (b) Real, measurable, and long-term benefit related to the mitigation of climate change; and
   (c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

6. The clean development mechanism shall assist in arranging funding of certified project activities as necessary.

7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, elaborate modalities and procedures with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities.

8. The Conference of the Parties serving as the meeting of the parties to this Protocol shall ensure that a share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.

9. Participation under the clean development mechanism, including in activities mentioned in paragraph 3(a) above and in the acquisition of certified emission reductions, may involve private and/or public entities, and is to be subject to whatever guidance may be provided by the executive board of the clean development mechanism.

10. Certified emission reductions obtained during the period from the year 2000 up to the beginning of the first commitment period can be used to assist in achieving compliance in the first commitment period.

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