Mitigating Climate Change: Forestry Projects under the Kyoto Protocol's Clean Development Mechanism

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Humanity's ecological footprint has grown to such an extent that it is affecting the Earth's climate system itself. The great changes that have driven human development, including land use changes and the combustion of fossil fuels for energy, have also led to significant emissions of greenhouse gases such as carbon dioxide and methane. The accumulation of these gases in the atmosphere is now thought to have disrupted the Earth's climate system, with long-term and potentially serious implications, collectively referred to as climate change.

The Kyoto Protocol, which was negotiated in 1997 and came into force in 2005, is the first legally binding international agreement that attempts to tackle climate change. One of the instruments created under the protocol, the Clean Development Mechanism (CDM) allows developed nations to effect reductions of greenhouse gases in developing countries while at the same time bringing about sustainable development there. Among many types of eligible projects, countries can implement afforestation and reforestation projects that utilize the natural cycle of carbon sequestration to mitigate climate change. Under this logic, a country could plant a forest to sequester carbon and count that sequestration against its emission-reduction target back home.

Despite the promise that forests provide in offsetting carbon dioxide emissions, there are many uncertainties around forestry projects relating to the amount of carbon that trees can sequester and the permanence of such sequestration. Carbon sequestration was a controversial inclusion under the CDM not just because of these uncertainties but also due to concerns about the potential negative impacts of forestry projects on biodiversity as well as their uncertain contribution to sustainable development. As a result of these controversies and the delay in finalizing the rules on the CDM, to date not a single forestry project has been counted among the some 107 CDM projects approved by the CDM's governing authority, the CDM Executive Board.

Nevertheless, there are good reasons to assume that forestry projects can be implemented that meet the three requirements of the CDM – that they result in real and measurable greenhouse gas reductions, are additional to what would have happened without the project, and contribute to sustainable development. Accordingly, this report recommends a new program – the Capacitate Program – that would build capacity of all stakeholders in the CDM project cycle and lead to the implementation of credible forestry projects.

The Capacitate Program would establish a new working group, the Forestry Implementation Committee (FIC), to work alongside the other working groups that already exist under the CDM Executive Board. The FIC would resolve some of the major procedural issues confronting the implementation of forestry projects and develop strategies to encourage the growth of forestry projects. The FIC would be comprised of two part-time working groups that would provide expert advice to stakeholders. The FIC would also establish a Forestry Development Resource (FDR), which would be located across five regional centers of the world to provide support to stakeholders on the ground. The proposal outlines the budget, staffing requirements, performance management and calendar of events for the Capacitate Program's first year of existence.

Introduction

The Kyoto Protocol is an international treaty that attempts to address the problem of global climate change. The protocol sets legally binding limits on the anthropogenic emissions of significant "greenhouse gases", trace gases that trap heat and are thought to be accumulating in the atmosphere at a level sufficient to change the Earth's climate. Although the protocol was adopted in Kyoto, Japan, in 1997, it only came into force in 2005, when the required minimum number of countries finally ratified it. Despite widespread consensus about the causes and risks of climate change, ratification of the protocol was difficult because many countries disagreed on how best to address the climate change problem. Indeed, the United States, the world's largest economy and emitter of greenhouse gases, withdrew from the treaty in February 2001 (along with Australia) due to concerns that implementing the Kyoto Protocol would be unacceptably expensive.

Partly in anticipation of such criticisms, the Kyoto Protocol established the Clean Development Mechanism (CDM). The purpose of the CDM is to allow developed countries to benefit from the lower-cost opportunities in developing countries to reduce greenhouse gases, whereas the developing countries benefit from the investment that such projects will bring. One type of project allowed under the CDM is forestry, based on the rationale that trees absorb carbon dioxide (CO_2), one of the main greenhouse gases.

The first part of the report examines the problem that climate change poses, including the scientific basis behind the theory of climate change and the threats associated with it. It describes how the CDM was developed as part of the international response to the climate change problem. It outlines the scientific issues involved with the utilization of forests as eligible climate mitigation projects under the CDM and considers some of the controversies that have arisen as a result of including forestry projects as a means to address climate change. Partly as a result of these controversies, as well as a lack of capacity at all levels, to date no CDM forestry project has been approved. The second part of the report suggests a possible way forward for the implementation of CDM forestry projects. The proposed "Capacitate Program" would aim to increase the number of forestry projects under the CDM by building the capacity of all stakeholders in the CDM project cycle. The report outlines the tasks the program would undertake, its staffing and budget needs, as well as tools for managing the program's success.

Part I: Scientific and Policy Background

1. The Global Problem of Climate Change

There is growing consensus among the scientific community that global climate change is, in part, a result of long-term shifts in human development, particularly industrial and agricultural. These shifts have led to new land use patterns and increased combustion of fossil fuel for energy, which in turn have resulted in a significant increase in the emissions of greenhouse gases such as carbon dioxide and methane. The accumulation of these gases in the atmosphere has altered the Earth's climate system, with long-term and potentially serious implications. As stated by the Intergovernmental Panel on Climate Change in 2001: "There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities" and that the "Global average temperature and sea level are expected to rise under all IPCC… scenarios".[1]

1.1. The Science behind Climate Change

Climate change is a highly complex issue because it must account for the interactions between the ocean, atmosphere, and land, as well as the increasing impact of humans on each. Scientific understanding of the climate system has deepened over the past three decades. A comprehension of the naturally occurring greenhouse effect is necessary before understanding how anthropogenic influences have significantly altered this climate system.

1.1.1. The Greenhouse Effect

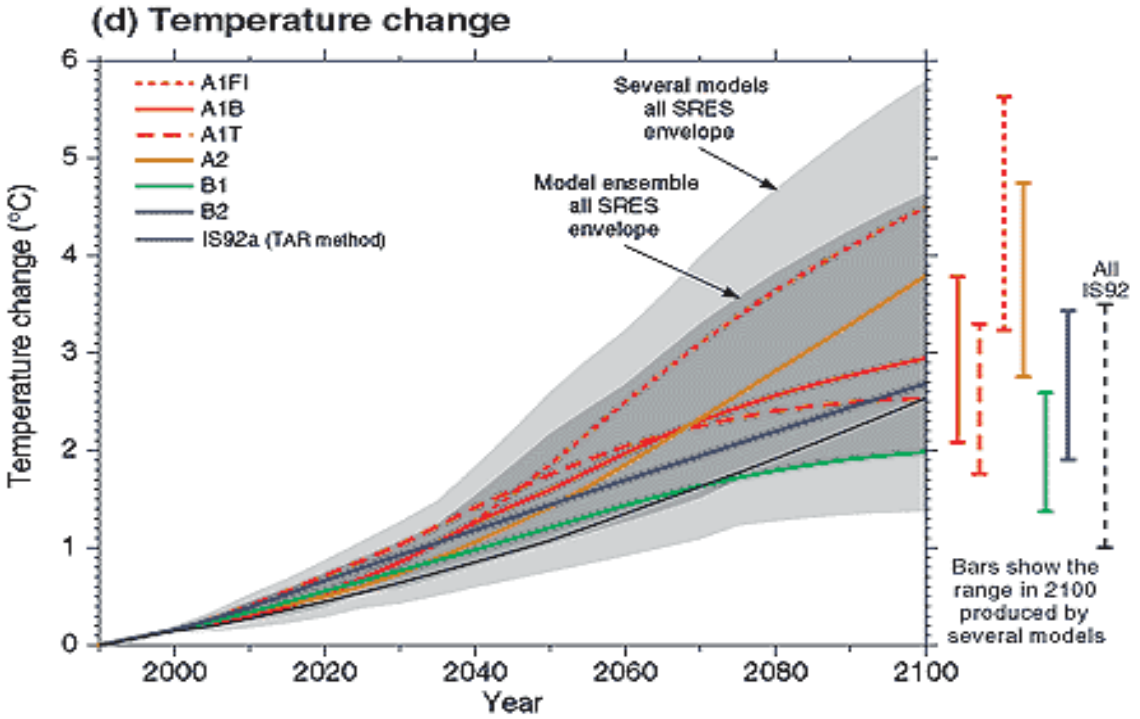
The primary influx of energy into the Earth comes from the sun in the form of shortwave radiation.[2] As the solar energy enters the atmosphere, its fate is varied. Some 30 percent is reflected back into space by clouds, while another 25 percent is absorbed by atmospheric gases. The remaining 45 percent is absorbed by the Earth's surface, and is eventually re-radiated back into space in the form of long-wave radiation. However, some of the long-wave radiation heading back into space is absorbed by a number of different atmospheric gases, known as greenhouse gases. These greenhouse gases, which include water vapor (H_2O), carbon dioxide (CO_2), and methane (CH_4), can then re-emit the long-wave radiation back towards Earth, preventing its escape to space. As a result, the average temperature at the surface of the Earth has risen.[3]

1.2. The Human Equation: Anthropogenic Influences on the Climate System

While naturally occurring concentrations of greenhouse gases are necessary to maintain Earth's present climate, it is widely accepted that human activities have accelerated the accumulation of such gases since the pre-industrial era.[4] Energy use, especially from fossil-fuel combustion, accounts for more than two-thirds of anthropogenic greenhouse gas emissions.[5] The extraction, processing, transporting, distributing, and burning of fossil fuels all contribute to significant emissions of CO_2. The greater concentrations of these gases augment the greenhouse effect by absorbing more long-wave radiation from the Earth's surface, thereby increasing the mean global surface temperatures.[6]

The adverse effects of CO_2 emissions may be further exacerbated by the direct effects of land use, land-use change, such as deforestation, and the response of terrestrial ecosystems to CO_2 fertilization, nutrient deposition, climatic variation, and disturbance (e.g. fires and major droughts).[7] Climate models attempt to address the limited uncertainties of measuring the collective anthropogenic greenhouse gas emissions, by running a large range of scenarios to predict likely future trends.[8] The Intergovernmental Panel on Climate Change "Special Report on Emission Scenarios" is a synthesis of the range of models that predict how anthropogenic emissions of greenhouse gases could increase over the next 100 years (Figure 1).[9] These models all show increase in average surface temperatures of between 1.4 degrees Celsius and 5.8 degrees Celsius by the end of the 21st Century.

Figure 1: Temperature change projected from the year 1990 to 2100



Source: http://www.ipcc.ch/present/graphics/2001wg1/small/01.33.jpg

1.3. Ecological and Socio-Economic Implications of Climate Change

Climate change models predict severe impacts on both the ecological and socio-economical spheres. The projected changes in the frequency, intensity, and duration of extreme climactic events may lead to significant alterations of precipitation patterns, in turn leading to floods or droughts over many regions.[10] While some regions may benefit from moderate amounts of climate change, benefits are expected to decrease as the magnitude of climate change increases. Overall, the majority of the scientific literature shows that human settlements will be affected by climate change through extreme weather, changes in health status, or migration. Both indirect and direct affects to human health can be expected as a result of climate change. Direct threats include an increase in heat stress and loss of life in severe floods and storms. An increase in the

range of disease vectors (e.g. mosquitoes), water-born pathogens, water quality, air quality, food quality, and availability will indirectly affect human health.

The range of social, institutional, technological, and behavioral adaptations that are available in reducing the full range of threats due to the onset of climate change are also important aspects of the problem.[11] Wealthy countries have the financial, institutional, and technological resources to predict and adapt to such impacts. While adverse effects are projected to be felt by much of the world, the impacts of climate change may fall disproportionately upon developing countries and the poor, exacerbating inequities in health status and access to adequate food, clean water, and other resources.[12]

Predicting the impact of climate change on the global socio-economic scale may prove challenging when considering the cumulative effects of the exponentially growing human population and the resulting changes in land use and loss of natural habitats. Nevertheless, it is clear that the greater the magnitude and rate of climate change, the more severe the potential adverse impacts will be.

2. Climate Change Policy: Addressing a Global Problem

Despite the uncertainties associated with climate science, the international community decided in principle to tackle climate change, recognizing that the risks of climate change are so great that the potential benefits of acting to mitigate it greatly outweigh the costs of doing nothing. The international community moved into action at the 1992 Earth Summit in Rio de Janeiro, Brazil. One major outcome of the Earth Summit was the creation of the United Nations Framework Convention on Climate Change (UNFCCC), an international treaty that remains the main forum for global attempts to address the problem of climate change.

2.1. International Consensus on Climate Change: the UNFCCC

The UNFCCC established an international consensus on the problem of climate change and laid down certain principles for action. These principles include:

- Recognizing that the problem of global climate change poses such serious threats to the whole of mankind that we cannot wait until achieving scientific certainty to tackle the problem of climate change.
- Encouraging developed countries to take the lead in combating climate change and its negative effects, given that the problem is largely due to historic emissions from industrialized countries.
- Promoting sustainable development.[13]

The UNFCCC did not contain legally binding requirements to reduce greenhouse gases, however. Its purpose was to establish a set of principles and goals as well as procedures for subsequent negotiations. Following the treaty's entry into force in 1994, Parties (countries that have ratified the UNFCCC) met at annual conferences (known as Conferences of the Parties, or COPs) to negotiate follow-up activities to the UNFCCC.

2.2. The Berlin Mandate: A Call for Action

In 1995, the first Conference of the Parties (COP) to the UNFCCC was held in Berlin, Germany. COP 1, as it became known, marked the beginning of the negotiation period for international climate change policy. The primary document that arose from this conference, known as the *Berlin Mandate*, declared that binding targets to reduce greenhouse gas emissions should be the primary vehicle for addressing climate change. To this end Parties agreed to begin negotiations on a Protocol to the UNFCCC. It was also agreed that developed countries should take the lead in reducing their emissions.[14]

2.3. The Kyoto Protocol: A Program for Action on Climate Change

Following two years of intensive negotiations, the Third Conference of the Parties (COP 3) was held in Kyoto, Japan, in December 1997. *The Kyoto Protocol,* which was adopted at the conference, was a landmark treaty as it set the first ever binding limits on the emission of greenhouse gases, requiring industrialized countries to reduce anthropogenic emissions of six greenhouse gases by an average of 5 percent below 1990 levels by 2010.[15]. Three important decisions were made during the framing of the Kyoto Protocol:

- Industrialized countries (called "Annex I countries"), agreed to take the lead in reducing their anthropogenic greenhouse gas emissions.
- Industrialized countries were allowed to meet part of their emission reduction targets through "flexible mechanisms," or lower-cost market-based alternatives to reducing their emissions domestically.
- Developing countries (called "Non-Annex I countries") agreed to allow developed countries to take advantage of low-cost emission-reduction opportunities in developing countries, while at the same time bringing investment and sustainable development to those host countries.

2.3.1. The Flexible Mechanisms of the Kyoto Protocol

During the Kyoto negotiations some countries emphasized that alternatives to reducing emissions domestically were necessary for many countries to reach their respective targets. As a result, the Kyoto Protocol established three flexible mechanisms to allow countries partly to meet their emission-reduction targets through the use of market-based mechanisms. The purpose of the flexible mechanisms is to lower the overall cost of reducing emissions by allowing countries with difficult targets to take advantage of cost-effective emission-reduction opportunities in other countries. Theoretically, the overall effect on the atmosphere should be the same if a country reduces greenhouse gases at home or in another country because greenhouse gases accumulate in the atmosphere regardless of their point of origin.[16]

The three flexible mechanisms are Emissions Trading (IET, Article 17), Joint Implementation (JI, Article 6) and the Clean Development Mechanism (CDM, Article 12).

1. IET allows any country that is below its target to trade its surplus quota with countries that exceed their target.[17]
2. JI allows Annex I countries to meet their targets partially by carrying out projects in other Annex I countries that lead to emission reductions in the host country; this mechanism is particularly geared toward post-communist economies in transition.[18]
3. The CDM, like JI, is a project-based mechanism, but activities must take place in a developing country.

2.3.2. The Clean Development Mechanism (CDM)

The CDM was negotiated as a compromise between the interests of both developed and developing countries.[19] The CDM allows developed countries to exploit lower-cost emission-reduction opportunities in developing countries. The developing countries, in turn, benefit from the investment and transfer of clean technology that should come with these projects. These interests can sometimes contradict one another, however, because the cheapest project for a developed country might not bring the most benefits to a developing country. To address these concerns, the Kyoto Protocol set the following three criteria for the CDM:

- Projects must results in "real, measurable and long-term benefits related to the mitigation of climate change"
- Projects must result in "reductions in emissions that are additional to any that would occur in the absence of certified project activity"

- Projects must assist developing countries "in achieving sustainable development and contributing to the ultimate objective of the Convention [i.e. the reduction of atmospheric concentrations of greenhouse gases to safe levels]"[20]

Figure 2: The Flexible Mechanisms and the Clean Development Mechanism's project criteria

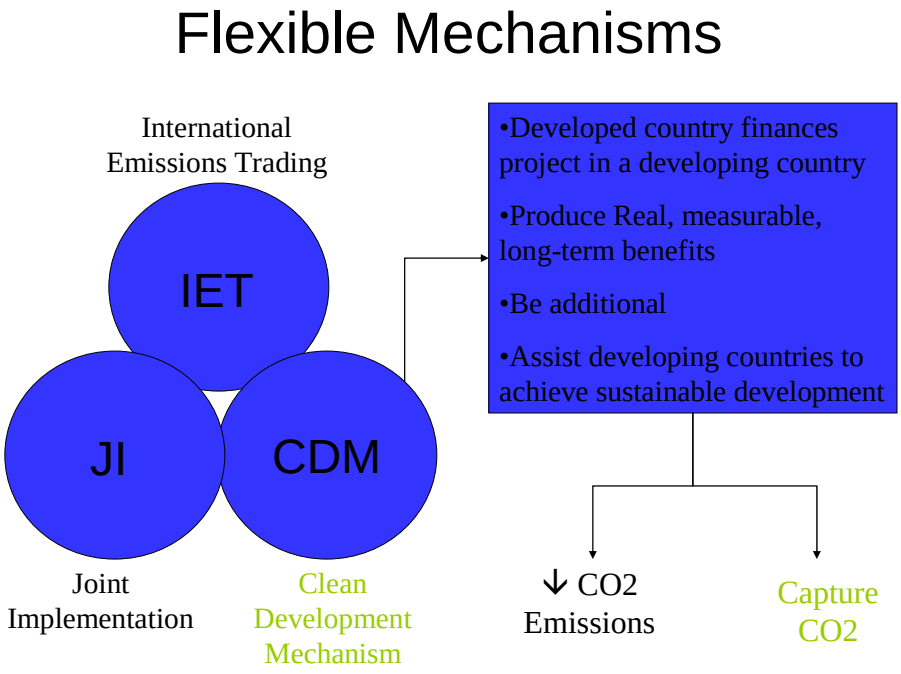


Figure 2: JI and CDM projects can either reduce carbon dioxide emissions or cause the sequestration of atmospheric carbon dioxide.

The Kyoto Protocol represents the first international policy response to mitigate climate change, through both emission reductions and carbon sequestration. Article 12 of the Kyoto Protocol defines how Carbon Emission Reductions credits (CERs) are achieved through project-based approaches; the developed country can use these CERS to offset is abatement target.

2.3.3. Negotiations of the CDM: The Marrakech Accords

COP 7 was held in Marrakech, Morocco in 2001. The main result of the conference, often known as the Marrakech Accords, defined how the CDM will work in practice. Importantly, the Marrakech negotiations established a "CDM Executive Board" that would manage the CDM. The Executive Board functions under the auspices of the Parties to the Protocol and assesses, oversees and reports on all aspects of officially sanctioned CDM projects. A complex system of roles and responsibilities exist within the CDM project approval and implementation stages. As the overseer of the CDM, the Executive Board serves under the authority of the COP, whose main objective is to ensure accountability, transparency, and efficiency in all CDM procedures and modalities.[21] Implementation of the CDM involves many different parties all of whom are overseen by the Executive Board. For example, it is the responsibility of Annex I countries to

reduce their emissions, but the job of developing and implementing projects will be the joint responsibility of the Annex I country, the host developing country, and private companies that execute the contract.

The 10 members of the Executive Board are appointed from the following country groups:

- Two Annex I and two Non-Annex I Parties,
- One representative from a small island developing state, and
- One representative from each of the five official UN regions (Africa, Asia, Latin America and the Caribbean, Central and Eastern Europe, and Western Europe and Others)[22]

Under the rules of the CDM, each country that has ratified the Kyoto Protocol must designate a national authority, known as a Designated National Authority (DNA). The DNA is responsible for CDM project evaluation and approval as well as being a central point of contact for each respective CDM project within their country.[23]

Another key part of the negotiations at Marrakech was to determine what sort of projects should be allowed under the CDM. Many project types could theoretically reduce greenhouse gases, either by reducing emissions greenhouse gases at their sources or by enhancing the removal of greenhouse gases from the atmosphere via "carbon sinks." A carbon sink is essentially a forest or other ecosystem, such as the ocean, that sequesters carbon, thereby offsetting carbon dioxide accumulating in the atmosphere. Potential project types that were deemed not to meet all three CDM criteria outlined previously became ineligible under the CDM.[24] For instance, the Marrakech Accords state that nuclear power, although it produces limited greenhouse gas emissions, is not eligible under the CDM because it is not considered to contribute to sustainable development.

One type of project that is eligible under the CDM is forestry projects, which will be the focus for much of the remainder of this report. The Marrakech Accords allow two kinds of forestry projects to take place under the CDM:

- Reforestation, defined as "Replanting of forests on land that was previously forested but subsequently converted to other use"
- Afforestation, defined as "Planting of new forests on lands that historically have not contained forests".[25]

Recognizing that the laws of economics would tend to favor large projects over smaller ones (which could be expected to bring greater relative social benefits), the Marrakech Accords established a fast-track approval process for small projects (defined as projects that reduce and emit less than 15 kilotons of CO_2 equivalent annually) to make them more competitive.[26] The Marrakech Accords also set a limit on the extent to which countries can use the CDM to meet their targets, requiring that domestic emission reductions be a "significant element" of each Annex I country's compliance with the Kyoto Protocol. For the first commitment period (2008-2012), CDM projects can only meet up to 5 percent of a country's emission-reduction targets[27].

3. Contentious Issues Surrounding CDM Forestry Projects

The primary objective of CDM forestry projects is to reduce atmospheric CO_2 levels by capturing, or sequestering, CO_2 from the atmosphere by exploiting the biological capability of plants to photosynthesize and thereby take in CO_2 for plant primary production. To understand how forestry projects work to meet the goals of the CDM, it is important to understand the scientific basis for carbon sequestration in forests.

3.1. The Scientific Basis for Forestry Projects: Sequestration

Photosynthesis describes the process by which plants and other chlorophyll-containing organisms utilize CO_2 from the atmosphere and liquid water to form simple carbohydrates (sugars)[28]. It is by this process that the CO_2 is sequestered, or incorporated into plants. There are also releases of CO_2 into the atmosphere by processes such as respiration, decomposition and combustion, but because primary production is greater than these oxidative processes, there is a net sequestration of carbon in an aggrading forest ecosystem.[29]

In forests, carbon fixed via photosynthesis is stored in leaves, roots, needles and bark. Carbon accounts for approximately 50percent of the dry weight of the tree.[30] In the forest ecosystem, the carbon is exchanged among various carbon reservoirs. It is transferred to the litter layer as dead foliage and twigs, and as this litter composes the carbon becomes incorporated into the soil organic matter. Microbial decomposition transfers some of the carbon back to the atmosphere as CO_2. Overall, the terrestrial ecosystem currently serves as a global sink for carbon, in spite of the losses of CO_2 to the atmosphere from natural processes and, on a larger scale, fossil-fuel combustion and land-use change. Tropical forests account for the largest carbon stocks in terms of vegetation.

3.2. CDM Forestry Project Controversies

Carbon sinks, such as forests, have generated controversy since the Kyoto Protocol was first negotiated in 1997. Some of the major points of controversy center on:

- Uncertainty concerning the effects of carbon sequestered in trees,
- The fact that sequestering carbon in trees could be reversible or temporary (the forest might be cut down)
- Difficulties in monitoring and accounting for such sequestration[31]
- The risk that protecting a forest could lead to release of carbon dioxide somewhere else outside the project boundary (also known as “leakage”).

Due to these uncertainties, there was much opposition during the negotiation of the climate regime to the inclusion of sinks (the ability of land uses such as forestry to absorb carbon) to account for a country’s carbon emissions. The main controversies over forestry projects under the CDM are tabulated in Figure 3, below.

Figure 3: Political Differences Over CDM Forestry Projects

Issue	Contention	Supporter	Contender
Sinks	Broad Definition Accounting Monitoring	US Canada Japan	EU & Russia
Sequestration	Leakage Lack of Permanence	N/A	All Parties
Deforestation	Excludes countries without rich forest resources	US, Japan, Brazil, Canada	EU & other Non-Annex I countries
Forests	Definition: size, scale, etc.	N/A	All Parties
Development Dividend Divide	Large projects at an advantage due to economic benefits	US	EU & Non-Annex I countries
Established Forests	Excludes countries without rich forest resources	US, Japan, Brazil, Canada	EU & other Non-Annex I countries

The controversy over sinks became most acute during the sixth Conference of the Parties at The Hague, Netherlands, in November 2000, which broke down in acrimony when European and US negotiators could not agree on how to account for the role of sinks. The European negotiators and many developing countries objected to the inclusion of sinks in the Kyoto Protocol because of the uncertainties outlined above. The United States and its allies in the climate negotiations at this point, including Japan, Canada, and some developing countries, argued to allow for a broad definition of sinks in the protocol.[32] The interest of the United States was to reduce the cost of compliance with the protocol, but the Europeans and many NGOs pointed out that accounting for the 300 metric tons of carbon supposedly absorbed by US forests would have effectively cancelled out the entire US commitment.[33]

Developing countries had split interests. Although they did not have any emission-reduction commitments under the Kyoto Protocol, they knew that the rules on sinks would be very consequential for the CDM, because forestry projects under the CDM would most likely deliver emission-reduction credits at a much lower price than other kinds of projects. Some countries saw the CDM as an opportunity to attract investment and technology transfer through projects such as renewable energy development; for these countries forestry projects would divert CDM investment from such projects. Others, particularly in Latin America, wanted to benefit from CDM investments in their vast forests[34].

The European Union emphasized that projects under the CDM should not just generate real and measurable carbon-reduction credits but also bring about sustainable development. On this basis the EU, supported by many environmental NGOs, objected to the inclusion of sinks, nuclear power and large hydroelectricity generation as eligible project activities because they did not

contribute, in the EU's opinion, to sustainable development. Another point of controversy related to the tension between attracting private investment in the CDM and ensuring sustainable development. If left to the market, and especially if transaction costs are high (as is expected), investors would seek the highest return in terms of carbon credits in return for their capital, but this would see an overemphasis on low-cost projects like forestry and large projects like large hydropower dams. European and some developing countries were concerned about how to maximize what some experts have termed the "development dividend" of CDM.[35]

3.3. Methodologies for Measuring Carbon Sequestration Capacity

Carbon sequestration is not an exact science. There are several uncertainties inherent with measuring and monitoring the amount of carbon sequestered because of the variables of different soil types and species of tree. For this reason different methodologies have been proposed to allow the Executive Board to decide how CDM forestry projects should be conducted.

3.3.1. Carbon Stock Method

A methodology for measuring carbon stock was proposed in the IPCC Good Practice Guidelines for Land-Use, Land-Use Change and Forestry projects, which came out of the 8th Conference of the Parties (COP 8) held in New Delhi in 2002. This proposed methodology would allow the Executive Board to determine whether a project actually sequesters carbon that would not have otherwise been captured by taking into account both the "with" and "without" project scenarios, along with any emissions associated with project implementation[36].

3.3.2. Establishing the Baseline

Establishing the baseline condition should occur at the start of the project and should involve determination of the most likely land use for the project area in a "without project" or "business-as-usual" scenario. The determination of carbon stock changes associated with the most likely land use in the absence of the project is made by taking into account the following key factors:

- direct human impacts,
- the natural ecosystem dynamics of the project area, and
- indirect human impacts like occurrence of invasive species or climate change.

These factors would be incorporated into the baseline by utilizing economic modeling, policy and local practice research, available data on ecosystem variables, and on-site data collection[37].

3.3.3. Project Monitoring

Monitoring the carbon sequestered in a CDM forestry project area would require both modeling and data collection, via remote sensing and on-site sampling and measurement. Vegetation would be divided into strata and experimental plots established in which sampling of various carbon pools will occur. Carbon pools include aboveground biomass (trees and herbaceous growth), necromass (standing and fallen dead trees), belowground biomass, litter and soil. Biomass measurement procedures would include diameter at breast height and dry weight. Belowground biomass could be estimated based on an accepted ratio of aboveground biomass to belowground biomass. This is necessary because methods for belowground measurement are complicated and have not been standardized.[38] Soil cores would also be taken within the experimental plots and analyzed using laboratory procedures such as loss on ignition, in order to

determine carbon content. Most measurements would be taken annually, though soil stock changes occur even slower than biomass changes, so soil samples would be taken every 2 years. Project verification would occur on a five-year cycle with results presented to the CDM Executive Board at this time.[39]

3.4. Measuring the Sustainability of Forestry Projects

Another contentious issue is how to assess whether or not a project contributes to sustainable development, required under Article 12 of the Kyoto Protocol, which states that CDM projects must help developing nations to realize sustainable development. To ensure this, the CDM project approval process includes an assessment of the ecological and socioeconomic impacts of each project. Several sets of criteria and indicators to assess these impacts have been developed, though no single set has yet been agreed upon to serve as the standard.[40] The lack of standardized methods is proving to be one of the stumbling blocks facing the forestry projects, as project investors are reluctant to undertake projects without sufficient guidelines.

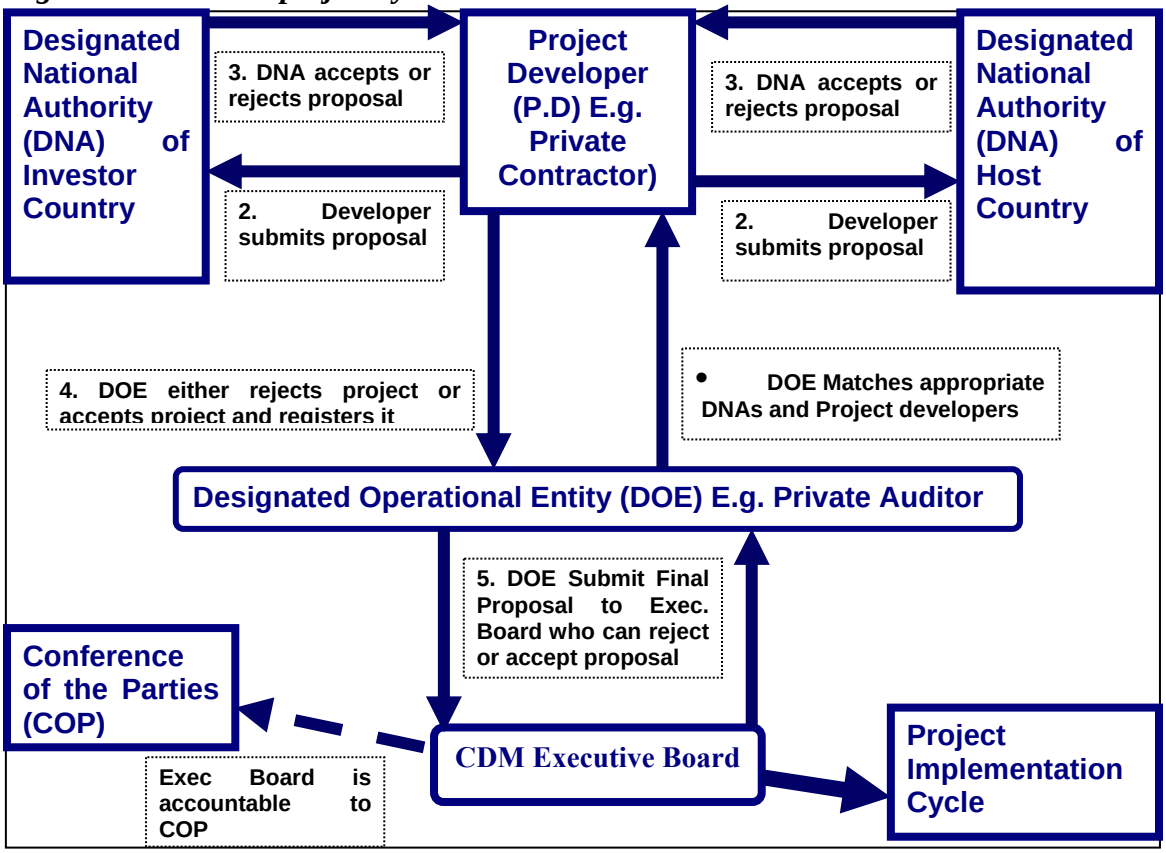
One example of a series of criteria and indicators to assess environmental integrity and social equity was developed in 2003 as part of a study conducted by the International Institute for Environment and Development.[41] Criteria for environmental integrity include a net increase in the amount of carbon sequestered, improvement in air, water, and soil quality, and maintenance of or increase in biodiversity. Assessing social equity takes into account a number of criteria as well, including net employment gain, the quality of employment, the financial commitment to social goals, and local participation in the project. The degree of social inclusion of residents in the generation of carbon credits is particularly a key issue in assessing the contribution of CDM forestry projects to local sustainable development.[42] More formalized options for the assessment of sustainable development at the project level could include detailed environmental and socioeconomic assessments adapted to CDM forestry projects.[43]

4. The Current State of the CDM

4.1. The Project Cycle of the Clean Development Mechanism

The CDM project cycle is complex. First the CDM Executive Board is always accountable to the COP. Second, since negotiations did not produce consensus on standard indicators for sustainable development, it is up to individual countries (through their Designated National Authorities) to define principles and criteria for determining whether a project contributes to sustainable development. Third, once the Executive Board awards a Certified Emission Reduction credit (CER), the Designated Operational Entity (DOE) can then trade that CER on the market in an emissions trading scheme. Fourth the CER will also contribute to the investor country's reduction targets. Fifth, the DOE is, in effect, a matchmaker between the DNAs and the project developers. The DOE also deals directly with the Executive Board. Figure 4 provides a schematic of the CDM project cycle.

Figure 4: The CDM project cycle



The Executive Board is in charge of accrediting Designated Operational Entities (DOEs), which are responsible for ensuring that a CDM project is in compliance with the project eligibility criteria and that the general rules of the CDM are being followed in each particular project.[44] Only countries that have ratified the Kyoto Protocol can take part in the CDM and any establishment of a CDM project is contingent upon the creation of a Designated National Authority (DNA) within the developing host country of a CDM project. A Host Country must approve any project before it can be adopted as an official CDM project. It is the job of the DNA to assess every CDM project proposal.

The only function explicitly delineated of the DNA of a host country is to issue written approval of the project stating that participation is voluntary and that the CDM project contributes to the sustainable development of the host country. From there a DNA could assume the role of:

1. Authorizing private and public entities to participate in the CDM
2. Ensuring all stakeholders have a clear point of contact that is familiar with national policies
3. Developing rules and procedures for approval of CDM projects
4. Including national sustainable development criteria or principles
5. Reporting on national CDM programs and providing recommendations on changes or additions that should be made to CDM procedures.

4.2. Forestry Projects under the CDM: An Uncertain Prognosis

To date, 30 proposed CDM projects have been submitted to the Executive Board for consideration and are currently in the validation stage (which includes a provision for public comment). Proposed projects include solar energy production, landfill gas recovery, biomass-based power, and numerous agricultural efficiency initiatives.[45] No forestry projects have been developed, however.

As we have seen there were many controversies surrounding the negotiations of forestry projects under the CDM. Some of these have been resolved while others have not. For instance, negotiations are continuing on the final rules for afforestation and reforestation projects. The CDM Executive Board has commissioned a specialized working group – the Afforestation and Reforestation Working Group – to compile a set of baseline and monitoring methodologies for the assessment of forestry projects under the CDM.[46] This Working Group has proposed new methodologies (which await official adoption). These proposed methodologies contain a complex array of equations and criteria that outline what variables should be accounted for in any CDM forestry project.[47] Once adopted, these methodologies will provide the Executive Board with guidelines to analyze how forestry projects may contribute to carbon mitigation strategies.

The result of all these controversies is that, to date, there have been no proposals for forestry projects, although a number of pilot projects have begun under, for instance, the World Bank's Prototype Carbon Fund. This is because negotiations are continuing on the final rules for afforestation and reforestation projects. The CDM Executive Board has commissioned a specialized working group –the Afforestation and Reforestation Working Group – to compile a set of baseline and monitoring methodologies for the assessment of forestry projects under the CDM[48]. This Working Group has proposed new methodologies that await official adoption. These proposed methodologies contain a complex array of equations and criteria that outline what variables should be accounted for in any CDM forestry project.[49] Once adopted, these methodologies will provide the Executive Board with guidelines to analyze how forestry projects may contribute to carbon mitigation strategies.

Given the current situation of CDM forestry projects, it is obvious that an effective facilitating function must be devised in order to lead to the implementation of afforestation/reforestation projects in developing countries. The rest of this elaborates on a recommendation for the best way for CDM forestry projects to succeed. We propose the creation of a Capacitate program,

which will create a regional network for stimulating the demand of forestry projects whilst ensuring the overall goals of the CDM and Kyoto Protocol are realized. The next section will discuss the function of the Capacitate program as well as its aims, structure, timetable and budget.

Part II: Recommendations for implementation

5. Options for a Program to Implement Forestry Projects

As discussed above, no forestry projects have yet been implemented under the CDM, mainly because the process is complex and controversial and the rules have only recently been finalized. This section of the report describes our recommendations for a new program that would help address these issues and encourage the implementation of forestry projects under the CDM. Before describing the recommended design, we briefly explain the different alternative options considered, which helped shape the rationale for the new program.

To ensure the successful implementation of forestry projects under the CDM the EB could exercise one of three options. (See Appendix A for an analysis of the three program design options.)

1. Decentralized approach: The Executive Board would devolves responsibility to the main project stakeholders that are involved in the CDM project activity cycle – the project participants (PPs), Designated Operational Entities (DOEs), and Designated National Authorities (DNAs) . This option relies upon the capacity of each entity to fulfill its role with minimal oversight. It is characterized by efficiency and the expedient review and approval of forestry projects.

2. Institutionalization: The Executive Board would establish a robust administration to oversee forestry project development at all stages of the project life cycle. Here, emphasis is placed on developing professional and technical capacity with the UNFCCC acting in service to the Executive Board. This option is characterized by a thorough review of all aspects of forestry projects and the deliberate exercise of oversight over the main project constituents.

3. Capacity building: The Executive Board would build consensus among all forestry project constituents and enhance each stakeholder's ability to fulfill their respective function. The Executive Board would accomplish this by substantially expanding the authority of, and increasing stakeholders' reliance upon, expert panels and working groups.

5.1. The Capacitate Program: Program Design

We recommend an approach based on the third option, entitled "The Capacitate Program."[i] The first option would give much leeway to stakeholders to define for themselves how best to monitor and review projects, which would decrease transaction costs and therefore lead to the rapid development of forestry projects, however likely at the expense of overall project quality. This could threaten the integrity of the CDM by facilitating projects that promote private financial interests to the detriment of meaningful public participation and sustainable development. The second option would suffer from the opposite problem, an excess of oversight by a robust central authority that would administer all aspects of the CDM afforestation/reforestation program. Although this would provide clear guidance and technical

[i] The term capacitate is defined as "to make (someone) capable of a particular action or legally competent to act in a particular way".

capacities, it would inevitably delay the issuance of CERs, increase the transaction costs associated with afforestation/reforestation projects, and thus jeopardize the viability of the projects. This option would also require significant financial resources. The third option, the Capacitate Program, seems to be the most feasible, given available resources and the need to strike a balance between supporting and directing stakeholders. This program would provide education, information and support to all the main stakeholders in the CDM project cycle to ensure that they are able to navigate through the complex project cycle and begin the process of implementing CDM forestry projects that meet the minimum criteria mandated by the Kyoto Protocol.

5.2. The Capacitate Program: Activities

There are three primary tasks associated with the Capacitate Program:

5.2.1. Streamline Forestry Project Procedures

To ensure that new projects are initiated and that projects currently in the pipeline are implemented, the Capacitate Program will streamline the project cycle and provide guidance with forestry project checklists, manuals and other tools

5.2.2. Disseminate information

This will be accomplished by setting up the Forestry Development Resource (FDR) which will act like a help desk and aim to answer all questions related to forestry projects, actively troubleshooting and providing a forum where all queries and concerns can be stored. The FDR will initially be established in five regions. Depending on the success of the Capacitate Program, the FDR could set up offices at a more local level.

5.2.3. Facilitate NGO involvement and build local capacity

Building capacity for developing countries and the NGOs will help ensure that projects meet the CDM minimum criteria and build local trust, which will also be essential for the development of additional forestry projects in the future. The Capacitate Program will conduct workshops to support the design and monitoring of the projects, along with training manuals and information guides for stakeholders.

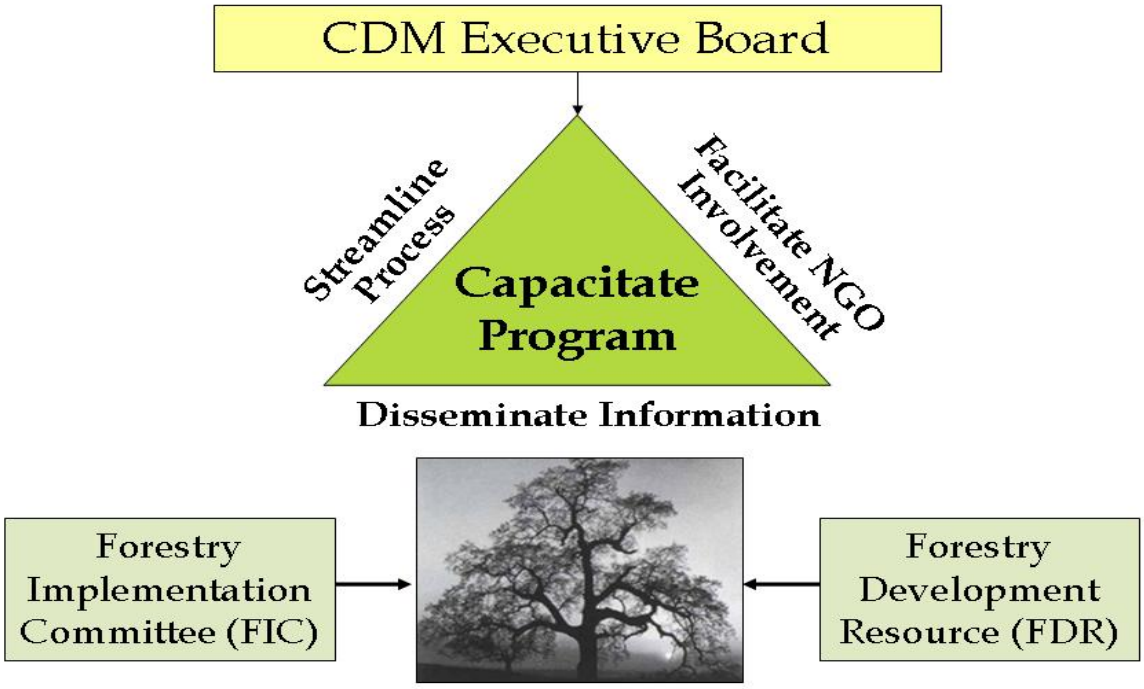
5.3. The Capacitate Program: Rationale

The Capacitate Program would establish, authorize, and rely on expert panels and working groups to develop standards, establish scientific consensus, and otherwise provide technical guidance and support to all entities involved in the forestry program. The Executive Board would maintain oversight over the development of afforestation/reforestation projects but would attempt to foster transparency and participation, and otherwise work to develop each project constituent’s capacity to adequately serve its respective function. Panels could be established to review project proposals, establish and amend monitoring strategies, and set criteria for sustainable development. Working groups could focus on streamlining the application process, setting standards for DOEs, and developing the capacity of DNAs.

Developing capacity among project constituents would involve a substantial amount of time and effort. Yet, to a large degree, the Executive Board would rely upon the services of panels and working groups that already exist and are comprised of experts who serve without compensation.[50] One of these working groups is the Afforestation and Reforestation Working Group, whose primary task is to prepare recommendation for new baseline and monitoring methodologies for forestry projects. In addition to this working group, we recommend the establishment of an additional, temporary, working group entitled the Forestry Implementation Committee (FIC). Fostering transparency, participation and consensus among all constituents would help to ensure the Capacitate Program's political feasibility. This would also serve to establish common standards upon which entities will be held accountable. Over time, project outcomes will become more certain, thus lessening the transaction costs and helping to ensure the viability of forestry projects.

Figure 5, below, outlines the three aforementioned goals of the capacitate program. In addition it illustrates how the Executive board, FIC and FDR will work together, through the Capacitate program to increase the quantity of forestry projects.

Figure 5: The Capacitate Program



6. The Organizational Structure of the Capacitate Program

The creation of the Capacitate Program would require additional human and administrative resources, while at the same time build on the existing structure (Appendix * shows the existing organizational structure of the Executive Board). The new program would consist of two parts. The Forestry Implementation Committee (FIC) would be based at the UNFCCC headquarters in Bonn, Germany. The FIC would then also oversee the establishment of the Forestry Development Resource, which would be located in five main regions (called "super-regions") of the world to build local capacity to develop and implement CDM projects.

6.1. The Forestry Implementation Committee (FIC)

The main function of the FIC would be to streamline the procedures and project cycle and encourage collaboration between the working groups and expert panels established under the Executive Board (Appendix B and C). To this end, the FIC's main functions are to:

- Develop Partnership plans with other working groups: The FIC will ensure that information is passed freely through the working groups to help standardize methodologies and accreditation procedures specifically designed for forestry projects. The FIC would hold joint quarterly meetings of the working panels in conjunction with the Executive Board meetings in an effort to ensure that a mutual exchange of information occurs between working groups developing different phases of the CDM project cycle.

- Identify and refer to the Executive Board general issues with forestry project capacity building, and focus their attention on achieving the three tasks of the capacitate program, streamlining procedures, disseminating information, and building NGO involvement and local capacity..

The FIC will be comprised of a chairman and a vice-chairman, hereafter referred to as the dual commissioners, one from a developed nation and the other from a developing nation. The dual commissioners will oversee two working panels of four members each under the FIC that will be staffed from the UN Secretariat roster of experts. These two working panels are as follows:

- The Project Participant and Designated Operational Entity Working Group, which would identify and refer general issues to the Executive Board associated with project design and auditing. This group will be staffed by four of the 10 members of the FIC.
- The NGO and Designated National Authority Working Group, which would identify and refer general issues to the Executive Board associated with project monitoring and attaining sustainable development. This group will be staffed by four of the 10 members of the FIC.

The entire FIC, comprising both forestry experts and the commissioners, will meet five times a year, coordinated with the meetings of the other working groups, to ensure joint meetings with the other working panels under the Executive Board. The FIC will answer directly to the Executive Board. The Chairman and Vice-Chairman of the FIC will serve to coordinate the activities of the Project Participant and Designated Operational Entity Working Group and the

NGO and Designated National Authority Working Group. Issues that come through the FDR will be taken up by the two working groups as appropriate based on their functional descriptions and as the dual commissioners deem necessary.

6.2. Forestry Development Resource (FDR)

The dual commissioners will also oversee the Forestry Development Resource (FDR), which will build local capacity to develop and implement projects in the five "super-regions". The FDR will be responsible for involving NGOs in the monitoring phase of the project cycle and serve as the primary information resource for all project players. The FDR will be staffed by five Super-Regional Directors, who meet the same competency requirements as the FIC members. These members will be full-time CDM employees (Appendix C).

- *Dual Commissioner:* The Chairman and Vice-chairman of the FIC will also serve as Commissioners of the FDR and will be responsible for the coordination of the five Super Regional Directors. They will also hold the final say in issues that come through the Super-Regional Directors. They will also serve to organize the specific issues raised through the FDR to the appropriate working panel within the FIC for resolution. These positions will be full-time and answer directly to the Executive Board.

- *Super-Regional Directors*: This position will be a full-time paid position for five members covering five super-regions. They will be subject to the competency requirements stated above and be primarily responsible for maintaining the information clearinghouse as well as develop the workshop series for Designated National Authorities on sustainable development. Their regional mandate will be as follows:
    - Americas – North and South America
    - Europe – Europe and the European Mediterranean
    - Asia – the Middle East, Middle East Mediterranean, and Asia
    - Africa – Africa and African Mediterranean,
    - Oceania – Pacific Islands and Oceania

The Super-Regional Directors will also be responsible for developing regional and local representatives should the forestry project demand increases. If five forestry projects are registered with the Executive Board within a particular super-region, the super-regional directors can appeal to the Chair and Vice-Chairman of the FIC to develop additional regional representatives. If sufficient demand does not exist, the super-regional directors will assume the roles of regional and local directors in addition to their own. They will answer directly to the Dual Commissioner, the Chairman and Vice-Chairman of the FIC.

- *Regional Director*: This position will be a full-time paid position to be staffed when sufficient demand, as noted in "Super-Regional Directors", occurs. These positions will be subject to the same competency requirements as the members of the FIC and the Super-Regional directors. Regional Directors will be primarily responsible for developing the workshop series on project design for Designated Operational Entities and on monitoring for NGOs, as well as addressing issues from Designated Operational Entities. If sufficient demand occurs within the regional level (a threshold of five registered projects within the region), the Regional Directors can appeal to the Super-Regional director, who in turn

appeals to the Chairman and Vice-chairman of the FIC to develop local representatives. If sufficient demand does not exist, regional directors will assume the roles of local representatives in addition to their own. Regional directors will answer directly to their corresponding super-regional director.

- *Local Director*: This position will be a full-time paid position to be staffed when sufficient demand occurs. These positions will be subject to same competency requirements of the FIC and the Super-regional directors. They will be primarily responsible for addressing specific issues with DOEs, PPs, and NGOs. They will answer directly to their corresponding regional director.

6.3. Staffing the FIC and FDR

The FIC will serve as a temporary working panel under the Executive Board. After Year One, the FIC will evaluate the success of the Capacitate Program. If the three initial goals are met, the FIC will dissolve and the management of the FDR will be transferred to the Afforestation/Reforestation Working Group. If the evaluation deems that the tasks have not sufficiently been met, however, the Executive Board can authorize an extension of the FIC on a year-by-year basis.

The establishment of the FIC would allow for the resolution of general issues regarding capacity building and the formulation of strategies to encourage the growth of afforestation/reforestation projects. The establishment of the FDR would allow for rapid dissemination of information through workshops and as an information clearinghouse. However, the implementation of the FIC and the Forestry Development Resource would place further demands on an already strained Clean Development Mechanism budget. In addition significant care will have to be given to any selections for the super-regional director post to avoid political controversies.

7. Budgeting for the Capacitate Program

This budget plan for the first operational year of the Capacitate Program includes personnel compensation expenses and program operations expense ("other than personnel services."). The actual estimated costs needed are $1,150,928.91. The 2006 budget plan includes a line item budget and a program budget (Appendix F.) The budget plan accounts for the creation of a 10-person, full-time and part-time, staff on the FIC and 5 full-time managers on the FDR.

7.1. Sources of Funding

The proposed budget for the Capacitate program would draw directly from the CDM Executive Board's budget of approximately $8.7 million.[51] The CDM acquires its budget from voluntary contributions made by parties to the UNFCCC that are then filtered into four UNFCCC trust funds established at the 1995 COP:

- The Core Administrative Budget (the "core budget");
- The Facilitating Participation of Parties Process (the "participation fund");
- The Voluntary Supplementary Financing (the "trust fund for supplementary activities");
- The Host Country Contribution (the "Bonn Fund").[52]

7.2. Funding Baselines

Funding is foreseen for five FIC meetings a year for Year One, at a total of 22 working days. The FDR is funded over nine months in its first year of existence. The FDR does not have a 12-month funding cycle because, considering the time it will take to hire personnel, the FDR is not expected to start functioning until the beginning of Month Three.

7.3. Funding Standard

The funding methodology for the FIC and FDR working groups is based on two major assumptions:

- All parties have made their contributions to the general UNFCCC, thus ensuring the CDM program budget has funds to allocate
- All hiring costs have been internalized by the Human Resources Department of the United Nations, thus ensuring this proposed budget only encompasses costs directly associate to program operation

7.3.1. Full-Time Personnel

All full-time personnel are funded based strictly on the UN's "Professional" compensation rate. A UN "Professional" grade hire is funded based on the most competitive civil service compensation rate across all member states. Thus, a UN "Professional" hire is compensated at a level to a comparable civil service position in the United States. The UN has a scale of 1 to 5, differentiating the level of "Professional" and the subsequent salary. The FDR managers are assigned a UN "P-3" grade; a mid-level administrator. The Dual Commissioners are paid at the "P-4" grade. In addition to an annual salary, the "Professional" staff is allotted benefits for dependents. In forming this budget, the baseline was set at 1 spouse and 1 child. Because the UN is also concerned with assuring all, individual "Professional" staff members have equal

purchasing power at their respective duty station; net salaries are adjusted for standard of living based on a standard UN "post adjustment multiplier" formula.[53]

7.3.2. Part-Time Personnel

Because part-time FIC staff is funded per diem, they do not receive an annual salary. The UN has set per diem rates at $400.

7.3.3. Other than Personnel Services

The UN provides funding for all costs necessary for a program to operate including: office supplies, telecommunication fees, all travel related fees, workshop fees, overhead, etc. Funds for these "other than personnel" costs were estimated based on competitive cost comparisons of anticipated needed goods and services for both the FIC and FDR.

Because the FIC and FDR and both new working groups have no past budget baselines to compare it was necessary to account for "additional" or "other" operating expenses. A modest contingency fund is needed by both the FIC and FDR to fund unforeseen expenses that might be incurred. Unforeseen expenses could include anything from additional facility fees to increased travel.

The Institutional Support Cost earmarks funds specifically for hosting conferences. Regional managers may host two conferences per year to help educate, train and engage different CDM project stakeholders.

7.4. Total Requested Funds vs. Actual Funds Used

Each full-time employee, the five Super-Regional Directors and the two Dual-Commissioners hired, in theory, is supposed to provide support and assistance to at least two regional afforestation/reforestation projects. However, in anticipation that the number of projects in the first year of the program will be small, we assume that only 50 percent of Super-Regional Directors' and Commissioners' time will be spent working on afforestation/reforestation projects. The other 50 percent of their time would be spent helping to increase overall CDM capacity by working with other kinds of existing projects. The Actual Funds Used reflects the 50 percent forestry related portion of salaried full-time manager hours. The Total Funds Requested looks at the whole picture and accounts for the manager wage where the CDM project function is undifferentiated.

7.5. Budget Justification

This proposed budget requires budget flexibility; numbers were over-estimated in most instances to accommodate unforeseen expenditure. However, there are several reasons that justify the funds proposed. While the CDM program budget is small, the Executive Board itself has few operational costs. Also, some of the working groups under the Executive Board are self-funded through fees (e.g. the Designated Operational Entity Accreditation Panel.) In the first year of the program, an initial investment is required to ensure the program starts off correctly.

It is unlikely that the program budget for Year 2 will be as large unless the Capacitate Program exceeds expectations and generates many afforestation/reforestation projects. In addition, we

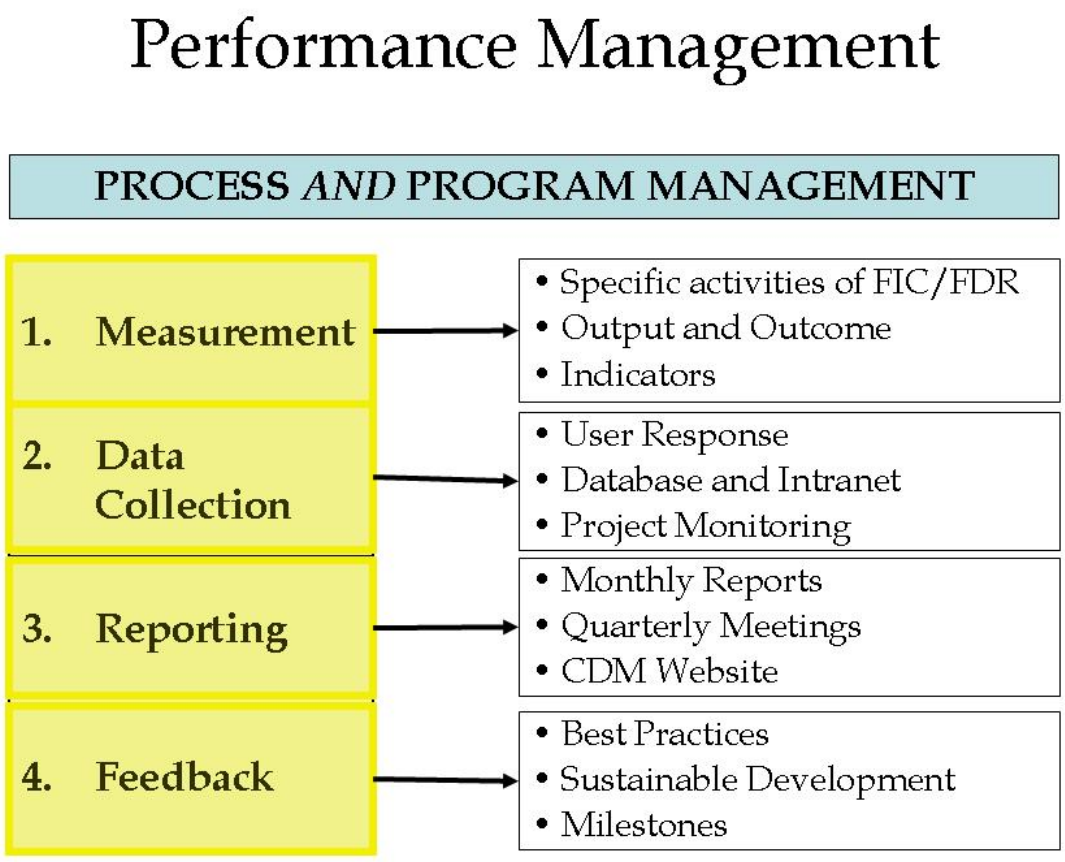
assume that the FIC will be disbanded after Year 1, devolving authority for the management of the FDR to the existing Afforestation/Reforestation Working Group. Should Regional Directors need more support, they can fund supplementary staff through the influx of project application fees.

Funding the budget for the Capacitate Program represents a necessary investment to ensure the implementation of credible forestry projects and the overall capacity of the CDM. Eventually, forestry programs will be generating revenue (through project application fees and emissions credits), and these revenues can be used to offset operational costs incurred by the FDR. Funds not used will roll back into the general UNFCCC budget.

8. Performance Management of the Capacitate Program

To assess the success of the Capacitate program, the FIC will evaluate its internal performance continuously throughout the first year of operation. A two-part performance management system has been devised, fitting into the framework of the Executive Board's CDM Management Plan, which is "a comprehensive framework for planning, implementing and monitoring the work of the CDM on a 12-month-basis."[54] The performance management system will focus on two broad areas. First, it will measure the effectiveness of the FIC in setting up the new structures and organizations that are necessary to meet the three goals of the Capacitate Program – to streamline processes, disseminate information and facilitate the participation of stakeholders. Second, it will measure the effectiveness of the FIC in meeting these three overall goals and, more generally, in building capacity among stakeholders to take advantage of afforestation and reforestation projects under the CDM. The first area is therefore focused on the performance of the *process*, and the second is focused on the overall success of the *program*. Figure 7, below, describes some of the main aspects of performance management for the Capacitate Program.

Figure 7: Performance Management of the Capacitate Program



8.1. Main Year 1 Activities

The main activities of the Capacitate Program in its first year are as follows:

Forestry Implementation Committee

- Set up FDR and coordinate its activities throughout Year 1
- Set up two working groups to function as a helpdesk/clearing house for information on issues for DOEs, NGOs, DNAs and PPs
- Performance management of entire Capacitate program
- Hand over responsibility for management of Capacitate program to FDR at end of year one

Forestry Development Resource

- Establish and maintain contacts with the main CDM project stakeholders
- Build capacity of stakeholders by series of workshops, providing information to them as requested, dealing with queries relating to forestry projects
- Refer difficult problems/issues up to FIC Dual Commissioners (to be resolved by WGs if necessary)
- Deal with problems and log responses for reporting to FIC
- Facilitate development of national (DNA) elaboration of sustainable development definitions
- Initiate expansion of FDR if and when demand for forestry projects increases

The success of all Year 1 activities will be assessed in Month 11, when the FIC and FDR will decide whether or not to dissolve the FIC and hand over responsibility for the Capacitate Program to the existing Afforestation and Reforestation Working Group. To assess the success of the program the FIC will develop performance indicators and a comprehensive performance management system. The ultimate measure of success of the program would be approval of a significant number of new forestry projects (we consider that 10 projects would be a major indicator of success), although failure to approve 10 projects would not be considered a failure, since capacity building is the primary goal.

The performance management system has four parts: measurement, data collection, reporting and feedback. Appendix G contains a list of activities to be implemented: the numbers in parentheses in the following sections refer to those activities or to the three overall program goals.

8.2. Measurement

The FIC must carry out a number of activities according to a detailed calendar of events to achieve the outputs and goals set out for the Capacitate program's first year of operation. The FIC has established a set of baselines and indicators for each activity and for the overall goals of the program. Appendix E shows the 11 main activities that the FIC and FDR must implement in the first year of the program. For each activity the FIC will measure the actual performance against the goals using the indicators provided. The table in Appendix E outlines indicators for the three overall goals of the project. The FIC is responsible for developing these indicators during the course of the first year. These indicators are not expected to be relevant for the first year because they depend on the implementation of actual forestry projects, which is not expected until toward the end of the first year.[55]

8.3. Data Collection

The FIC has defined the kinds of data that are required to measure its operational capacity and the success of the overall program. The FIC will be responsible for the collection, processing, and storage of this information. The FIC is required to ascertain what kind of data is relevant to the operational capacity of the Capacitate program and then to develop means for collection, processing, and storage of this information.[56] The data collected should aid the FIC in determining whether the program is on schedule and how effectively the FIC is in building the capacity of relevant stakeholders. The FIC will utilize the following methods to collect and analyze data.

8.3.1. Surveys

Devise survey templates that have a standardized format but can be adjusted to reflect the need for both qualitative and quantitative information, covering every aspect of the CDM Project Cycle. This will allow the FIC to determine where problems may be occurring along every stage of the project cycle. The surveys will also serve as an outreach effort on the part of the FIC to allow for continuous feedback from stakeholders. Surveys will be conducted one month prior to the second, third and fourth quarterly meetings and their results presented at those meetings. (Activities 4, 6, 7, 8, 9 – for this and following sections, please refer to activities and goals listed under Appendix E)

8.3.2. User feedback

All project stakeholders will have the opportunity to provide feedback about their experiences with the FIC and FDR. The FIC will collect, among others, participant feedback from working groups, meeting reports, and Frequently Asked Questions. FAQs will be published on the program website (see below). All participants at the workshops will be invited to fill out a feedback form. The Dual Commissioners will be responsible for collating and analyzing these forms as well as the content of the FAQs and presenting the results at the next quarterly meeting. (Activities 4, 6, 7, 8, 9)

8.3.3. Project monitoring

The FIC will collect information on the geographical distribution of A/R projects from the FDR reports. The FIC will decide whether to redeploy resources to under-represented regions. As an educational tool the FIC could utilize data from other UN agencies (e.g. the UN Food and Agricultural Organization) using Geographic Information Systems to create a map showing the geographic distribution of CDM forestry projects. The FIC will maintain a constantly updated list of forestry projects proposed and/or approved, including all relevant information (e.g. duration and size of project, amount of CERs generated) and indicate whether the program is on track to meeting its year-one target of ten forestry projects approved. (Goals 1, 2, 3)

8.3.4. Database

In order to ensure a centralized collection of data that can be accessed and utilized by any interested parties for the establishment of CDM forestry projects, the FIC will feed all information received into the United Nations Common Database (UNCDB).[57] The function of the UNCDB is to promote consistency and integration among various UN databases for a

centralized repository of information and the development of a data dictionary of official definitions and terms used in relation to the CDM so as to prevent confusion over complex terminology. This database will also contain a list of DNA/DOE and their contact details. (Activities 5, 8; Goal 3)

8.3.5. Intranet

An intranet will be set up to facilitate communication between the five Super-Regional Directors and between the Super-Regional Directors and the FIC. (Goal 3)

8.4. Reporting

Different actors will be responsible for presenting this information at regular periods and according to certain formats to relevant decision-makers. Reporting of information should flow between the FIC and the FDR and between the five Super-Regional Directors. This flow of information will be facilitated through the following mechanisms:

8.4.1. Monthly Reports

For the first year the Super-Regional Directors are required to submit detailed reports at the end of every month to the FIC (the Dual Commissioner). The Dual Commissioner will be responsible for re-transmitting relevant information from the monthly report to the rest of the FIC and FDR. The report should include information on the following areas:

- Actions taken to date according to annual work plan (Activity 1)
- Overview, including contacts details, of stakeholders contacted in region (DNAs, DOEs, PPs, NGOs) (Activity 5; Goal 3)
- Description of any projects planned or implemented, including name, location, size, amount of carbon to be sequestered, duration, additional long-term benefits, environmental impacts (Goals 1, 2, 3)
- Possible forthcoming projects (Goals 1, 2, 3)
- Summary of national sustainable development strategies (Activity 8)
- Problems arisen, lessons learnt
- Recommendations for FDR action over coming three months

8.4.2. Quarterly Meetings

FIC and Super-Regional Directors will meet in Bonn or elsewhere once every quarter. The Quarterly Meeting is the opportunity for the FIC to report on progress to the Executive Board. (Activities 1, 2, 3; Goals 1, 2, 3)

8.4.3. Website

A user-friendly website will be created and managed by the FIC, and subsequently the FDR, that will contain relevant working documents, online surveys & questionnaires, CDM forestry project comparisons and updates, workshop information, and contact details of relevant CDM forestry project stakeholders.

8.4.4. Other

The FIC will ensure regular communication through teleconferences and broadcast emails. There will also be site visits by the Dual Commissioners to each of the Super-Regional Directors.

8.5. Feedback

The FIC has defined a series of procedures to ensure that the organization is on track to meet its first-year targets, as well as to ensure that recommendations are made and implemented.
The FIC will ensure that the work plan is being implemented on schedule all year and provide early warning of any potential problems to the Executive Board. The Dual Commissioners are the first point of contact for any problems and it is their responsibility to make recommendations to the Executive Board for any delays or modifications to the work plan.

8.5.1. Early warning

The FIC will monitor the geographical distribution of projects and the problems that arise on the basis of the SRD monthly reports. The Dual Commissioners will recommend redeployment of resources or special focus on a region or sector as needed. Super-Regional Directors will communicate to the Dual Commissioners any increase in the number of A/R projects that would necessitate an expansion of the regional office. (Activity 11, Goals 1, 2, 3)

8.5.2. Sustainable Development Dictionary

The FIC and FDR will maintain a database compiling every participating country's national sustainable development criteria for CDM forestry projects. This will assist future project participants in creating location-specific sustainable development criteria by learning from the best practices in the field developed by other countries. The FDR will seek out common denominators and create a comprehensive list of sustainable development indicators for forestry projects. This directory will also help the CDM Executive Board assess whether every CDM forestry project is meeting the sustainable development requirements as set forth in the official CDM project criteria. The directory will be made public and the FDR should welcome comments. (Activity 8, Goal 3)

8.5.3. Project Stakeholder Surveys

The Super-Regional Directors will be responsible for the dissemination of appropriate surveys (see data collection, above) within their respective regions every quarter to all stakeholders.

8.5.4. Milestones

The FIC will define a number of important dates by which demonstrable progress should have been made in reaching the program's goals. Based on the indicators outlined above, at each quarterly meeting the FIC will decide whether or not the program is on track and, if not, what additional resources must be deployed. (Activity 11). For example, by Month 6 the Capacitate program should be fully operational, with FDR staff in place and activities under way. By Month 11, the FIC will decide whether or not to proceed with the handover of responsibility to the Super-Regional Directors.

Conclusions

As discussed in this report, anthropogenic activity, particularly fossil-fuel combustion and land-use alterations, have led to increased emissions of greenhouse gases, such as carbon dioxide and methane, to the atmosphere. There is growing consensus among the scientific community that these accumulating emissions are bringing about global climate change, which in turn is leading to greater catastrophic events like hurricanes and sea level rise. A global problem of this nature requires a global solution.

This report looks at a part of one such approach, the Kyoto Protocol, which was negotiated in 1997 and came into force earlier this year. It obliges developed countries that ratify the Protocol to reduce their greenhouse gas emissions by an average of about 5% below 1990 levels. The Clean Development Mechanism (CDM) has the advantage of allowing industrialized countries to profit from low-cost opportunities to reduce greenhouse gases in developing countries, while simultaneously bringing desired investment and sustainable development to developing countries that host projects. There are many types of CDM projects, such as increasing industrial efficiencies or recovering methane gas from landfills, but this paper focused on one particularly controversial kind of project, afforestation and reforestation.

All projects under the CDM must meet three criteria: they must result in real, measurable, and long-term benefits in mitigating climate change; their reductions must be additional to reductions that would have occurred without the project taking place, and the project must contribute to sustainable development in the host country. There are presently 107 CDM projects in the validation stage, but of these, none concerns afforestation or reforestation. In our analysis, we determined three major reasons for the lack of forestry projects, including the complicated process of getting these projects approved, the relatively new rules and methodologies, and the uncertainties associated with implementing projects for which there are no adequate models already in place. The current state of CDM forestry projects described here led us to propose a new program, the Capacitate Program, which would build the capacity of all stakeholders to implement forestry projects.

The Capacitate Program would aim to achieve three overarching goals. First, it should streamline the process and reduce uncertainties in getting forestry projects accepted, while ensuring that forestry projects remain robust and credible. Second, it should disseminate information between all relevant stakeholders. Third, it should facilitate the involvement of NGOs and other project stakeholders to increase capacity at the local level where the forests are being planted. We have proposed staffing, budgeting, and main activities for the first year of this program.

The two arms of the Capacitate Program, the Forestry Implementation Committee (FIC) and the Forestry Development Resource (FDR), would contribute to all three goals. The FIC would be more focused on streamlining the process for achieving forestry project development, which includes working with other CDM panels and working groups concerned with forestry. This is a more top-down approach for streamlining the process because they would be creating rules and methodologies that are robust, yet simple to understand. The FDR, in contrast, would develop capacity from the bottom up by working “on the ground” in the developing countries to ensure

that high quality, credible forestry projects are developed. The FDR would facilitate workshops with local NGOs, particularly those that work in project oversight and monitoring. They would also work with other stakeholders, including private companies that develop the forestry projects, national administrators who approve the projects, and those responsible for establishing sustainable development criteria for each country.

The program detailed here attempts to observe the goals for the UNFCCC outlined by Canada's environment minister, Stéphane Dion, who at the 2005 UN Climate Change Conference in Montreal called for steps to "implement, improve, and innovate". With a well-designed implementation program in place, guided by sufficiently clear goals, afforestation and reforestation projects have great potential to mitigate climate change.

Appendix A: Analysis of program options

	Option 1:	Option 2:	Option 3:
Criteria / Issue	**Decentralize**	**Institutionalize**	**Capacitate**
Effectiveness:	6	9	9
Climate Change Mitigation	✔–	✔+	✔
Sustainable Development	✔–	✔	✔+
Efficiency	✔+	✔–	✔
Credibility of the CDM	✔–	✔+	✔
Feasibility:	8	7	9
Economic (transaction costs)	✔+	✔–	✔
Financial (administrative)	✔+	✔–	✔
Political (international accord)	✔–	✔	✔+
Social (NGOs)	✔–	✔+	✔
Total:	**14**	**16**	**18**

Ranking:	(✔–) = 1	(✔) = 2	(✔+) = 3

Appendix B: Existing staffing functional units

UNFCCC Secretariat
The secretariat is a 7-member panel that oversees the entire implementation of the Kyoto Protocol. This panel is significant for forestry projects in that it directly oversees the Executive Board and the CDM. The Secretariat is also crucial in that it screens and maintains a roster of experts which can be used to establish working groups under the Executive Board (United Nations Framework Convention on Climate Change –http://unfccc.int)

COP- Conference of the Parties
Representatives of the signatory nations of the Kyoto Protocol debate and decide critical policy issues. Of significant interest to forestry projects as the Executive Board answers to the representatives of the COP as well. (United Nations Framework Convention on Climate Change –http://unfccc.int)

Executive Board
This body governs and executes CDM projects through the CDM project cycle. They officially accredit DOE's and DNA's as well as issue CERs upon completion of a CDM project. The panel is staffed with 10 members representing both developed and non-developed nations which chosen from different regions around the world. They are elected to terms with all of the terms coming up for expiration in either 2006 or 2007. (United Nations Framework Convention on Climate Change –http://unfccc.int)

The Executive Board is authorized to form working groups in order to help it develop and manage CDM projects. These working groups answer directly to the Executive Board which makes all final decisions. There are currently four working groups:

Accreditation: CDM Accreditation Panel prepares decision making of the Executive Board in accordance with the procedures for accrediting operational entities (DNAs and DOEs). This panel is staffed by 7 members from the roster of experts who meet roughly 4 times a year.

Methodology: The methodology panel prepares and performs a desk review of new methodologies for the Executive Board to determine project validity. This panel is staffed by 18 members from the roster of experts and meets approximately 4 times a year.

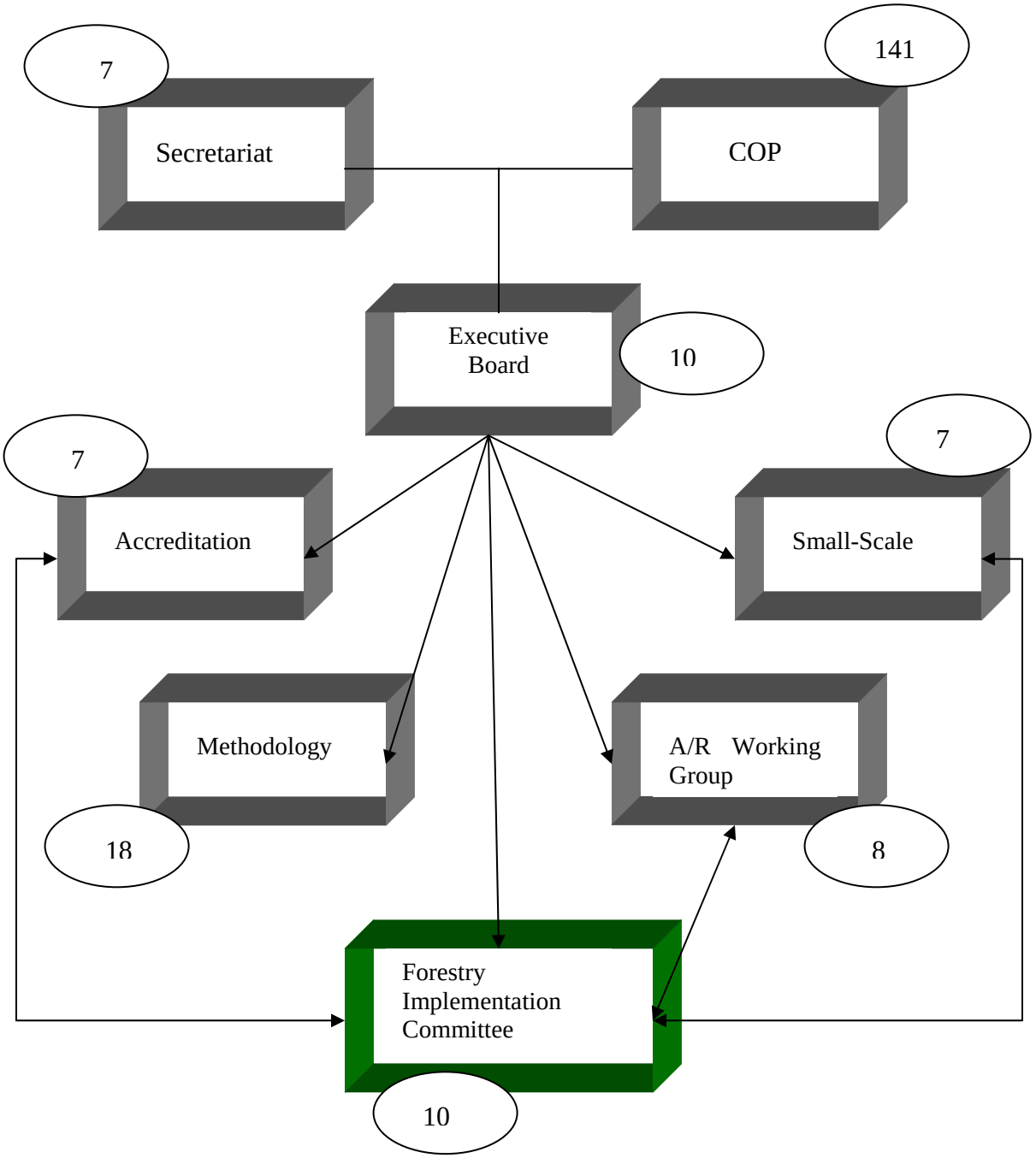
Small-Scale: This working panel focuses on simplifying the methodologies of small-scale CDM projects to make smaller CDM projects more attractive. The panel consists of 7 members from the roster of experts.

Afforestation and Reforestation Working Group: This group is mandated to design baseline and monitoring methodologies for selected forestry project activities. They are also mandated to design a tool for demonstrating additionality in these projects. The panel is staffed by 8 members from the roster of experts.

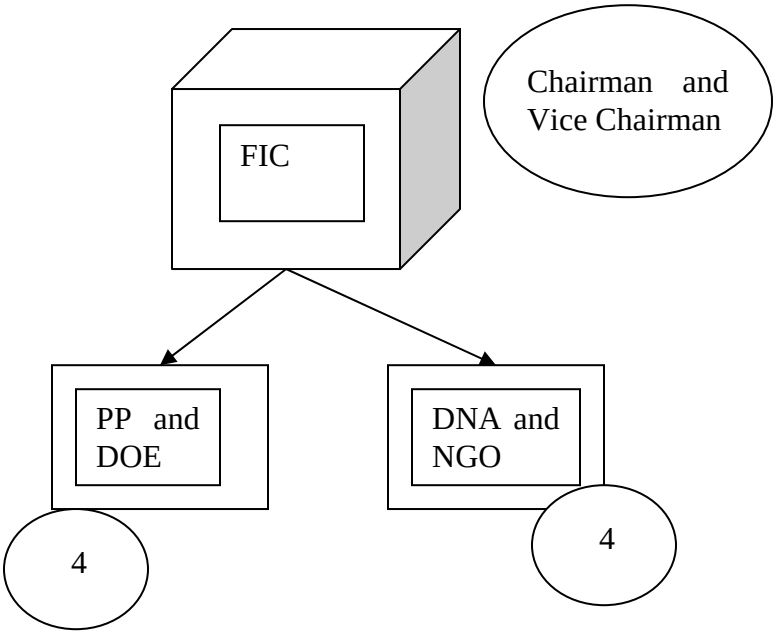
All information obtained for the working panels – (United Nations Framework Convention on Climate Change –http://unfccc.int)

Appendix C: Staffing structures

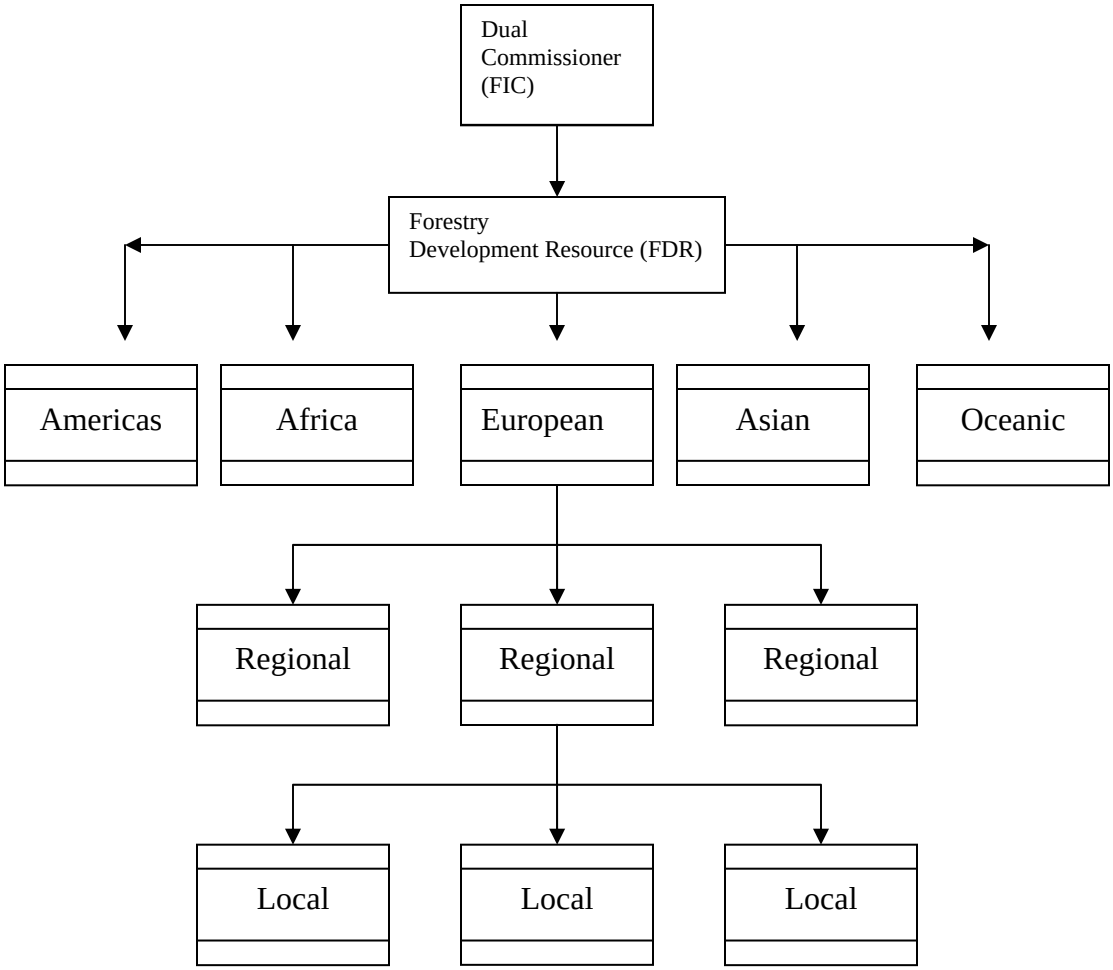
Existing Clean Development Structure and Addition of Forestry Implementation Committee – Ovals represent current number of staff.



Breakdown of Forestry Implementation Committee into the Project Participant/Designated Operational Entity and Designated National Authority/Non-governmental organization working groups – Ovals represent number of staff



Staffing structure of the Forestry Development Resource- Dual Commissioners (Chair and Vice-Chair of FIC) will oversee the 5 super-regional directors, who then can establish local and regional capacity as forestry project demand grows.


Dual
Commissioner
(FIC)
Forestry
Development Resource (FDR)
Americas
Africa
European
Asian
Oceanic
Regional
Regional
Regional
Local
Local
Local

Appendix D: Competency Requirements

Roster of Experts- Existing Staffing
Personnel for working panels and for the Forest Development Resource will be hired from the roster of experts maintained by the UNFCCC Secretariat. The online application can be completed through their website and candidates are screened by the secretariat to meet the following Competency requirements

- Demonstrate and have recognized expertise in relevant Project Task
- Be familiar with the methodologies of the Conference of the Parties
- Expertise relevant to the CDM project
- Meet minimum year requirement
- Fluent in English, with another UN language recommended
- Impartial, no obvious conflicts of interest

(United Nations Framework Convention on Climate Change –http://unfccc.int)

Forest Development Resource:
Individuals selected to staff within the FDR will meet the competency requirements set forth within the Roster of Experts. In addition, they will also meet the requirements below:

- Have significant international public management experience
- Experience with forestry projects
- Familiar with CDM methodologies

Based on information obtained from:
(United Nations Framework Convention on Climate Change –http://unfccc.int)

Appendix E: performance management indicators

Measurement Part I: Operational indicators

ACTIVITY	INPUT	OUTPUT	OUTPUT INDICATOR	OUTCOME	OUTCOME INDICATOR
Forestry Implementation Committee					
1. Establishment of FIC office in Bonn	Staff (secretary), equipment (computer, office furniture)	n/a	n/a	FIC office established, equipped and staffed at UNFCCC HQ, Bonn	First FIC progress report
2. Design of workplan for Year 1	FIC members design all activities based on goals and targets	(month 1) Completed workplan	Workplan presented at first meeting	FIC members aware of duties and goals for 1st year	First FIC progress report
3. Set up FDR	Define criteria for SRD Advertise five SRD positions Interview and appoint S Plan training programs for SRDs and prepare material. Implement training for SRDs at first Quarterly FIC Meeting	(month 1) Well-defined positions created and recruitment notices posted Training programs planned and implemented	Job notices Training material	Five SRDs recruited for well-defined jobs SRDs trained and prepared to take up positions in five regional centers	Recruitment process report SRD feedback to FIC following training
4. Set up two FIC Working Groups: "PP and DOE Working Group"; "NGO and DNA Working Group"	Four FIC members assigned to each working group	(month 1) 2 working groups established and functional	Terms of Reference for each working group	Working Group available to provide expert input and advice to FDR and all project stakeholders	Stakeholders' feedback, Working Group quarterly reports
5. Coordination/ collaboration between FIC and other CDM Working Groups	Panel discussion, dinner with all CDM working groups to initiate collaboration Regular meetings with other WGs Formal exchanges of information	Regular exchange of information and expertise Increased body of cross-disciplinary knowledge at CDM headquarters	Quarterly reports to EB Database of CDM-relevant knowledge	Streamlined procedure for project implementation Increased institutional capacity to deal with problems relating to methodology, measurement and other afforestation/reforestation issues that arise in the field	Inter-WG meeting reports, quarterly meeting reports, feedback from project stakeholders
Forestry Development Resource					

6. Set up offices and begin work	Establish five officers in Americas, Europe, Asia, Africa, Oceania Develop/refine individual work plans for the remainder of the year	(month 4) Five offices staffed and equipped Workplans completed and approved	Individual monthly reports Completed workplans	Five FDR offices are established and functioning to provide services to all CDM A/R project stakeholders	FDR monthly reports to FIC Project stakeholder feedback
7. Standardize project design for DOEs	Develop regulations and standards for DOEs Assist in developing projects so they can be approved expediently	(month 6) Workshops held with high participation of DOEs	Workshop report	DOE understanding of CDM procedures increased Approval time for projects reduced compared to that of non-forestry CDM projects	Approval rates and speed of approval for CDM A/R projects DOE participant feedback
8. Support for DNAs	Identify sustainable development criteria, indicators, and monitoring plan Develop a system for evaluating specific needs of DNA in order to aid in development where attention is required Assist DNAs and governments in capacity building to make state attractive for forestry developers	(month 7) Workshop held with high participation of DNAs	Workshop report	DNA capacities to develop monitoring of projects and national criteria for sustainable development are enhanced	National sustainable development strategies developed and published DNA participant feedback
9. Project monitoring for NGOs	Develop standard methodologies to monitor projects efficiently and cost-effectively	(month 9) Workshop held with high participation of NGOs as well as DOE and DNA representation	Workshop report	NGOs are able to access CDM projects to monitor them in cooperation with DNAs and DOEs	NGO monitoring reports published or transmitted to FIC NGO participant feedback
10. Addressing collaboration between the EB (i.e. the FDR) and the stakeholders (DNAs, DOEs, NGOs)	Develop methods for regular cooperation and sharing of information between project stakeholders and Executive Board	(month 10) Workshop held with high participation of all project stakeholders	Workshop report	All project stakeholders are informed of CDM A/R opportunities and regularly feed information back to EB as clearinghouse	Project stakeholder feedback
11. Handover of responsibility from FIC to	3rd Quarterly Meeting: assessment of progress:	(month 9) 3rd Quarterly meeting	Decision to hand over taken at third quarterly	Five SRDs are fully capable of assuming responsibilities	Quarterly meetings, reports, successful implementation of

FDR	decision to handover or not come month 12) 4th Quarterly Meeting: handover from FIC to FDR (if determined in month 9 that this will occur	results in positive decision to go ahead with handover	meeting (month 9) Handover effected month 12	for the management of the program	all previous steps, approval by Executive Board of handover

Program performance indicators

Overall program goals	Indicators
1. Streamline process to provide clarity on the project cycle and methodologies 2.Encourage/facilitate NGO involvement to encourage project monitoring and community involvement 3. Information dissemination/ channeling to ensure that forestry projects are effectively designed and implemented	Proposed A/R projects (at least 20 projects, with at least 2 in each region) Accepted A/R projects (at least 10 projects, with at least 1 in each region) Accepted A/R project methodologies (at least 1 afforestation and 1 reforestation methodology accepted) Geographical scope of projects (dispersed or concentrated in few countries?) Size of projects (large or small-scale, measured by tons of CO2 reduced) Number of Certified Emission Reductions (CERs) awarded by project, country, region Share of A/R projects in total CDM project profile Total investment in A/R projects, also as share of total CDM investment (public vs. private investment) Local participation in project design, monitoring, implementation Number of national institutions (e.g. DNAs) established

Appendix F: Budget

Line Item Budget

LINE ITEM BUDGET

PERSONNEL SERVICES

Region/Office/Item	Maximum Funds Needed	Actual Use
F/T Implementation Group dual Commissioner	$268,161.22	$134,080.61
P/T DOE and PP Group Experts	$35,200.00	$35,200.00
P/T DNA and NGO Group Experts	$35,200.00	$35,200.00
F/T Super-regional Director Asia	$107,195.24	$53,597.62
F/T Super-regional Director Americas	$95,348.09	$47,674.05
F/T Super-regional Director Africa	$93,571.02	$46,785.51
F/T Super-regional Director Europe	$98,467.84	$49,233.92
F/T Super-regional Director Oceanic	$87,884.39	$43,942.19
TOTALS	$821,027.81	$445,713.91

OTHER THAN PERSONNEL SERVICES

Item		
General Office Supplies	$23,100.00	$11,550.00
Telephone/Internet/Communication	$17,500.00	$8,750.00
Travel	$220,250.00	$152,525.00
Accommodations (while traveling)	$140,350.00	$100,975.00
Food (while traveling)	$44,190.00	$30,015.00
Overhead	$279,300.00	$139,650.00
Institutional Support (Workshop) costs	$241,000.00	$241,000.00
Contingency/Other Operating Costs	$36,500.00	$20,750.00
TOTALS	$1,002,190.00	$705,215.00
GRAND TOTAL	**$1,823,217.81**	**$1,150,928.91**
% of CDM Program Budget	**20.96%**	**13.23%**

Program Budget

Forestry Development Resource

Line Item	Maximum Funds Needed	Actual Use
F/T Manager Asia	$107,195	
F/T Manager Americas	$95,348	
F/T Manager Africa	$93,571	
F/T Manager Europe	$98,468	
F/T Manager Oceanic	$87,884	
Personnel Subtotal	$482,467	$241,233.30
General Office Supplies	$16,500.00	
Phone/Internet/Communication	$12,500.00	
Travel	$96,750.00	
Accommodations	$56,250.00	
Food	$20,250.00	
Overhead	$199,500.00	
Other Operating Expenses	$22,500.00	
Other than Personnel Subtotal	$424,250.00	$212,125.00
Manager Workshop Expenses	$191,000.00	
Workshop Overhead	$50,000.00	
Institutional Support Subtotal	$241,000.00	$241,000.00
Total	$1,147,716.59	$694,358.30

Forestry Implementation Committee

Line Item	Maximum Funds Needed	Actual Use
2 F/T Dual Commissioners	$268,161.22	
4 P/T DOE and PP Experts	$35,200.00	

4 P/T DNA and NGO Experts	$35,200.00	
Personnel Subtotal	$338,561.22	$204,480.61
F/T General Office Supplies	$6,600.00	$3,300.00
F/T Telephone/Communications	$5,000.00	$2,500.00
F/T Travel	$38,700.00	$19,350.00
F/T Accomodations	$22,500.00	$11,250.00
F/T Food	$8,100.00	$4,050.00
F/T Overhead	$79,800.00	$39,900.00
F/T Other Operating Expenses	$9,000.00	$4,500.00
P/T Travel	$84,800.00	
P/T Accommodations	$61,600.00	
P/T Food	$15,840.00	
P/T Other Operating Expenses	$5,000.00	
Other than Personnel Subtotal	$336,940.00	$252,090.00
Total	$675,501.22	$456,570.61

Appendix G: Calendar of Activities

Capacitate Approach	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12
Forestry Implementation Committee												
Establish FIC												
Kick-Off Meeting												
Advertise for SRDs	●											
Hire SRDs												
First Quarterly Meeting			●									
Forestry Development Resource												
Training of Super Regional Directors												
First Workshop: DOEs						●						
Second Quarterly Meeting						●						
Second Workshop: DNAs							●					
Third Workshop: Involve NGOs								●				
Third Quarterly Meeting									●			
Workshop: All stakeholders										●		
11th Month Assessment											●	
Fourth Quarterly Meeting												●
Prepare for Year Two												☻

Appendix H: glossary of acronyms

Forestry IC – Forestry Implementation Committee
PP – Project Participant (project initiator)
DOE – Designated Operational Entity (auditing firm)
DNA – Designated National Authority (Sustainable Development)
NGO – Non-governmental Organization (Monitoring)
FDR – Forestry Development Resource (Help Desk)
CDM – Clean Development Mechanism
COP – Conference of the Parties
UNFCCC – United Nations Framework Convention on Climate Change

Bibliography

(IPCC), Intergovernmental Panel on Climate Change (2001). "Summary for Policymakers Climate Change 2001: Mitigation."

Anderson, D., R. Grant, et al. (2001). Taking Credit, Canada and the Role of Sinks in International Climate Negotiations, David Suzuki Foundation**:** 86.

Annie Petsonk, D. J. D., Joseph Goffman (1998). "Market Mechanisms and Global Climate Change: An Analysis of Policy Instruments." Pew Center on Global Climate Change.

European Commission (2003). Linking project credits to the EU emissions trading scheme. COM (2003) 403.

Arnaldsm, A. (2004). ". Carbon Sequestration and the Restoration of the Land Health An Example from Iceland." Climate Change **65**: 333-346

Aslam, E. H. a. M. A. (2000). "Coordination Issues and Domestic Policies". The Kyoto Mechanisms and Global Climate Change, Pew Center on Global Climate Change**:** 1-44.

Brewer, T. L. (2005). "Climate Change in the US Government Budget: Funding for Technology and Other Programmes, and Implications for EU-US Relations."

Brown, S. (2002). "Changes in the use and management of forests for abating carbon emissions: issues and challenges under the Kyoto Protocol." The Royal Society.

Brown, S. (2005). "Guidelines for inventorying and monitoring carbon offsets in forest-based projects." 5 July 2005. <http://www.winrock.org/reep/guidelines.html>.

Brown, S., I. R. Swingland, et al. (2002). "Changes in the use and management of forests for abating carbon emissions: issues and challenges under the Kyoto Protocol." Philosophical Transactions of the Royal Society of London **360**: 1593-1605.

Brundtland, G. H. (1987). Our Common Future. Report of the World Commission on Environment and Development. New York, New York, United Nations General Assembly.

Center, P. (2005). "The European Union Emissions Trading Scheme (EU-ETS) Insights and Opportunities", Pew Center on Global Climate Change**:** 1-20.

COP (2004). Conference of the Parties 10. United Nations Convention on Climate Change

Costa, P. M. (1996). "Tropical Forestry Practices for Carbon Sequestration - A review and a case study from Southeast Asia." Ambio **25**: 279-328.

Diversity, C. o. B. (1992). Sustaining Life on Earth. United Nations Convention on Biodiversity, Rio de Janeiro, Brazil.

Earth, Friends. of. the. Tree Trouble, A Compilation of Testimonies on the Negative Impact of Large-scale Monoculture Tree Plantations prepared for the sixth Conference of the Parties of the Framework Convention on Climate Change, Friends of the Earth International in cooperation with the World Rainforest Movement and FERN

Edmonds, J., M. J. Scott, et al. (1999). International emissions trading & Global Climate Change Impacts on the Costs of Greenhouse Gas Mitigation. Batelle, Washington, D.C., Pew Center on Global Climate Change**:** 51.

Emmer, I. M. (2005). An Introduction to the Monitoring of Forestry Carbon Sequestration Projects. Capacity Development for the Clean Development Mechanism. U. N. E. Programme.

Garcia-Olivia, F. and O. R. Masera (2004). "Assessment and Measurement Issues Related to Soil Carbon Sequestration in Land-Use, Land-Use Change, and Forestry (LULUCF) Projects Under the Kyoto Protocol." Climatic Change **65**: 347-364.

Garcia-Quijanoa, J. F., Gaby Deckmynb, Ellen Moonsc, Stef Proostc, and R. C. a. B. Muys (2005). ""An integrated decision support framework for the prediction and evaluation of efficiency, environmental impact and total social cost of domestic and international forestry projects for greenhouse gas mitigation: description and case studies"." Forest Ecology and Management **207**: 245-262.

Haites, E. and M. A. Aslam (2000). The Kyoto Mechanisms and Global Climate Change: Coordination Issues and Domestic Policies, The Pew Center on Global Climate Change.

Hardner, J. J., P. C. Frumhoff, et al. (1999). "PROSPECTS FOR MITIGATING CARBON, CONSERVING BIODIVERSITY, AND PROMOTING SOCIOECONOMIC DEVELOPMENT OBJECTIVES THROUGH THE CLEAN DEVELOPMENT MECHANISM." Mitigation And Adaption Strategies for Global Change **5**(1): 61-80.

Heller, T. C. and P. R. Shukla (2003). Development and Climate: Engaging Developing Countries (working draft, July 2003). Beyond Kyoto: Advancing the International Effort Against Climate Change. Washington, D.C., Pew Center on Global Climate Change**:** 28.

Heller, T. C. and P. R. Shukla (2004). "Development and Climate: Engaging Developing Countries". Beyond Kyoto: Advancing the International Effort Against Climate Change, Pew Center on Global Climate Change**:** 111-140.

Hendrick, E. and M. Ryan (2000). Carbon sequestration: Policy, Science, and Economics. National Council on Forest Research and Development conference on Carbon Sequestration and Irish Forests, Dublin, Ireland.

IPCC (2005). Proposed New Methodology for Afforestation and Reforestation Project Activities: Baseline, International Panel on Climate Change.

Joseph G. Canadell, P. C., Peter Cox, and Martin Heimann (2004). "Quantifying, understanding and managing the carbon cycle in the next decades." Climatic Change **67**: 147-160.

Jung, M. (2005). "The Role of Forestry Projects in the Clean Development Mechanism." Environmental Science and Policy **8**: 87-104

Kauppi, P. and R. Sedjo (2001). "Chap 4. Technological and Economic Potential of Options to Enhance, Maintain, and Manage Biological Carbon Reservoirs and Geo-Engineering." IPCC Climate Change 2001: Working Group III: Mitigation

Kill, J. (2001). "Sinks in the Kyoto Protocol: A Dirty Deal for Forests, Forest Peoples and the Climate."

Kolshus, H. H., J. Vevatne, et al. (2001). Can the Clean Development Mechanism attain both cost-effectiveness and sustainable development objectives? C. f. I. C. a. E. Research. Blindern, Center for International Climate and Environmental Research (CICERO)**:** 1-25.

Lile, R., M. Powell, et al. (1998). Implementing the Clean Development Mechanism: Lessons from U.S. Private-Sector Participation in Activities Implemented Jointly. Washington DC, Resources For the Future**:** 1-28.

Loschel, A. and Z. Zhang, Eds. (2002). The Economic and Environmental Implications of the US Repudiation of the Kyoto Protocol and the Subsequent Deals in Bonn and Marrakech.

May, P. H., E. Boyd, et al. (2003). Local sustainable development effects of forestry carbon projects in Brazil and Bolivia: A view from the field. International Conference on Rural Livelihoods, Forests and Biodiversity. Bonn, Germany.

McCarthy, J. J., O. F. Canziani, et al. (2001). Impacts, Adaption, and Vulnerability. IPCC Third Assessment Report: Climate Change 2001. Cambridge, England, International Panel on Cliamge Change.

McCright, A. M. and R. E. Dunlap (2000). "Challenging Global Warming as a Social Problem: An Analysis of the Conservative Movement's Counter-Claims." Social Problems **47**(4): 499-522.

McCright, A. M. and R. E. Dunlap (2003). "Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy." Social Problems **50**(3).

Meadows, D. (1972). The Limits to Growth. New York.

Michaelowa, A. and M. Dutschke (2002). Integration of climate and development policies through the Clean Development Mechanism. Hamburg, Hamburg Institute of International Economics**:** 1-17.

Michaelowa, A. and E. Fages (1999). "OPTIONS FOR BASELINES OF THE CLEAN DEVELOPMENT MECHANISM." Mitigation And Adaption Strategies for Global Change **4**(2): 167-185.

Nakicenovic, N., J. Alcamo, et al. (2000). Emission Scenarios: A Special Report of IPCC Working Group III. N. Nakicenovic, J. Alcamo, G. Daviset al. Cambridge, International Panel on Climate Change**:** 599.

Oxley, A. and S. Macmillan (2004). The Kyoto Protocol and the APEC Economies, Australian APEC Study Centre.

Parsons, E. and K. Fisher-VanDen (1999). "Joint implementation of greenhouse gas abatement under the Kyoto protocol's clean development mechanism: Its scope and limits." Policy Sciences **32**(3): 207-224.

Repetto, R. (2001). "The Clean Development Mechanism: Institutional breakthrough or institutional nightmare?" Policy Sciences **34**(3-4): 303-327.

Richards, K. R., R. Moulton, et al. (1993). "Costs of Creating Carbon Sinks in the U.S." Energy Conservation and Management **34**(9-11): 905-912.

Robert, R. (2001). "Clean Development Mechanism: Institutional breakthrough or institutional nightmare?" Policy Sciences **34**: 303-327.

Rowlands, I. H. (2001). "The Kyoto Protocol's 'Clean Development Mechanism': a sustainability assessment " Third World Quarterly **22**(5): 795-811.

Schlamadinger, B. and G. Marland (2000). "Land Use and Global Climate Change: Forests, Land Management and the Kyoto Protocol." Pew Center on Global Climate Change(June 2000): 1-63.

Sedjo, R. A. (2001). Forest Carbon Sequestration: Some issues for Forest Investments. Washington D.C., Resources for the Future.

Stavins, R. N. and K. R. Richards (2005). The cost of U.S. forest-based carbon sequestration. Washington, D.C., Pew Center on Global Climate Change**:** 52.

Streck, C. (2004). "New Partnerships in Global Environment Policy: The Clean Development Mechanism." The Journal of Environment and Development **13**(3): 295-322.

Tietenberg, T. (1992). Environmental and Natural Resource Economics.

UNEP. (2005). "United Nations Environment Programme." 2005, from <http://climatechange.unep.net/.>.

UNFCCC (1992). United Nations Framework Convention on Climate Change.

UNFCCC (1995). First Session. Conference of the Parties.

UNFCCC (1995). UNFCCC: First Conference of the Parties. COP1. Berlin, UN.

UNFCCC (1997). Kyoto Protocol to the United Nations Convention on Climate Change, United Nations

UNFCCC (2003). Conference of the Parties 9. United Nations Framework Convention on Climate Change, Milan, Italy.

UNFCCC (2004). The Marrakech Accords and the Marrakech Declaration. United Nations Framework Convention on Climate Change. Marrakech, Morocco.

UNFCCC. (2005). "Kyoto Mechanisms - Emissions Trading." United Nations Framework Convention on Climate Change 13 August 2005, <http://unfcc.int/kyoto_mechanisms/emissions_trading/items/2731.php>.

UNFCCC (2005). "United Nations Framework Convention on Climate Change: CDM Background." UNFCCC, UN.

Vitousek (1997). "Human Domination of Earth's Ecosystems." Science **277**: 494-499.

Vliet, O. P. V., A. P. Faaij, et al. (2003). "Forestry Projects under the Clean Development Mechanism?" Climatic Change **61**: 123-156.

Watch, C. (2005). "The World Bank and the Carbon Market: Rhetoric and Reality ".

Watson, R. T. (2001). Synthesis Report. IPCC Third Assessment Report: Climate Change 2001. Geneva, Switzerland, International Panel on Climate Change.

Watson, R. T., I. R. Noble, et al. (2000). IPCC Special Report on Land Use, Land-use Change and Forestry. Cambridge, International Panel on Climate Change**:** 377.

References

[1] Watson et al, (Eds.). (2001) IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis. Synthesis Report. Geneva, Switzerland.
[2] Philander. (1998) *Is the Temperature Rising? The Uncertain Science of Climate Change*. New Jersey, Princeton University: 35.
[3] Philander. (1998) *Is the Temperature Rising? The Uncertain Science of Climate Change*. New Jersey, Princeton University: 35.
[4] Watson et al, (Eds.). (2001) IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis. Synthesis Report. Geneva, Switzerland.
[5] Nakicenovic et al, (Eds.). (2000) Emissions Scenarios. A Special Report of IPCC Working Group III. Cambridge University Press: 1-599.
[6] Philander. (1998) *Is the Temperature Rising? The Uncertain Science of Climate Change*. New Jersey, Princeton University: 35.
[7] Watson et al. (2000) IPCC Special Report on Land Use, Land-use Change, and Forestry. Cambridge University Press: 1-377.
[8] UNEP (2005)IPCC SRES Scenarios. From http://climatechange.unep.net/jcm/doc/emit/sres.html. Accessed 13 August 2005.
[9] Watson et al, (Eds.). (2001) IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis. Synthesis Report. Geneva, Switzerland.
[10] Watson et al, (Eds.). (2001) IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis. Synthesis Report. Geneva, Switzerland.
[11] McCarthy et al. (2001) IPCC Third Assessment Report: Climate Change 2001: Impacts, Adaptation, and Vulnerability. Cambridge University Press.
[12] Watson et al, (Eds.). (2001) IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis. Synthesis Report. Geneva, Switzerland.
[13] UNFCCC, (1992) Article 3
[14] UNFCC Conference of the Parties, First Session 28th march-April7th 1995 From http://unfccc.int/resource/docs/cop1/07a01.pdf, Accessed on 5 August 2005.
[15] Kyoto Protocol, Article 3 and Annex A
[16] Streck, (2004),"New Partnerships in Global Environmental Policy: The Clean Development Mechanism," *The Journal of Environment & Development*, Vol. 13: 295-322,
From <http://jed.sagepub.com/cgi/reprint/13/3/295.pdf> Accessed 8 July 2005.
[17] UNFCCC, (2005), Kyoto Mechanisms- Emissions Trading" From http://unfccc.int/kyoto_mechanisms/emissions_trading/items/2731.php Accessed on 5 August 2005.
[18] Haites, (2000), "The Kyoto Mechanisms and Global Climate Change: Coordination Issues and Domestic Policies" The Pew Center on Global Climate Change.
[19] Schlamadinger, et al,.(2000), "Land Use and Global Climate Change: Forests, Land Management, and the Kyoto Protocol," The Pew Center on Global Climate Change.
[20] UNFCCC, (1997) "United Nations Framework Convention on Climate Change, Kyoto Protocol: Article 12," From <http://unfccc.int/resource/docs/convkp/kpeng.pdf> , Accessed 1 August 2005.
21Designated National Authority for the CDM in South Africa (2005) "Background Information" Seen at http://www.dme.gov.za/cdm/background.htm Accessed on 09/15/05
22 http://unfccc.int/essential_background/kyoto_protocol/compliance/items/2772.php
23Designated National Authority for the CDM in South Africa (2005) *"Background Information"* Seen at http://www.dme.gov.za/cdm/background.htm Accessed on 09/15/05
[24] UNFCCC, (2005)"Kyoto Mechanisms- Joint Implementation Projects," From http://unfccc.int/kyoto_mechanisms/ji/items/1674.php, Accessed on 5 August 2005.
[25] UNFCCC, (2005) "Glossary of Terms,"From http://unfccc.int/essential_background/glossary/items/2639.php, Accessed on 13 August 2005

26 United Nations Framework Convention on Climate Change (2004) *"The Mechanisms under the Kyoto Protocol: Joint Implementation, the Clean Development Mechanism and Emissions Trading"* UNFCCC (Ed.)United Nations

27 Ibid

[28] Ibid.

[29] Prentice at al. 2001. The carbon cycle and atmospheric carbon dioxide. Climate Change 2001: The Scientific Basis. Cambridge: Cambridge University Press.

[30] Dayal. 2000. Carbon Trading and Sequestration Projects Offer Global Warming Solutions.

[31] BROWN, S. (2002) Changes in the use and management of forests for abating carbon emissions: issues and challenges under the Kyoto Protocol. The Royal Society.

[32] GRUBB, M., HOURCADE, J.-C. & OBERTHUR, S. (2001) *"Keeping Kyoto A study of approaches to maintaining the Kyoto Protocol on Climate Change"* London, Climate Strategies.

[33] Ibid.

[34] Ibid

[35] COSBEY, A., PARRY, J.-E., BROWNE, J., BABU, Y. D., BHANDARI, P., DREXHAGE, J. & MURPHY, D. (2005) *"Realizing the Development Dividend: Making the CDM Work for Developing Countries"* Winnipeg, Manitoba, Institute for Sustainable Development.

[36] Garcia-Oliva, F. and O.R. Masera. 2004. Assessment and measurement issues related to soil carbon sequestration in land-use, land-use change, and forestry (LULUCF) projects under the Kyoto Protocol. Climatic Change 65: 347 – 364.

[37] Proposed new methodology for afforestation and reforestation project activities: Baseline (CDM-AR-NRB) – Version 1. Downloaded from http://cdm.unfccc.int/UserManagement/File on July 10, 2005.

[38] Brown, S. 1999. Guidelines for Inventorying and Monitoring Carbon Offsets in Forestry-Based Projects. Winrock International.

[39] Proposed new methodology for afforestation and reforestation project activities: Baseline (CDM-AR-NRB) – Version 1. Downloaded from http://cdm.unfccc.int/UserManagement/File on July 10, 2005.

[40] IPCC. (2000), "Summary for Policymakers: Land-Use, Land-Use Change, and Forestry."

[41] May, et al, (2003), "Local sustainable development effects of forestry carbon projects in Brazil and Bolivia: A view from the field" *International Conference on Rural Livelihoods, Forests and Biodiversity*, Bonn, Germany.

[42] Ibid.

[43] IPCC. (2000), "Summary for Policymakers: Land-Use, Land-Use Change, and Forestry."

[44] Ibid

[45] United Nations Framework Convention on Climate Change (2005) *"United Nations Framework Convention on Climate Change: CDM Project Validation"* UNFCCC (Ed.),United Nations

[46] UNFCCC,(2005), "United Nations framework Convention on Climate Change: Panels and Working Groups,"From http://cdm.unfccc.int/Panels, Accessed 18 August 2005.

[47] UNFCC, (2005), "United Nations Framework Convention on Climate Change: Clean Development Mechanism: Proposed New Methodologies for Afforestation and Reforestation Project Activities". From http://cdm.unfccc.int/Panels/ar/ARWG01_Annex2_CDM_AR_NMB_rev01.pdf, Accessed 16 Aug. 2005.

48 United Nations Framework Convention on Climate Change (2005) *"Panels and Working Groups"*. UNFCCC (Ed.)United Nations.

49 International Panel on Climate Change (2005) *"Proposed New Methodology for Afforestation and Reforestation Project Activities: Baseline"* International Panel on Climate Change.

[50] UNFCC. (2002.) "Working Groups/Panels." http://cdm.unfccc.int/Panels, Accessed on 25 October 2005.

[51] UNFCC.(2005.) "Budget Performance for the Biennium." http://unfccc.int/resource/docs/2005/sbi/eng/13.pdf. Accessed on 25 October 2005.

[52] COP I. (1995.)

http://unfccc.int/parties_and_observers/parties/administrtative_and_financial_matters/items/3009.php. Accessed on 25 October 2005.

[53] http://www.un.org/Depts/OHRM/salaries_allowances/

[54] United Nations Framework Convention on Climate Change (UNFCCC). CDM Management Plan (CDM_MAP) 2005-2006. Accessed 25 October 2005
http://cdm.unfccc.int/EB/Meetings/021/eb21annagan3.pdf

[55] Some of these indicators are based on OECD (2004), "Taking Stock of Progress Under the Clean Development Mechanism (CDM)", Paris, 15 June 2004

[56] Governmental Accounting Standards Board (GASB). "Managing for Results: An Overview of the Basics". Accessed 26 October 2005
http://www.seagov.org/aboutpmg/mfr_steps.pdf

[57] United Nations Statistics Division. "Methods and Classifications" Accessed 30 October 2005
http://unstats.un.org/unsd/methods.htm