I. INTRODUCTION

1.1. The NSS Program

The National JI/CDM Strategic Study program on climate change assists host country governments understand how they could benefit from participation in the CDM. They aim to emphasize the needs and priorities of host countries in the implementation of the CDM and provide the government and other stakeholders with a greater understanding of the issues, challenges and opportunities that are presented by the development of an international market in GHG offsets and the financing opportunities presented by the CDM.

Each study will provide a framework that will allow the economic, social and environmental benefits of the implementation of the CDM to be maximized for the host country. In doing so the studies consider the following:

- Quantification of the potential for GHG reductions and their cost
- Analyze country specific options in addressing climate change
- Highlight the opportunities created by a possible market for GHG offsets and other financing opportunities for GHG abatement projects
- Assess potential for capacity building and identify areas for its implementation, establishing a link to sustainable development targets of host countries.
- Flesh out possible issues and concerns with GHG offsets trading and possible trading mechanisms and develop policy options and strategies, and
- Develop a pilot pipeline of possible projects for different financing opportunities and available to all interested sponsors.

Each study is customized to recognize work already undertaken and consultation with the host government and stakeholders is required to finalize content of the study. A key output from strategy studies is a pipeline of GHG abatement projects along with the identification of potential sources of financing. With a better understanding of the international demand for GHG offsets, the traded volume and the price of potential offsets, the country can make a more informed decision on market options and opportunities.

1.2. The NSS in Indonesia

The NSS in Indonesia is being conducted in two components:

- The Energy component financed by GTZ and coordinated by the State Ministry for the Environment, which was completed in late 2001. This component primarily dealt with the potential of the CDM in the energy sector, and only included some basics assumptions about the Land Use, Land Use Change and Forestry (LULUCF) sector in market modeling. The term LULUCF used here also refers to forest carbon or sink project which are more generic than LULUCF-CDM Project which is Kyoto Complaint.
  (The report is available at http://wbln0018.worldbank.org/essd/essd.nsf/b9532a53ffb42daf85256981006f18e3/c30e8fe4b4897d328525698100733468).
- The current LULUCF component, funded by AusAID, which will deal with the implementation of the CDM in the LULUCF Sector.

In conducting the current study, it is important that analysis and recommendations consider the work carried out in the energy component of the CDM. Where ever possible, current work should build on the energy component, and update analysis, market modeling and recommendations in the basis of developments in international negotiations and at the national level.

1.3. Major Findings of the Energy NSS

The major findings from the energy component of the NSS form the foundations for the current study. In particular, information on the emissions profile of Indonesia and recommendation on the institutional and marketing issues need to be considered in the context of the LULUCF sector.

1.3.1. Indonesia's Emissions Profile

National greenhouse gas emission from 1990–1994 grew by 1.8% per year. The energy sector contributed 27-46%, LULUCF 16-49% and agriculture 15-23% (Table 1.1). The key factor in these fluctuating shares the highly variable emissions from the LULUCF sector. In the period, net emissions varied between 58 and 269 Tg CO_2-eq. Emissions are difficult to predict, particularly given that control of the sector has been decentralized, and the complexity of the sector. There are also significant concerns over the accuracy of data sets.

Table 1.1. Indonesian greenhouse gas emissions 1990 - 1994

Sector	1990	1991	1992	1993	1994
	Gg CO_2-eq				
Energy	136803	149030	158773	167406	177525
Fugitive	32830	37345	39503	40739	42801
Waste	7798	7950	7687	8270	8440
Industrial	2058	1928	1992	2206	2324
LULUCF	197734	269141	207018	58137	164035
Agriculture	75101	83585	84836	84852	84507
TOTAL	452324	548979	499809	361612	479632

Source: MoE (1999)

1.3.2. Indonesia's Energy Abatement Costs and Market Potential

The utilisation of flared gas is the most promising of the abatement opportunities in the energy sector in Indonesia, producing potential savings of 84 million tons (Mt) of CO_2 per year at a marginal abatement cost of US$ 1.5 per ton of CO_2. Other promising mitigation options identified by the energy component of the NSS include Integrated Gasification Combined Cycle, waste incineration, fuel switch in the pulp and paper industry, co-generation and heating system reconstruction in the textile industry and improved waste management in starch factories, all of which have mitigation costs under US$ 10 but offer relatively small carbon savings (less that 29 M tons of CO_2 per year).

Market modeling was carried out using the Pelangi Emissions Trading (PET) Model, specially developed for this task. Sinks were not included in the modeling. The PET model projected that the CDM would have a volume of 1200 Mt CO_2 per year at a price of US$ 1.83 per ton and for an after tax revenue of US$ 10.6 B. The distribution of CDM trade would depend on the structure of national economies. China and India are heavily reliant on coal, have inefficient infrastructure and large economies, which should make them the dominant players in the energy CDM market. China is expected to capture 50 to 60% of the CDM while contributing 40 % of non-Annex B emissions by 2010 (MoE, 2001)

Indonesia's projected share of the CDM energy market is average at about 2.1%. Total net revenue is projected to be US$ 244 M in the first commitment period. Gas flaring is the major source of these reductions, contributing to 53% of sales. A further 28% comes from no-regrets measures and a further 19% from other projects with a positive MAC (MoE, 2001).

1.3.3. Institutional Issues

The energy report considered the current framework for foreign investment in Indonesia and the current institutional framework applying to climate change. It recommended that a Designated National Authority (DNA) be created to manage the CDM in Indonesia. The Authority would consist of:

- A CDM Board, which would approve projects, acts as a focal point for the CDM in Indonesia and liaises with international bodies.
- A CDM clearing house, that would act as an information center for the CDM, and provide the Board with technical support for its project approval The Clearing House may be a private entity contracted to provide the service to the Board. This house has no authority but it manage day to day activities

The report addressed a number of technical issues for the implementation of the CDM in Indonesia. In particular, it canvassed the setting of baselines, including:

- Static verses dynamic baselines.
- Project and baseline lifetime
- Leakage
- Additionality
- Basis of baseline establishment – Project, technology or national levels
- The basis for establishing baselines for small projects, where transaction costs may be high

The report recommended that a national baseline study be conducted to assist formulate guidelines on the types of baselines and methodologies that should be used for particular project types. The need for a thorough consideration of the social and environmental costs and benefits of projects to be considered was highlighted.

The issue of benefit sharing in the CDM was considered. While many of the benefits of the CDM accrue to the investor, it was noted that any attempt by Indonesia to capture benefit through taxes, charges or other measures would lead to a potential loss in CDM volumes. As a result it was recommended that clear benefit sharing guidelines be put in place to guide investors.

There are many potential barriers to the development of the CDM market in Indonesia. Significant investment will depend on a conducive investment environment that minimizes risks and transaction costs while ensuring that project meet international and national requirements.

Promoting investment opportunities may require prioritization of project types and should concentrate on demonstrating the infrastructure in place to support the CDM.

To assist project developers, it was recommended that the following actions be taken:

- National CDM Manual and guidelines be developed, containing:
  - An outline of the key steps on the project development cycle
  - All necessary approvals forms
  - Contact details for relevant government agencies
  - A list of all criteria that are to be met for project approval
  - An explanation of the required baseline methodology
- National CDM sustainability criteria be developed. The criteria to be applied need to be clearly set out. These should take account of environmental, social, economic, institutional and legal considerations.

The report also recommended that no-regrets and low cost abatement options be prioritized. Often, these projects face significant investment and implementation barriers. In addition, they are often seen as low priority compared to immediate development issues. The significance of small scale projects in environmental and social terms was highlighted. Unfortunately, these projects often face high transaction costs in relation to baseline setting, monitoring and verification. It was recommended that a process be put in place to fast track these project types.

II. CDM, CARBON TRADE IN THE INTERNATIONAL PERSPECTIVE

2.1. The International Framework

The United Nations Framework Convention on Climate Change (UNFCCC) is an international agreement that aims to prevent dangerous anthropogenic interference in the climate. It was opened for signature at the United Nations Conference on the Environment and Development at Rio in 1992. One hundred and eighty six countries have ratified the Convention. The UNFCCC requires the Organization of Economic Cooperation and Development (OECD) countries, the former Soviet Union and Economies in Transition, to stabilize anthropogenic emissions of greenhouse gases at 1990 levels by 2000.

It became clear that further guidance was required if the overall objectives of the UNFCCC were to be met. In 1997, the Kyoto Protocol was negotiated. The most important aspect of the Protocol was the legally binding commitment by 39 industrialized countries (Annex I Parties) to reduce emissions by an average 5.2% on 1990 levels over the period 2008 – 2012 (the first commitment period). These emission reductions were differentiated amongst countries based on economic and social impact: the EU has accepted a reduction of 8% while Iceland is allowed to increase emissions by 10%. To come into force, the Protocol shall enter into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55 per cent of the total carbon dioxide emissions for 1990 of the Parties included in Annex I. To date, 101 countries representing 43.9% of emissions have done so.

In order to assist the Annex I Parties meet their emission reduction obligations, a number of market based flexibility mechanisms were agreed to. These included:

- Emissions Trading (the trading of emission allowances amongst Annex I parties)
- Joint Implementation (the transfer of emission reductions resulting from specific projects between Annex B countries) and
- The Clean Development Mechanism. The Clean Development Mechanism allows developed countries to invest in specific projects in developing countries and claim the emission reductions (Certified Emission Reductions) that result, while assisting the developing countries that host CDM projects to achieve sustainable development.

The CDM is unique as it allows emission reductions to be created in non-Annex B Parties to used by Annex B parties to meet their targets. This recognizes:

- the potential for low cost emission reductions to be achieved in developing countries, reducing the rate of emissions increase in developing countries while reducing the cost of compliance in Annex B countries
- assists in sustainable development, technology transfer and capacity building in developing countries and
- creates potential financial flows from developed to developing countries.

Participation in the CDM is to be voluntary; projects are to result in real and meaningful carbon benefits and are to provide sustainable development benefits.

The Kyoto Protocol was unclear on the matter of the eligibility of LULUCF projects for the CDM. Considerable debate ensued on this matter. There were significant concerns that the inclusion of the LULUCF sector in the CDM would result in very large quantities of cheap emission reductions becoming available in the market. This was compounded by concerns over

a number of technical issues relating to LULUCF based credits (see Section 2.2 for a discussion of these).

2.1.1. The Framework for the Implementation of the CDM

The detailed framework for the operation of the CDM was negotiated at the Seventh Conference of Parties to the Convention in Marrakesh in 2001. The Marrakesh Accords establish the broad parameters for participation in the CDM. The relevant decisions are shown in the Table 2.1.

Table 2.1. The relevant decisions of the Marrakesh Accords

Annex B forest management	An allowance for Annex B countries to include forest management activities when calculating assigned amounts, effectively reduced developed country commitments by 117 Mt CO_2 per year.
Institutional	A requirement for non-Annex I countries to establish a Designated National Authority to approve CDM projects.
	The definition and development of indicators for sustainable development to be applied to CDM is to be the responsibility of each host country.
	A CDM Executive Board has been established, which will be responsible for supervising CDM projects at the international level. The Executive Board has established the infrastructure to assess and approve CDM projects, including the appointment of several technical; panels to assist with the development of policy frameworks and the assessment of projects that request approval.
	A project development cycle, complete with standardized documentation requirements have been established by the CDM Executive Board. This process will operationalize the CDM and determine the likely level of transaction costs, which may present significant barriers to the development of small projects.
	An adaptation fund was established that requires 2% of the CER proceeds from a CDM project are to be placed in the fund to assist non-Annex I countries adapt to a wide range of climate change circumstances using other project mechanisms as a means to make these adaptations
Eligibility of LULUCF	LULUCF activities are to be eligible for the CDM, although they are restricted to afforestation and reforestation activities and Annex I parties are limited to using LULUCF CER's up to 1% of their 1990 emissions.
Technical	The details on how LULUCF activities are to be accounted for and the modalities for their inclusion in the CDM were referred to the Subsidiary Body on Scientific and Technical Advice (SBSTA) for preparation of recommendations for consideration at COP9. To date, SBSTA has made little headway in its deliberations, unable to agree on the definition of forest that should apply to the CDM at its last meeting
	The lifetime of a CDM project was set at 10 years or 21 years with a review of the baseline at 7 and 14 years. It is unclear if this project lifetime applies to the LULUCF sector.
Flexibility Mechanisms	No quantitative restrictions were placed on the use of trade to meet commitments (with the exception of LULUCF CDM). This means that there are no restrictions on the sale of "hot air".

2.1.2. The Project Development and Approval Cycle

The CDM executive Board has developed a project development cycle for the CDM as shown in Figure 2.1. The project development cycle is comprehensive and will require the preparation of substantial documentation for the approval of projects. The Project cycle will require projects to go through the following steps: the project design phase that involves the identification of a project, feasibility studies, the preparation of business and management plans and preparation of the (Project Design Document) PDD, stakeholder consultation and monitoring and verification protocol.

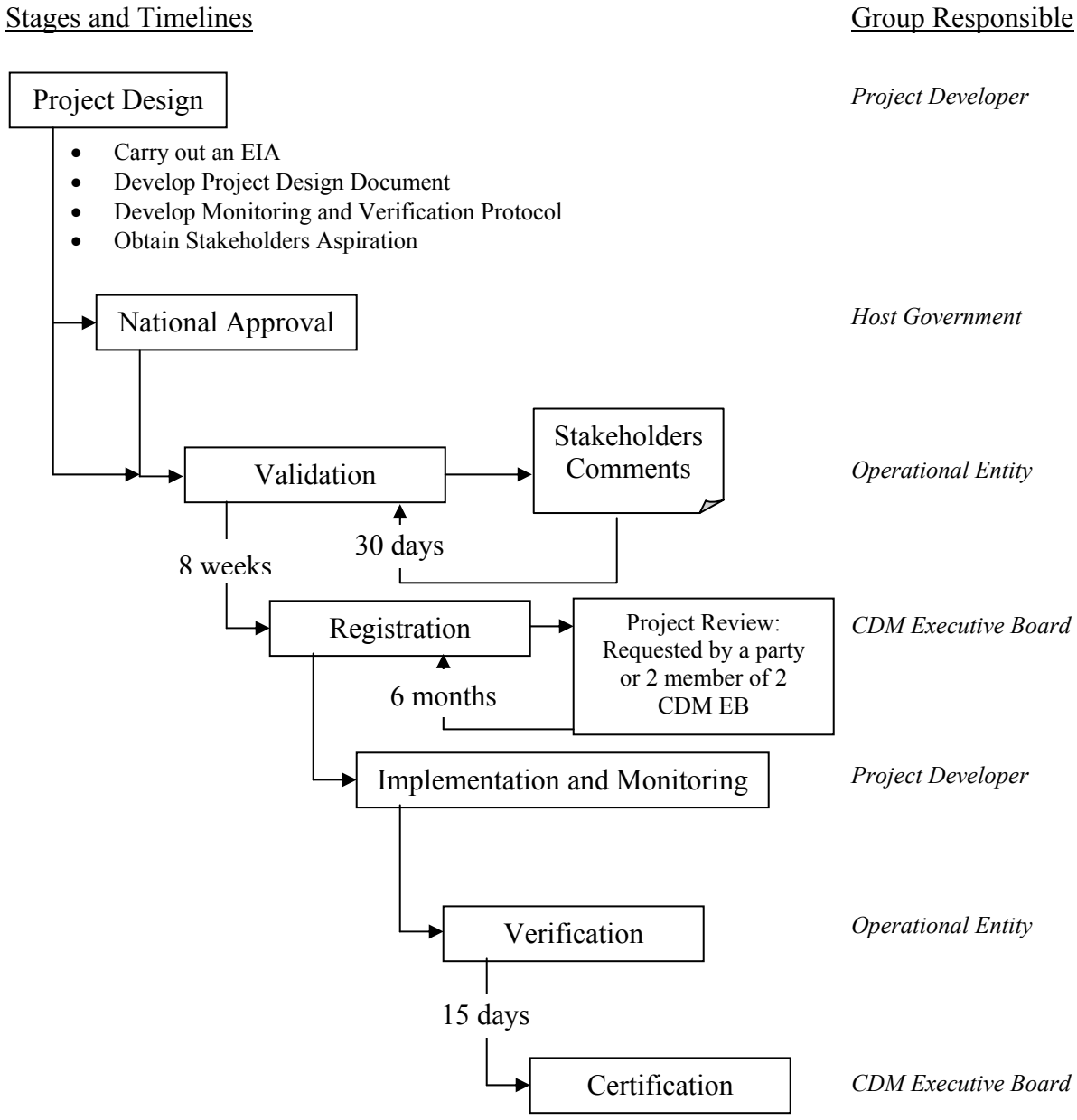

Figure 2.1. The project development cycle for the CDM (Modified from UNFCCC CDM Executive Board; Source: Aukland *et al*., 2001.)

Project Design

The development of project documentation for CDM approval is the culmination of a long process of project development, which ensures that all required elements for a successful project are in place. This would normally be undertaken by an organization interested in developing a project such as an NGO, a study center etc. However, an investor might act partly or entirely as a project developer if they are pro-actively seeking projects in which to invest or partners with which to work on CDM project development.

National Approval

Any project wishing to participate in the CDM must obtain written approval from the host government. The government is responsible to determine the national criteria for project approval (Figueres and Gowan, 2002). The criteria should comply with the requirements defined by COP/MOP, and also meet the national requisites and priorities for sustainable development. A pro-active government National Authority for CDM can facilitate this (see Section 4.3 p: 61-63 for detail).

Validation and Registration

Before projects are registered, they must obtain validation report from one of operational entities, independent companies accredited by the CDM Executive Board and designated by the COP/MOP. These operational entities will be current private companies such as auditing, accounting, consulting, and law firms that are capable of conducting credible independent assessment of emission reduction/carbon removal[1]. The validation process includes:

- scrutiny of the institutional capacity of project stakeholders
- analysis of the environmental impacts
- the evidence underlying the emissions reduction will ensure as a result of the project
- methodologies to be used for baseline and monitoring
- written confirmation by the host country that the project meets sustainable development and
- the government written approval.

During this period, Project Design Document will be made publicly available for comments and the comments should be received within 30 days. After this time, comments are taken into consideration, and the Operational Entity will make a decision whether to validate the project. Once validated, the validating report, as well as the Project Design Documents, will be submitted by the operational entity to the CDM Executive Board for approval. Registration is final 8 weeks after the CDM Executive Board receives the validated document, unless a review is requested by a party or two members of CDM Executive Board (for a period of 6 months).

[1] Operational entities can perform only one function in the cycle of any given CDM project either validation/registration or verification/certification. Participation in both auditing steps would be a clear conflict of interest and is not allowed.

Project Implementation and Monitoring

Project Developers are responsible for implementing the project as written in the agreement between parties involved. Once a project is implemented, emissions reduction or carbon removals must be monitored in accordance with the protocol prescribed in the Project Design Document. The monitoring plan should clearly identify responsibility and authority for registration, frequency of monitoring and measurement activities, and should determine the verification schedule for claimed carbon emission reduction or removal. The monitoring plan should give enough information to satisfy the needs of future verifiers. This plan can be developed either internally by project developer or externally by a specialized agent.

The monitoring plan also has to follow an internationally recognized monitoring methodology or propose a methodology for approval by the Executive Board and provide for the collection of data necessary for estimating the baseline as well as the emissions within the project boundary. It should identify and measure all potential source of leakage (see Section 2.2.6). Thus, the plan should establish quality assurance and control procedures and include training requirements to support the proposed monitoring plan. The plan can be executed by the project implementer and should be an integral part of project's tracking system.

Verification and Certification

Verification and certification are necessary in enhancing the credibility of the CDM Monitoring is done by project implementers, which includes review of baseline condition, as well as other activities set in rules/guidelines for monitoring and verification. Monitoring reports must be forwarded to the designated Operational Entity so that the emissions reductions can be verified and (Certified Emissions Reductions) CERs issued.

The Designated Operational Entity will periodically review the monitoring reports associated with the project to ensure that greenhouse gas measurement is performed in a prudent manner, and that emissions reductions are being realized. The analysis may conduct on-site inspections, speak with project participants and local stakeholders, and collect its own data. Once the project meets the requirements of verification, it will issue a written confirmation of verification for the project activity. The verification report will be submitted to the Executive Board and project participants, and will be made publicly available. Based on the verification report the Certified Emission Reduction will be issued to the project developer within 15 days, unless the CDM Executive Board requests a review.

2.2. Technical Issues that Remain to be Resolved

International concern over the inclusion of LULUCF projects in the CDM related to some unique issues that risk the environmental integrity of the emission reductions achieved. The critical question is whether one ton carbon removed from atmosphere and stored in the terrestrial biosphere will have the same climatic benefit as an equivalent reduction in emissions from fossil fuel combustion. In order to answer this, there are several technical and accounting issues such as permanence and duration, leakage and baseline/additionality that need to be resolved.

The modalities of the inclusion of the LULUCF under CDM remain to be determined. This includes determination of definitions, determination of accounting methodologies and the development of baseline methodologies. These issues were referred to the SBSTA for consideration and the development of recommendations for consideration at COP9. In doing so, SBSTA has been referred to decisions made at Marrakesh regarding accounting for LULUCF

under Articles 3.3 and 3.4 of the Protocol and work being undertaken by the International Panel on Climate Change (IPCC) on best practice accounting in the LULUCF sector countries.

2.2.1. Forest Definitions

COP7 did make progress by agreeing on the following definitions of forest for use in Annex I countries:

- Forest is land with a minimum area of 0.05 – 1 ha with tree crown cover of more than 10% – 30% with trees having a potential to reach 2–5 meters in-situ. It may be a closed or open formation. Young stands that are expected to meet the definition of forest in the future are included. For the purposes of accounting, each Annex I country is to choose a definition within these parameters. It is not clear if accounting for the CDM will offer similar flexibility
- Afforestation is direct human induced conversion of land that has not been forested for at least 50 years
- Reforestation is the direct human induced conversion of non-forested land to forest. For the first commitment period reforestation activities will be limited to those areas that were not forested on 31 December 1989.

These definitions were adopted after a long and at times acrimonious debate amongst technical experts and policy makers. The flexibility allowed in the definition reflects the varied definitions of forests adopted on a national basis and on which the data sets required to account for carbon stocks in forests were based. The process of determining forest definitions for the CDM is proving to be as difficult - to date SBSTA has been unable to agree on definitions of LULUCF. At SBSTA 16 in July 2001 it was proposed that the Article 3.3 definitions of afforestation and reforestation be adopted. However, Canada proposed different definitions, mainly relating to the use of 2000 instead of 1990 as a baseline year for afforestation and reforestation under the CDM. SBSTA was unable to agree on definitions and deferred the matter to SBSTA 17 in October 2002.

The definition of forest has substantial implications for LULUCF CDM projects in tropical countries, where forest succession is very different from the mainly temperate and sub-tropical developed countries and the quality of data is much lower. These are further discussed in relation to Indonesia in Chapter 4 and 5 of the Technical Report.

2.2.2. Additionality

It is a requirement of the CDM that any emission reductions or sequestration resulting from a project is additional to any that would occur without the project. This concept is called ‘additionality’ and it is determined by comparing the carbon stocks associated with the project activities with those that would have occurred without the project. The ‘without project’ scenario is also called the ‘baseline’.

For carbon credits to be acceptable under the terms of the Kyoto Protocol, no project can claim GHG emission reductions unless project proponents can reasonably demonstrate that the project’s practices are ‘additional’ to the ‘business-as-usual’ or baseline scenario. Baseline scenarios are necessarily counter factual, based on a range of assumptions on economic, social, financial, regulatory and political circumstances within which a particular project is implemented and will operate.

There are a number of ways in which additionality can be assessed:

- ***GHG or emissions additionality*** – which refers to the actual difference between the project's emissions or sequestration profile and that of the baseline scenario. It is imperative that the GHG profile of the project positively differs from that of the baseline.
- ***Program additionality*** **–** requires a project to demonstrate that its emission reductions are additional to what is required by law and government policy initiatives.
- ***Investment additionality*** – if a project has an acceptable risk/return profile to an investor it would have proceeded without the CDM. Financial additionality requires demonstration that low returns, unacceptable risk or other barriers would have prevented project development in the absence of the CDM .
- ***Financial additionality*** – funding for the implementation of CDM projects must not be provided by developmental and environmental assistance funds. It is likely, though, that projects may be able to receive developmental funds for activities not related to the implementation of the project, such as capacity building, training, or feasibility studies.

GHG additionality is the only form of additionality that is specifically required by the Protocol. However, it is likely that the CDM Executive Board and host countries will require Investment, financial and policy additionality to be demonstrated before approving a CDM project.

2.2.3. Baseline Methodology

The determination of baselines is critical to the environmental integrity of project based activities. However, standard methodologies for determining the baseline scenario have yet to be developed, but a number of different approaches have been used to date:

- ***Project specific versus generic*** **–** Baselines can be developed as a case-by-case project specific exercise, or based on generic data aggregated in a "top-down" approach. Baselines could therefore be developed by project proponents or by independent bodies (regional, national or international institutions).
- ***Fixed or adjustable*** **–** Should baselines established at the start of the project be maintained for the project's lifetime or be periodically adjusted?
- ***Simple or complex models*** **–** Should baselines be derived by simple extrapolation of past trends in the use of land, or should they be derived from models that attempt to simulate the driving forces of change? The baseline can also be described as static or dynamic (Ellis and Bosi, 1999), depending on whether the data is fixed at the start of the project and not assumed to change over time, or whether the baseline is assumed to vary with time, depending on the variables taken into account when establishing the baseline scenario.

Until the modalities for the inclusion of the LULUCF Sector in the CDM has been finalized, there will be ongoing difficulties with the preparation of baselines. However, the approach that has been adopted for other sectors provides an indication as to how baselines for LULUCF projects might be treated. While the precise approach of baseline determination is yet to be finalized, a prescriptive approach is not to be followed. A decision tree that will guide project proponents on the key issues to be considered in the development and evaluation of baselines is to be constructed. Work on this is progressing, delayed by the need for the Executive Board to clarify a number of definitional issues.

This approach suggests that project proponents should adopt baseline approaches that are conservative and are based on best practice in advance of the finalization for methodologies for the inclusion of LULUCF in the CDM.

2.2.4. System or Project Boundaries

System or project boundary chosen for a project is also an important issue because this will affect the baseline and project carbon flows for a given project. However, until now there is no international guidance on where exactly the boundary should be set (Ellis, 1999). On the other hand, it is difficult to generalize as many of the existing project case studies only provide sector-specific guidance. For example, as a practical rule existing studies considered that direct emissions as well as indirect emissions from electricity generation should be included in the project boundary. Other indirect emissions, such as transport related emissions, might be either included or excluded (Willems, 2000). In LULUCF projects, a project could be viewed as an isolated project or it can be viewed as an integral part of a larger system (Chomitz, 2000). For example, consider a project that sequesters carbon by restoring a degraded forest ecosystem, but neither produces saleable timber nor displaces agricultural production. Sequestration on this site therefore does not appreciably interact with the rest of the economic system, and can be considered in isolation. Other projects may not be so clear-cut, for example the case of some forest protection projects, and might not be wise if it is viewed in isolation. There are two concerns, namely the establishment of the baseline deforestation rate and the potential for leakage. Both of these issues are closely linked to the project boundary and the data that has been incorporated into the analysis. In such a case, the boundary for analysis of the carbon flows might be a different one from actual project implementation.

This is particularly true for baselines, where it has been suggested that baselines can be established at a number of different levels, thus influencing the boundary of analysis. Estimation of baselines could be carried out at the national level, sectoral level and project or technology level. These three approaches have been described in many papers (*e.g.* Michaelowa and Fages, 1999; Ellis and Bosi, 1999; Puhl, 1998). At the national level, the baseline is commonly called a top-down baselines (Puhl, 1998). These top-down baselines are highly aggregated and should reflect national government objectives, targets and policies. These baselines could be used to assess emission reductions or carbon stock increment resulting from policy initiatives (*e.g.* Puhl *et al*., 1998). At a sectoral level, the baseline carbon emission or removal are developed from a set of activities (multi-projects). Potential CDM or JI projects would be measured against these aggregate baselines to see whether or not they are eligible for emission credits. In the energy and industry sectors, these baselines would probably be based on emission rate (tC per unit outputs, *e.g.* tC/GWh). At project level, the baselines are developed to evaluate emission reduction generated from one particular project. However, it is not clear how all the baseline methodologies described here could be applied to the land use sector, because ultimately the analysis for the project flows will be based on a defined geographical area where the project will take place.

Given that an international agreed rule on project boundaries is not available, the project developer needs to specify the boundary before project implementation. Understanding the dynamics of land use in the project location is important in setting up this boundary. Given that the activities that are eligible for the CDM for the first commitment period are limited to afforestation and reforestation the project boundary could be limited to area due to be planted (or naturally regenerated).

2.2.5. Establishing Baselines

Most projects to date have adopted a two-step approach to determining baselines. First, the likely fate of terrestrial ecosystems within the project boundary is predicted. Second, the changes in carbon stocks that would occur as a result of this scenario are estimated. The following techniques have been used to predict likely outcomes:

- ***Simple logical arguments*** – that do not use quantitative methods for predicting changes in current trends (or use simple ones). This approach can be defined as rational baseline.
- ***Use of spatial or social-economic models*** – that simulate land use change processes based on factors such as proximity of towns, roads and agricultural frontiers, population growth, food requirements and the productivity of local agricultural technology (Brown *et al*., 1999).
- ***Utilization of econometric models*** - that give an econometric treatment to data factors such as historical series of productivity, price, costs, etc. As far as we are aware, this approach has not been used in the pilot phases of carbon projects, but it has been discussed in a few publications (*e.g.* Chomitz and Gray, 1995).

Simple logical arguments are not necessarily less accurate, in terms of predictive ability and these may well be appropriate given the restriction, for the first commitment period, to afforestation and reforestation. More complex approaches are also more data intensive and their application might proven difficult in developing countries where data on the LULUCF sector is often incomplete.

The estimation of the projection could be done either using data generated by models, historical data or data based on strategic planning that has already been established by the project host in the absence of the CDM project (see Section 2.2.3). However, the fact that different sources of information can be used to establish the baseline scenario, makes the exercise difficult and may result in a range of carbon offset estimations. This is not unique to land use projects, but is a problem for all project based analyses of carbon benefits.

2.2.6. Leakage

Leakage can be defined as the unanticipated loss or gain of net greenhouse gas benefits beyond a project-accounting boundary (Brown *et al*., 1997; Makundi, 2000). Leakage can occur on a geographical basis (beyond project boundaries) or a temporal basis (beyond the crediting or monitoring period of a project) while leakage often refers to the negative impacts of a project, it can also be a positive GHG effect (Michaelowa, 1999) referred to as 'positive leakage' or 'spillover'.

The main processes that lead to leakage or spillover are (Makundi, 2000; IPCC, 2000):

- ***Activity displacement*** – for example, when a forest conservation measure forces those initially engaged in deforestation in the target area to move and conduct their deforesting activities elsewhere.
- ***Activity intensification*** – for example, increasing the amount of biomass extraction per hectare in response to limitations on logging intensity in new concessions.
- ***Demand and/or supply displacement*** – for example, if a certification policy reduces the demand of tropical logs but they are replaced by softwood logs or high GHG intensity substitutes like concrete.
- ***Investment crowding-out*** – for example, when a project drains resources from other investments that have significant GHG impacts.

Although the methodologies for dealing with leakage are still undecided, the various studies that have been carried out, have come up with a number of general measures that can be taken by the project to curb leakage. Most importantly, good project design should reduce the risk of certain types of leakage (primary or shifting activity), although more specific examples include:

- Multiple component large projects for which leakage from one component is captured in another component of the same project *e.g.* wide area integrated projects (*e.g.* Costa Rica PAP, Guatemalan CARE etc).
- Binding agreements with involved parties not to engage in GHG emitting replacement activity.
- Engaging and encouraging the parties to get involved in GHG being income generating activities such as harvesting NTFPs.
- Overall participation of local peoples in the design of project activities,
- Extension activities to increase demonstration effect in cases of introduction of new and more environmentally sound practices.

The costs of such measures should be counted under the project, and there is also an argument for including at least a portion of the GHG spillover (*e.g.* demonstration effect) as credit to the project, depending on the assumptions underlying the baseline scenario (Makundi, 2000).

2.2.7. The Permanence and Accounting of LULUCF Credits

One of the main concerns relating to the use of biological sinks as a greenhouse gas (GHG) mitigation option is the question of 'permanence', the length of time for which carbon will remain stored after having been fixed in vegetation. In reality, the concern is about the possible loss of carbon stocks created or conserved by a project, whether on purpose (*e.g.* timber harvests) or as a result of undesirable events (*e.g.* natural disasters). The possible reversal of sequestration, however, does not need to be seen as an insurmountable obstacle. Carbon accounting methodologies have been devised especially for sinks projects, taking into account the differences from other types of emission reduction projects.

The treatment of permanence influences and is influenced by the choice of carbon accounting methodologies, the timeframes chosen for carbon accounting, and the approach chosen for dealing with liabilities (*i.e.* the need to return or replace carbon credits if carbon is released to the atmosphere).

There are several views on timelines for the analysis of greenhouse gas benefits (Watson *et a.l,* 2000):

- The environmental benefits of projects must be maintained forever (Perpetuity). This argument is based on the assumption that only maintenance of carbon stocks in perpetuity could counter the environmental effects of GHG emissions from fossil fuel sources. However this approach has been criticized since it is not possible to guarantee that a project will be run in perpetuity; that maintenance of projects in perpetuity may create conflicts with other land uses in the long term; and that because of the decay pattern of GHGs in the atmosphere, there is no need for mitigation effects to be perpetual.
- The GHG benefits of a project must be maintained for a period of 100 years to be consistent with the Kyoto Protocol's adoption of the IPCC's GWPs and the Protocol's 100-year reference time frame for calculation of the AGWP for CO_2.

- The GHG benefits of LULUCF mitigation projects must be maintained until they counteract the effect of an equivalent amount of GHGs emitted to the atmosphere (equivalent basis), estimated on the basis of the cumulative radiative forcing effect of a pulse emission of CO_2 during its residence in the atmosphere (*i.e.*, its AGWP). Variations of this concept have been developed that proposed minimum time frames of 55 years (Moura Costa and Wilson, 2000) or 100 years (Fearnside *et al.,* 2000).
- Different projects may have different operational time frames. Proposals for variable timeframes have been combined with liabilities to propose the use of temporary carbon credits for land use projects in the CDM.

2.2.8. Accounting Methodologies

Various approaches to account for carbon sequestration in land use and forestry projects have been proposed to account for carbon fluxes over time. These methods vary in their theoretical frameworks, some based on absolute measurements at a point in time while the others adopt into the accounting the two dimensional measurement unit reflecting both carbon storage and time. As a result, the application of different accounting approaches to a single project can produce vastly different crediting and financial outcomes.

a) Stock Change Method (SCM)

The method most commonly used for expressing carbon storage is based on calculating the difference in carbon stocks between a project and its baseline at any given point in time (the *Stock Change Method)*. It provides projects with credits as carbon is fixed, and credits are returned when carbon is released back to the atmosphere, irrespective of the period of storage.

The use of the Stock Change Method (SCM) for CDM projects may not be appropriate given that it will involve frequent exchanges of credit and debt of carbon between project developers and buyers or regulatory bodies (Moura Costa, 2002). This creates complexity and increases transaction cost, and should be taken into consideration when deciding on an appropriate accounting methodology.

b) Average Storage Method (ASM)

In this method, credits are issued (annually) in line with increases in stocks up to the level of the predicted average storage capacity. The averaging process balances further increases in stock against predicted decreases in stock and so compensates for the re-emission of credits due to planned management activities (Phillips, 2002). This method requires the definition of a period of time over which carbon stock must be averaged. During the period, it needs to be guaranteed that trees will be replanted after any harvest or destruction not previously anticipated.

There is an interaction between the periods used for averaging the sock changes and project period that affects the attractiveness of projects. The following outcomes can occur:

- The use of an averaging period the same as project length will delay crediting if the majority of sequestration occurs early in the project life and bring it forward if the majority of sequestration occurs late. This will affect the financial returns – discounting will reduce the value of any delayed crediting and increase the value of any crediting bought forward.
- The use of an averaging period longer then crediting period will result in crediting occurring at a lower rate than actual stock change. This will result in not all actual stock

change being credited during the crediting period. This may act as a substantial disincentive to investment in project

- The use of an averaging period shorter than the crediting period will bring forward credits and allow more credits to be accumulated than actual sequestration. As a result, the averaging period should never be shorter than the crediting period.

c) Ton Year Method (TYM)

Alternative approaches have been proposed to better address the risk of future reversal of storage. Most of these are based on adopting a two-dimensional measurement unit that reflects both carbon storage and time. The general concept of the ton-year approach is in the application of a factor to convert the climatic effect of temporal carbon storage to an equivalent amount of avoided emissions (this factor is referred to as the equivalence period). This factor is derived from the length of time that CO_2 must be stored as carbon biomass or soil for it to prevent the cumulative radiative forcing effect exerted by a similar amount of CO_2 during its residence in the atmosphere (Moura Costa, 2002).

In essence, it defines the amount of time that carbon must be maintained in the atmosphere to be equivalent to a ton of avoided emission, and allows the sale of a partial credit each year the carbon remains stored. In its simplest form it would allow the sale of one fiftieth of a credit each year a ton of carbon is stored if the equivalence period was 50 years.

If an equivalence factor ton-year approach is used, carbon storage could be credited according to the time frame over which storage takes place. Such a crediting system would reduce the need for long-term guarantees and hence the risks associated with long time frames. The Ton Year Method (TYM) addresses completely the permanence issue. However, this method requires the definition of an equivalence factor, which can be complicated. It also only provides a small number of annual credits throughout the project lifetime, and it may perform very poorly when subjected to conventional financial discounting analysis (Phillips, 2002).

A ton year credit is permanent, so could be sold in the market place at an appropriate fraction of the price of a permanent credit. In reality, it could be expected that the credits would be bundled to provide a full ton of CO_2 in the market. However, there is a temporal effect with ton year credit pricing. Carbon sequestered in any particular year will continue to get credited over the equivalence period providing it is not emitted. The price of this "tail" of ton year credits will depend on the price of a full credit in any particular year. If there are real increases in credit prices over time, the non discounted value of the stream of 50 ton year credits created by sequestering 1 ton of CO_2 will exceed that of an AAU at the time of sequestration. In contrast, declines in real credit prices would lead to the stream of 50 ton year credits having a lower value that an AAU at the time of sequestration.

d) Liabilities and the Temporary Certified Emission Reduction (TCER)

As noted earlier, it is unrealistic to accept that all land use projects will result in the perpetual storage of carbon, especially given the need for flexible land use systems in many countries. The proposal for temporary crediting allows this by making CERs generated from sink projects valid for a certain period. If the carbon remains sequestered at the end of that period the credit is renewed. If the carbon has been released, the credit cannot be renewed and the holder of the TCER would have to source an alternative credit elsewhere. It has also been referred to as carbon leasing, as the purchaser only gets the use of the asset for a defined period of time.

This approach will allow the host country to use project land for other uses after termination of the project. In addition, it allows short rotation projects that do not tie up the land for long periods, and brings flexibility to the market by offering emitters the choice of renting emission reductions, and accounts for re-emission of credited carbon at the time of re-emissions (Phillips, 2002).

Pricing a temporary credit is subject to a number of variables. The value that a purchaser is willing to pay will depend on the period of the TCER and the expectations about the price of replacement credits at the expiry of the TCER. The price that the supplier is willing to sell at will depend on the cost producing the TCER (including transaction costs) and the length of the TCER (including renewals). This makes it difficult to analyze the financial impacts of temporary crediting.

The use of the Stock Change Method (SCM) for CDM projects may not be appropriate given that it will involve frequent exchanges of credit and debt of carbon between project developers and buyers or regulatory bodies (Moura Costa, 2002). This creates complexity and increases transaction cost, and should be taken into consideration when deciding on an appropriate accounting methodology.

The Ton Year Method (TYM) addresses completely the permanence issue. However, this method requires the definition of an equivalence factor, which can be complicated. It also only provides a small number of annual credits throughout the project lifetime, and it may perform very poorly when subjected to convention discounting analysis (Phillips, 2002). The Average Storage Method (ASM) also requires the definition of a period of time over which carbon stock must be averaged. During the period, it needs to be guaranteed that trees will be replanted after any harvest or destruction not previously anticipated. If the host of the CDM project could not meet this (project ends before end of the period, *e.g.* 100 years), it should pay the penalties. For the Indonesian context, the use of $TCER_5$ for LULUCF would be the best solution. This approach will allow the host country to use project land for other uses after termination of the project. In addition, it allows short rotation projects that do not tie up the land for long periods, and brings flexibility to the market by offering emitters the choice of renting emission reductions, and accounts for re-emission of credited carbon at the time of re-emissions (Phillips, 2002).

2.2.9. Crediting Period

The period over which credit is given to LULUCF projects is a key issue in the attractiveness of the sector. The crediting period adopted at COP7 in Marrakesh does not appear to take account of the long-term nature of many LULUCF projects that may produce carbon benefits for a period of 60 years or more, and would lead to a preference for projects with the most rapid early sequestration potential such as short rotation plantations. The decision to limit the crediting period to a maximum of 21 years reflects both the investment time horizon of energy projects and concerns that the implementation of new technologies causes the business as usual emissions to grow more slowly than is currently projected. Contrast this to the LULUCF sector, where investment horizons may be 40 years and forecasts are for the rate of emissions increase to grow.

There are a series of complex relationships between the crediting period and the accounting approach adopted that lead to different carbon crediting and financial outcomes for a single project. The factors influencing the outcomes include:

- The nature of the carbon fluxes of the project over time, particularly any emissions
- The actual project life

- The accounting method used and how it takes account of potential emissions from the project (permanence).

The preferred accounting methodology and crediting period will vary from project to project. As a result, it is difficult to draw conclusions about the preferred accounting approach and crediting period for a project. The interaction between these factors will make different crediting periods more attractive on a project by project basis. There may also be a preference for different crediting periods on an environmental and financial perspective (Watson *et al* 2000). Box 1 shows how the outcomes of the application of different accounting approaches can vary depending on the carbon stock flows of the project.

The crediting period could be applied on the following basis (Philips *et al* 2002):

- Perpetual crediting, where the project will be credited and liable for emissions in perpetuity.
- Crediting for an Arbitrary Period. This is the approach that has been adopted for use in the Marrakesh Accords. The key issue is the length of the period. This is important, as the crediting period and the accounting methodology applied will determine the number of CERs accumulated and the rate at which it occurs over time, in turn affecting the attractiveness of different project types. Options for arbitrary periods include: 100 years to be consistent with the timeframe used for the calculation of Global Warming potentials by the IPCC
- An equivalence factor, based on the radiative forcing effect of a ton of CO_2 during its lifetime in the atmosphere
- Another arbitrary period such as 50 years
- The Marrakesh outcomes the same as for non-LULUCF projects
- Crediting for actual project life.

Perpetual crediting would be most appropriate if a stock change accounting approach is adopted with a permanent liability for carbon storage. This approach is consistent with Annex I stock change accounting, however, there are practical difficulties in ensuring a project runs in perpetuity and there is the potential for long-term land user conflicts to be created (Watson *et al* 2000).

If Average stock Accounting is used there is an interaction between the periods used for averaging the sock changes and project period that affects the attractiveness of projects. The following outcomes can occur:

- The use of an averaging period the same as project length will delay crediting if the majority of sequestration occurs early in the project life and bring it forward if the majority of sequestration occurs late. This will affect the financial returns – discounting will reduce the value of any delayed crediting and increase the value of any crediting bought forward
- The use of an averaging period longer then crediting period will result in crediting occurring at a lower rate than actual stock change. This will result in not all actual stock change being credited during the crediting period. This may act as a substantial disincentive to investment in project
- The use of an averaging period shorter than the crediting period will bring forward credits and allow more credits to be accumulated than actual sequestration. As a result, the averaging period should never be shorter than the crediting period.

No mater what the accounting approach used, if the crediting period is shorter than the project life, all the sequestration that occurs after the crediting period will not be available. This will reduce potential carbon revenues from a project.

A simple and practical approach would be to set the crediting period and averaging period (if applicable) at project life. However, this would require long crediting periods to be applied to some projects. The approach adopted at COP7 could also be adopted, with an option of either a fixed period of crediting or the option of a longer crediting period with regular baseline reviews. In the Marrakesh Accord, it was stated that CDM projects will be eligible for either a ten-year period, or for a seven-year period with up to two further seven-year extensions following review of the project baselines

Box 1. Impact of the application of different accounting approaches and crediting periods

Phillips (2002) evaluated the financial implications of applying the following accounting approaches on two hypothetical project types:

- Stock Change Method (SCM), in which credit and debits are given as carbon fluxes from the project occur.
- Average Storage Method (ASM), under which credits are given in line with annual stock changes up to the level of predicted average storage capacity. No further credits are given after this time in view of future planned emissions.
- Ton Year Method (TYM) in which credits are given annually for increases in the carbon stored multiplied by an equivalence factor
- Temporary CERs (TCERs), where a temporary 1 year credit is given for carbon stored, renewable annually while the carbon remains sequestered

The two projects modeled were ($2.72 per t CO_2, 10% discount rate):

- A plantation project consisting of four 20 year rotations, with a thinning cut taking place at year 10. The forest is not harvested at the conclusion of the project leaving the standing forest intact.
- The establishment of a natural forest to provide non timber benefits. Carbon sequestration is assumed to be linear until the stand reaches maturity at year 80. For the remaining 20 years of the project carbon stocks remain constant.

Table B.1 indicates the impact on the NPV per hectare for the projects under the accounting regimes. As can be seen, the NPV changes dramatically according to the project type, crediting period and choice of accounting approach. Other analysis (Moura Costa 2001) using different project types and average accounting methods (but the same carbon prices and discount rates) has noted that TCER can be financially attractive. This highlights the project by project sensitivity to the accounting method and crediting period used.

Table B.1. Impact of different accounting regimes on the NPV per hectare

Project type	Crediting period	Net Present Value		TCER * (Annual price)
		ASC	CTY	
Plantation	One 25 year rotation	$181	$270	$0.44 t/$CO_2$
	Four 25 year rotation	$200	$765	$1.13 t/$CO_2$
Natural Forest	100 years (no harvesting)	$118	$495	$1.23 t/$CO_2$

* Given the uncertainty over pricing a rented commodity the analysis defined the price at hich an NPV equal to that of the ASC was achieved. Source: Phillips (2002)

2.3. Risks for CDM Project

Risk is unavoidable element of any project development activity. It is the result of uncertainty in the outcomes of the project, from a financial, environmental and social perspective. This uncertainty may discourage project participants from becoming involved, as they cannot predict the level of benefits and associated costs that the project will deliver.

The assessment and mitigation of risk is a major element of project development. The views perception of risk and appetite form risk will vary according to the project participants:

- Governments may place a strong emphasis on the risk associated with the social and environmental outcomes of a project
- Commercial investors are likely to place a high priority on financial risks
- Local communities are most likely to be concerned about risks to social and to environmental outcomes
- A Operational Entity might place a high priority on the risk associated with carbon sequestration.

Many of these risks are related. The financial failure of a project will obviously affect upon the delivery of social and environmental outcomes. Likewise high environmental and social risks may affect the operational and financial success of the project.

It is also difficult to generalize about the risks level that different project types might present. The risks to a particular project are high dependant on the individual operating environment and the risks mitigation undertaken by project developers. As a result, it can be highly misleading to generalize about risk across project types. However, it is true to say that some project types are more likely to be subject to some risks than others.

The risks that accrue in CDM projects can categorized as coming from four sources:

- Policy risks are risks that emerge due to uncertainty in Kyoto process or change in national policies, etc
- Sovereign risks emerge due to change in macro-economic conditions, appropriation of assets, lack of clear legal and business infrastructure. They are country specific, and occur for all FDI
- Market risks are risks that come out due to immature market status and ranges of transaction structure of carbon assets.
- Project risks are all types of factors either technical or non-technical that causing failure of project or under performance.

There are many techniques that can used to mitigate the risks (Table 2.2). While most risks are most effectively mitigated at the project level, some risks can be assumed by governments individually or collectively. This provides a more certain environment for project developers, decreasing the risk premium that they apply to projects. However, it is unlikely that governments would accept risks that might force them to assume large potential liabilities or lead to the environmental integrity of the Protocol being questioned. These are more appropriately dealt with at the project level.

Table 2.2. Type of risks and approach to mitigate the risks

Type Risk	Mitigation		
	International	National	Project
1. Policy Risks			
Protocol doesn't come into force	-	-	Carbon sale contracts have force major
Changes in UNFCC/Kyoto Protocol	No retrospectively	-	Anticipates changes in project design
Eligibility activity	No retrospectively	-	Carbon sale contracts have force major
Indonesia not ratify	-	-	Carbon sale contracts have force major
Changes in national CDM policy	-	No retrospectively Build broad political and social support	Anticipates changes in project design Carbon sale contracts have force major
Conflict in domestic and intergovernmental policy	-	Seek to reduce conflict and policy	-
2. Sovereign Risks			
Macro economic	-	Sound macro economic policy	Apply financial risk management techniques Realistic economic assumption in project plan
Asset appropriation	-	-	Insurance
Legal/business certainty	-	Improve framework	Due diligence
3. Market Risks			
Immature market development	Develop market framework Capacity building	Capacity building	Flexibility in market arrangement
Future price risk (temporary crediting)	-	-	Apply financial risk management technique
Development non-Kyoto market	Promote consistency		Flexibility in arrangement
4. Project Risks			
Technical risk (Fire, pest and diseases etc)	-	-	Good project design Certainty boundary project Parallel accounting Buffering
Project underperformance	-	-	Good project design Buffering
Loss community support			Good project design Benefit sharing
Land tenure	-	Clarify land tenure arrangement	Good contract Due diligence

2.4. Carbon Market

2.4.1. International Carbon Market

The energy component of the NSS used the Pelangi Emissions Trading (PET) model to project the carbon market under a set of different assumptions. The model is a static supply/demand model that calculates the trade of emission permits based on the required emission reductions in Annex B countries and the relative costs of abatement in Annex B and developing countries in any given year.

The model is purely financial. It does not attempt to quantify any external impacts on commodity markets or investment levels, nor does it include additional environmental or social benefits or costs that might arise as a result of the implementation of emissions trading. As a static model, it does not account for temporal impacts, such as the ability to bank CDM credits from the current time, the provision for credits to be banked for future commitment periods or the ability to average emissions out over the first commitment period.

The key assumptions made in the modeling included:

- Conditions of a perfect market apply. As discussed previously, information asymmetries and other factors are likely to mean that this assumption does not hold, and the output from the model should be treated with caution as a result
- All the flexibility mechanisms will be homogeneous. While this may apply to CER's generated from energy projects, proposals for temporary crediting of LULUCF generated CERs would mean that this assumption would no longer be valid
- Emissions and emission reductions are based on CO_2 emissions from combustion only. It has been suggested that other greenhouse gases offer substantial low cost mitigation options and their exclusion from modelling results in an overstatement of compliance costs and permit prices (Babiker *et al.*, 2002). As a result, permit prices may be overstated
- Transaction costs were set at US$ 0.82 tCO_2 for the CDM, US$ 0.55 tCO_2 for JI and US$ 0.27 t CO_2 for emissions trading
- The adaptation levy is set at 2%. This is the figure adopted at COP7
- The emission data and MAC data is taken from the US Department of Energy projections, including the business as usual projections for 2010. Marginal Abatement costs in Annex B countries calibrated against the World Banks CERT model, and the MIT's EPPA model
- The model also includes data on gas flaring in developing countries
- Allows for the inclusion of limited no-regrets options in developing countries.

The energy component of the NSS modeled a standard scenario, and then tested the sensitivity of this to changes in key assumptions regarding market conditions. The standard scenario made the following assumptions:

- The US was participating in the Protocol
- No regrets options in the CDM were set at 1.5%
- Gas flaring was included, with up to 40% of most recent emissions through gas flaring included in the CDM at a price of US$ 1.50 per ton CO_2.

Table 2.3 shows the modelled outcome for the base case and the following scenarios:

- Changing transaction costs and abatement costs by doubling the transaction costs associated with the CDM, and halving the Annex B marginal abatement costs. The

relative inelasticity of demand allows most of the increased transaction costs to be passed on to buyers, resulting in an increase in overall CDM revenue. Lowering Annex B marginal abatement costs increases domestic compliance actions, lowering CDM volume and permit prices.

- Changing the percentage of no regret actions in the CDM. The more no-regrets actions that are included in the CDM the greater the volumes. However permit prices drop to reflect decreased costs and CDM revenue declines.
- Some preliminary modeling was done to assess the impact of including sinks. It was assumed that up to 150 Mt of CO_2e would be available from sinks at a total cost of US$ 1 per ton (including transaction costs). It was also assumed that this would be distributed according to the potential for countries to store carbon in plantations to the year 2010. Including sinks on this basis caused prices to fall and CDM volumes to rise, but there was a decrease in overall revenue.

The impact of US withdrawal from the protocol was also modeled. If the US did not participate, the total required emission reductions required falls from 3,062 to 1,100 Mt CO_2 per year. Given that there is potentially 1,166 Mt CO_2 available from hot air, it is possible for all the required emission reductions to be met without any domestic action or CDM sales.

The market projections in the energy component are broadly consistent with the projections of other market models, although tend to be at the lower end of price and volume expectations. In a review of 10 different studies on the international emissions market, Vrolijk (2000) reported permit price estimations ranged from US$ 1.75 to US$ 10 and CDM volume from 378 to 2948 Mt CO_2 per year. The lower results produced by the PET model can be attributed to the inclusion of no-regrets and gas flaring options in the PET model and the relatively higher estimates of hot air than some other models have used. It is also consistent with the overall trend for estimates of permit prices to decline over time.

Table 2.3. Outcomes of Market Modeling in the Energy Component of the NSS

	Standard (Unmodified PET Model)	Changes in MAC/transaction costs			No Regrets		Sinks included	Hot air excluded
		High Transaction costs	Low Annex B cost	Both	None	3%		
CER Sales (m/tCO_2)	1184	1034	1012	807	1067	1302	1235	1925
Permit Price (US$)	1.83	2.39	1.52	2.04	2.27	1.44	1.65	3.56
CDM share in meeting targets	38.7 %	33.8	33.0	26.3	24.8	42.5		
CDM revenue 2010 (US$ billion)	10.6	12.1	7.5	8.1	11.9	9.2	10.0	33.6
Indonesia's CDM revenue (US$ million)	224	271	170	199				580
No regrets share of sales	28.3				0	51.7		

2.4.2. Post Marrakesh Market

The modeling done for the energy component of the NSS was completed before COP6 Bis in Bonn and COP7 in Marrakesh. There were significant changes to the Kyoto framework negotiated at these meetings, and there is a need to update the PET model to reflect these. In addition, it was confirmed that the US would not ratify the Protocol post Bonn. From a market modeling perspective the most significant of these changes are:

- Removal of any quantitative cap on emissions trading, with the result the post-Bonn greenhouse gas market is now guided by a qualitative approach, which states that "domestic actions shall… constitute a significant element of the [greenhouse gas emissions reduction] effort" by each Annex I country;
- Fungibility of the three flexibility mechanisms;
- Annex I countries may chose to apply for sinks activities in their carbon accounting/crediting practices under Article 3.4 of the Kyoto Protocol, such as forest/cropland management, grazing land management and revegetation, but it is required that such activities are proven to be humanly-induced;
- Annex I Countries can claim credits from forest management activities to meet their emissions reduction commitments, but this is capped to country-specific limits, which were attached in Appendix Z to the Bonn Agreement which contain the assigned amount of parties included in Annex I resulting from forest management under Article 3.4, after the application Article 3.3 debit compensation implemented under Joint Implementation (JI) and resulting from forest management undertaken under Article 6.This has the effect of reducing developed country commitments by 180 Mt CO_2-eq per year;
- Afforestation and reforestation activities were included in the CDM, but Annex B parties are restricted to using LULUCF CER's to meet no more than 1% of their assigned amount, a total of 117 Mt of CO_2-eq per year with the US not participating;
- No caps have been place on the selling of Assigned Amounts. This means that the Russian federation and the Economies in transition are free to sell "hot air"; and
- A two percent levy will be placed on all CDM projects to serve as a funding mechanism to the Adaptation Fund.

However, both Bonn and Marrakesh Agreements have created a series of eligibility criteria and for participation in the flexibility mechanisms and also created a buffer to ensure that countries do not oversell assigned amounts. These measures include:

- The "commitment period reserve". This reserve prevents credit overselling, which may result in non-compliance. Annex B Parties are required to maintain at least 90 percent of their total Assigned Amount or 100 percent of five times the most recent GHG Inventory (whichever is the lowest)
- Countries agreed not to use nuclear facilities for the purpose of generating Joint Implementation-related ERUs and CDM-related CERs
- Parties in non-compliance with their emissions reduction and reporting obligations are required to set a compliance plan and will be temporarily suspended from using the Kyoto mechanisms until they restore compliance.

The changes outlined above and the US confirmation that it will not ratify the Kyoto Protocol has had a significant impact on the demand for emission offsets. The US withdrawal removed some 65% of potential demand. The inclusion of the provisions relating to the use of

forest management activities in the Marrakesh accords reduces demand by a further 49 Mt CO_2e per year after US withdrawal.

The impact of these changes has been modelled by several groups (Blanchard *et al.*, 2002, Jotzo and Michealowa, 2002; Babiker *et al.,* 2002). The findings are consistent, in that all studies project that the availability of "hot air" from Russia and the former Eastern European countries will largely or completely fulfil the emission reduction requirements of Annex B countries.

As a result, permit prices will be low – estimates range from transaction cost (in those studies where hot air is projected to exceed demand) to US$ 5 per ton of CO_2 (the EPAA model). Under these circumstances CDM market share is also projected to be low – from negligible in those models where hot air availability exceeds demand through to 30% of the market (290 MT CO_2 per year). This represents a substantial decline from the 1194 MT CO_2 per annum that was projected in base case used in the energy component of NSS.

A number of projections have also been made on the assumption the Russia and Ukraine will restrict the supply of "hot air" in order to maximise their own benefit. Jotzo and Michealowa (2002), using a version of the PET model, assumed that hot air sales would be limited to 400 Mt CO_2 per year (about 33% or that available). This leads to a permit price of US$ 0.90 per ton CO_2 and a CDM volume of around 297 Mt CO_2 per annum. Blanchard *et al.*, (2002) projected a permit price of US$ 4.64 and CDM volume of 161 Mt CO_2 with hot air sales restricted to 10%.

In both cases it is noted that the prices are at the lower end of estimates. However, it does clearly illustrate that the significant decline in demand as a result of US non-participation and relaxation of emission caps in the Marrakesh Accords has caused the projected permit price to fall, even if voluntary restrictions are placed on the sale of hot air. The availability of low cost hot air likewise causes a significant drop in projected CDM volumes.

From the perspective of LULUCF sector, most models assume that the full 1% of allowable sink projects will be filled on the basis that LULUCF projects offer low cost emission reduction options. This will have the effect of creating a separate market segment, in which LULUCF projects will compete to supply the 1% cap (32 Mt per year without the US participating).

2.4.3. Global Carbon Market with LULUCF Included

Both the decisions taken at COP7 in Marrakesh and the withdrawal of the US from the Kyoto Protocol act to significantly reduce demand for permits. The Marrakesh Accords effectively reduce the emission abatement targets of the Annex B countries by allowing carbon sequestered through forest management activities (up to the volume specified for each country in Appendix Z of the Bonn Agreement) to be accounted for as AAU's. The inclusion of the LULUCF sector in the CDM (albeit limited to 1% of 1990 Annex I emissions) also introduces a low cost mitigation option. The results of this are shown in Table 2.4. Purchase of "hot Air" becomes the major source of abatement after US withdrawal, mainly at the expense of Annex B abatement (Figure 2.2)

The contraction in market size is reflected in sharply declining credit prices and CDM volumes (down by 77% and 19% respectively). This combination results in a 67% fall in CDM revenues. The introduction of LULUCF into the CDM results in CDM composition changing as cheaper LULUCF CERs replace energy credits. LULUCF CERs are produced to the level of the 1% cap.

US withdrawal causes a further contraction in demand and credit prices to collapse. Credit price falls to just US$ 0.04 and CDM volume to 318 Mt CO_2 (mainly through contraction in the relatively expensive energy sector). Total CDM revenues are only US$ 8.8 M per year. The

LULUCF CDM volume is 52.1 Mt CO_2, again constrained by the 1% cap. Figure 2.2 also shows that US withdrawal leads to hot air dominating the emissions market.

Table 2.4. Impact of Marrakesh and US withdrawal on the carbon market

		Replicating the Energy NSS outcomes	Marrakesh outcomes with the US in	Marrakesh outcomes with the US out
Credit Price /tCO_2		1.87	0.76	0.03
CDM Quantity Mt (Mt CO_2)		1168.2	936.6	318.0
CDM Revenue US$ M		2186.2	707.9	8.8
Hot Air (Mt CO_2)		1169.7	1169.7	642.4
CDM Composition (Mt CO_2)	Energy	872.7	565.8	62.4
	LULUCF	0.0	101.2	52.1
	Gas flare	98.2	72.0	6.0
	No regrets	197.6	197.6	197.6

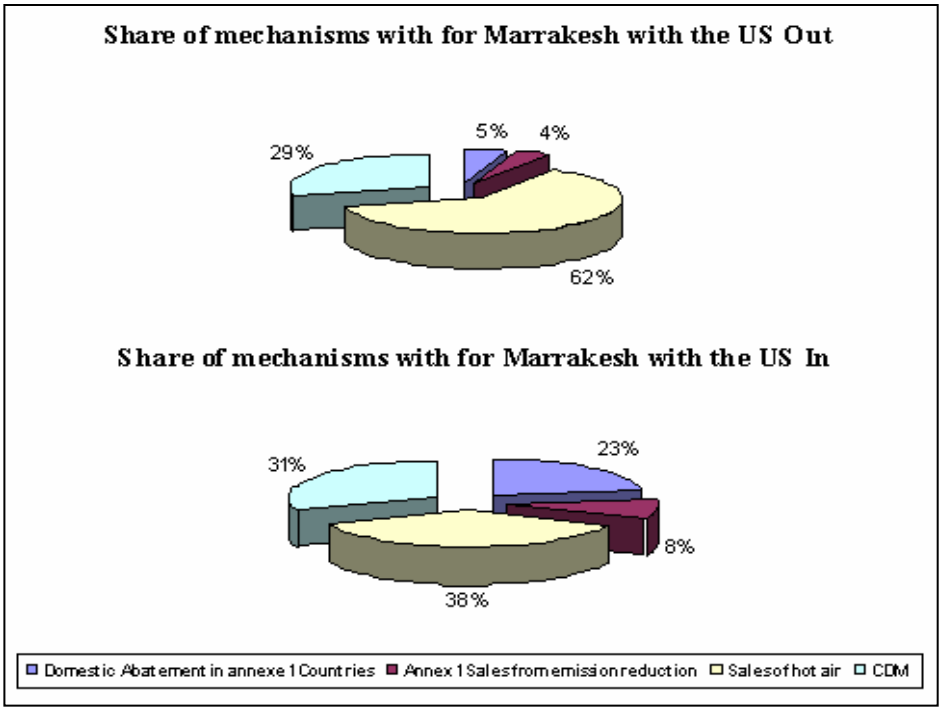

Figure 2.2. Flexibility mechanism share of the market for Marrakesh, US In and Out of the Kyoto Protocol

2.4.4. Global Carbon Market with Hot Air Restriction

The above analysis on the impact of the Marrakesh decisions and US withdrawal assumes that all hot air available from the former Soviet Union and Eastern European Countries will be available to the market. However, it is likely that these countries would restrict the availability of hot air in an attempt to drive up market prices rather than sell all hot air at very low prices. They may also wish to bank some of their excess AAU's for use in future commitment periods.

Blanchard *et al.* (2002) noted that selling only 15% of hot air maximized the revenue for the selling countries. The sensitivity of the market to this level of hot air sales was modeled. The impact total withdrawal of hot air from the market was also assessed.

Without restrictions on the sale of hot air the CDM market is likely to be small in size. CDM demand will be met by no-regrets projects (the modeling assumed that 1.5% of CDM is through no regrets). Credit price is only US$ 0.04 and total CDM revenue US$ 8.8 M globally. As sale of hot air is restricted, CDM volumes rise (Figure 2.3). Not all the hot air is replaced by the CDM, indicating that there has also been a small increase in Annex B domestic abatement. Most of the expansion in CDM volume is from the energy sector – both LULUCF and no regrets are already at the limits set and cannot expand any further.

The increase in CDM volumes and credit prices mean that the restriction of hot air sales significantly increases CDM revenues – up from US$ 8.8 M with no restriction on the sale of hot air to US$ 244.5 M when no hot air is available. If the Russia and the former Eastern European countries restrict the sales of hot air to 15 % of that available (the level of income maximization) credit prices improve to US$ 0.25 and CDM volume to 566 Mt CO_2.

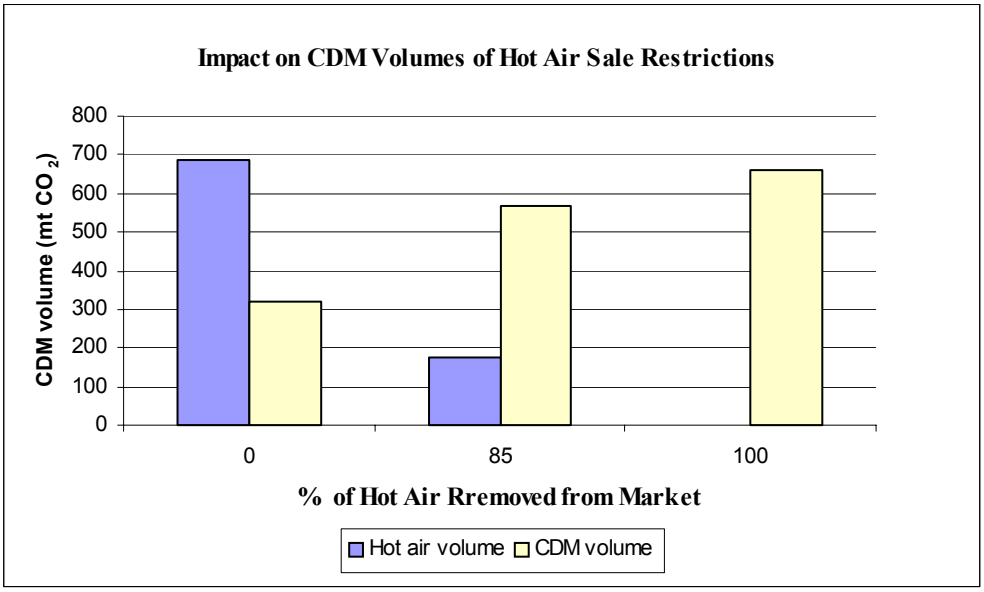

Figure 2.3. Impact of hot air sales on CDM

2.4.5. Global Carbon Market with Increasing the Size of the Cap

The impact of increasing the cap on the way in which emission reductions are achieved is shown in figure 2.4. As the cap is increased, more relative low cost LULUCF CERs become available, and the market share of the CDM increases from 52% (1% cap) to 74% (10% cap). This increase mainly replaces domestic Annex B abatement and emissions trading.

However, by substituting relatively cheaper LULUCF CERs for energy derived CERs, the price of permits drops (Table 2.5). The additional volume is not enough to offset the lower permit prices and overall CDM revenues decline.

Increasing the LULUCF cap also increases the contribution that the LULUCF sector makes to the CDM, mainly at the expense of more expensive energy and gas flaring sourced CERs. Figure 2.5 shows the changes in composition of the CDM. No regrets remain fixed at the 1.5 % level set in the model under all scenarios.

Table 2.5. Impact of increasing LULUCF cap on permit price and CDM revenues

	% of 1990 Annex B emissions allowable as CDM LULUCF CERs		
	1	**5**	**10**
Permit Price (US$ /t CO_2)	0.25	0.11	0.04
CDM Volume (Mt CO_2)	566	702	811
CDM Revenue (US$)	140	80	29

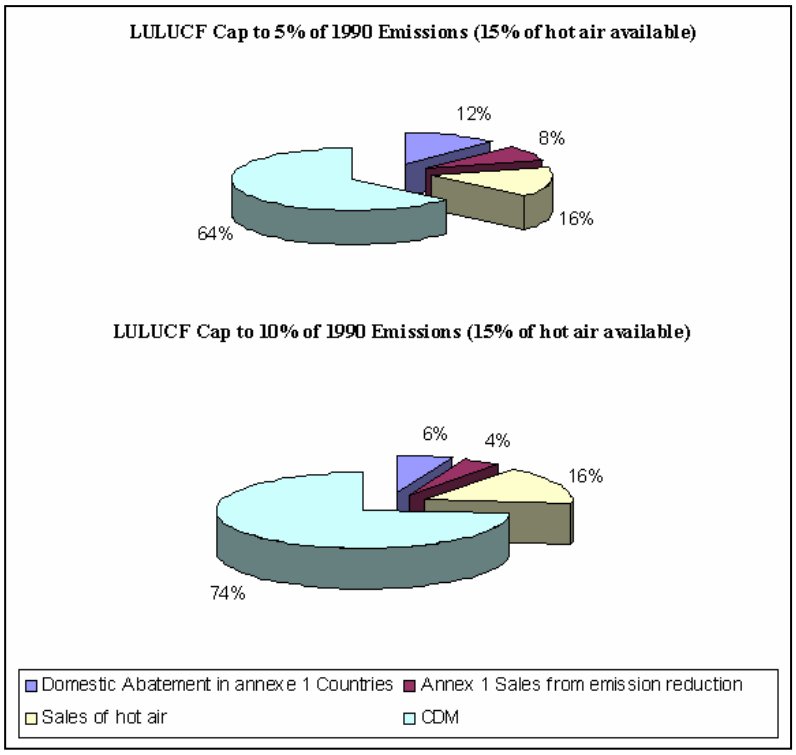

Figure 2.4. Impact of increasing LULUCF CER cap on share of mechanisms

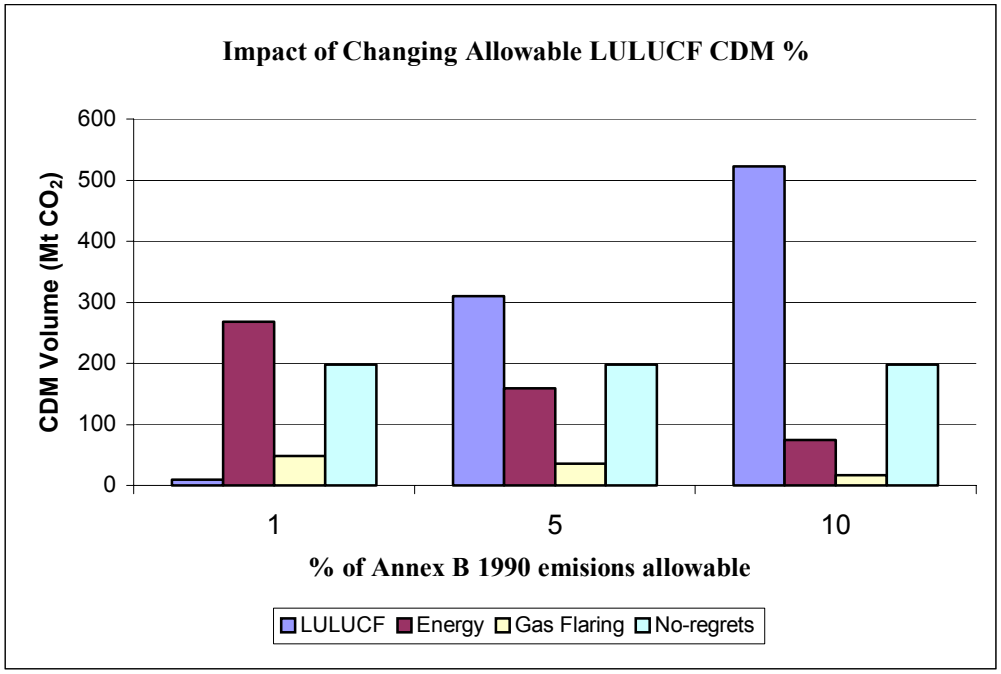

Figure 2.5. Changes in the composition of the CDM as a result of changing the LULUCF cap

2.4.6. Current Market and Financing LULUCF Projects

While modeling provides indications of the long term direction of the market place, it does not accurately indicate the short and medium term market conditions that are likely to prevail. To understand how Indonesia might most profitably engage in the carbon market, an appreciation of the current market and the potential pathways for its development is necessary. This encompasses the development of policy frameworks internationally and nationally, the current prices that are being achieved and the structure of the current market.

2.4.6.1. Policy Framework

As discussed previously, the policy structure surrounding the market for GHG emission permits is still evolving. Even within the CDM itself, the full details of the implementation framework have yet to be finalized, and in the case of the land use sector will not be for over 12 months. This presents a level of risk to investors likely to discourage investment in the LULUCF sector. Individual Governments are also pursuing a number of policies that will have an impact on the market place. These include:

- Development of domestic trading schemes. The United Kingdom and Denmark have both investigated domestic trading schemes. Although neither currently allows for permits created in other countries to be used, there has been ongoing discussion, extended to the level of the European Union, about how this might be achieved. Neither currently allows for the inclusion of land use change credits. The EU is currently developing proposals to integrate these schemes into an EU trading scheme to begin operation in 2005, although the implementation of an EU emissions trading scheme is yet to be agreed by member states.

- Introduction of subsidies to assist and encourage CDM investments. The Japanese Government is pursuing a wide range of policy measures to reduce emissions. The development of the CDM is one of these, and the Japanese Government intends to offer subsidies to Japanese companies investing in the CDM from next year, with total funding of 300 M yen having been allocated over a 10-year period. Japan has also entered into an agreement with Malaysia, Philippines and Vietnam to reduce emissions.
- Introduction of a range of domestic policies such as carbon taxes, renewable energy targets and trading schemes, voluntary industry emission reduction programs in order to reduce domestic emissions. Such measures may increase domestic emission reductions demand for external permits.

These domestic policy initiatives will shape the views and responses of participants in the marketplace. Not only will they impact on levels of aggregate demand, but they will also affect the perception of risks associated with different credit streams. For example, Natsource (2001) reports that there is already a propensity for market participants to prefer permit types that are already recognized under various national carbon and renewable trading schemes already in operation. This is because they provide clear price signals reflecting the existing regulatory structures, thus significantly lowering associated risks.

Of particular importance to Indonesia is the encouragement that the Japanese Government is providing for CDM investments. Japan is already the largest source of foreign investment in Indonesia thus giving Japanese business some understanding or the investment environment. This is likely to be important for attracting additional overseas investors – as discussed earlier, there are likely to be a number of strategic and risk management benefits to making CDM investments in countries in which investors already have existing investments.

2.4.6.2. Prices and Transactions

Currently the market is characterized by the following transaction types and prices (Natsource, 2001):

- Over 55 inter-company transaction of GHG emission reductions are known to have occurred involving over 55 Mt CO_2 (more trades are likely to have gone unreported). Most of these trades have occurred in Annex B countries.
- There is price differentiation on the perceived price risks associated with different credits, particularly over the creditworthiness of the seller. Permits with a high likelihood of acceptance under the CDM are selling at a premium – between US$ 3 and US$ 8 per ton CO_2-eq.

Other verified credits that have not fully met the emerging criteria for the CDM are selling at a discount – in the range of US$ 1.75 to US$ 3.00. These credits have still been verified, but have not necessarily using the processes set out in the CDM cycle (refer to Technical Report: Chapter 4) of the CDM.

The majority of credits are direct purchase transactions, while somewhere between a quarter and half of such trades are derivative purchases. Of significant interest is that the prices being achieved in the marketplace are above those projected in the majority of modeling. This is likely to reflect the emerging nature of the market, with buyers willing to pay a premium for credits to achieve objectives apart from cost minimisation.

Point Carbon (2002) forecast that for 2002 traded volumes are expected to range from 43 to 165 million tons of CO_2e with the *average* expected prices of US$ 4-7/ton CO_2-eq. However, Point Carbon emphasized that the degree of uncertainty in these projections and the need to treat the price estimates with great caution. Specifically, the *Point Carbon* forecasts are made on the basis of *planned* market activities. As a result, if one or several large-scale carbon buyers/sellers cancel their planned market activities, price estimates will be *dramatically* changed. This constitutes a serious limitation of short-term survey-based forecasts. They do, however, provide a sketch of market activities as 'they happen' and avoid having to make economic and institutional assumptions which may not be realistic.

2.4.6.3. Who is Buying?

The market is currently characterized by having relatively few buyers, who have a range of motives for participation. These range from small funds managers offering a specialized carbon investment product through governments to individual companies.
The best known purchasers are two major carbon funds managers (refer to Box 2 for details):

- The Prototype Carbon Fund (PCF, 2000) established by the World Bank.
- CerUPT/ErUPT -- two carbon project investment programs run by Center International on behalf of a consortium of private and public businesses and the Dutch Government.

A number of large companies have been involved in carbon transactions. Often these companies have adopted voluntary emission reduction targets. The best known is BP's voluntary emissions reduction program, which has implemented a trading system across all business units in the company. It emphasises high quality credits with strict verification requirements. This program constitutes a part of an overall strategic investment in clean technologies and renewable. British Columbia Hydro, a Canadian hydropower operator has issued a RFP for 5.5 Mt of emission offsets to meet a voluntary commitment to offset 50% of the increased greenhouse emissions from two new gas fired generation plants. Ontario Power Generation Limited has also purchased permits in order to satisfy voluntary emission reduction targets.

Japanese business and government have also become visible in the marketplace. Japan faces significant domestic emissions abatement costs due to the relative efficiency of its energy use compared to other Annex B countries. As a result, the use of flexibility mechanisms has always been an important part of the Japanese policy response to meeting its Kyoto commitments. The Japanese were large investors in a number of AIJ projects, particularly in economies in transition. More recently Japanese electricity utilities have shown particular interest in investing in LULUCF projects. Selected transactions to date include:

- Cosmo Oil, a large Japanese oil refiner and distributor, purchased options for permits from Australian Plantation Timber
- Toukhui Electric Power Company (TEPCO) has been a major investor in LULUCF projects in Australia, investing in plantations managed by State Forests of NSW.
- TEPCO have also been involved in the purchase of biomass credits from an Australian power generator which is substituting wood waste into the fuel in coal fired generators.

Some Japanese coal exporters have also started to enter into coal purchase agreements under which emission reductions are parcelled with the coal. Most notably, TEPCO and two Australian coal exporters have made such arrangements, with the emission reductions to be sourced from unspecified projects. Prices and volumes have not been disclosed.

This represents a new trend, in which energy purchasers may require the emission reductions to be 'stapled' to imported hydrocarbons. This may be of significance to Australian energy exporters, who, after the Australian Governments refusal to ratify the Protocol, have no domestic source of Kyoto compliant permits and will be thus required to source any permits 'attached' to energy exports from the international market. Indonesia may be a potential source of such credits.

Box 2. The Prototype Carbon Fund and Cer-UPT

The Prototype Carbon Fund

The Prototype Carbon Fund was established by the World Bank and has been capitalised at US$ 140M. Investors include governments and private sector. The fund invests in carbon projects that qualify under Joint Implementation or the CDM. Main objectives are:

- The financing and procurement of high quality emission reductions that qualify under the UNFCCC. The PCF will only invest in projects that produce identifiable carbon benefits and contribute to the sustainable development.
- Knowledge. Through experience in the development and financing of carbon projects that PCF aims to build an extensive knowledge base that can be shared with other stakeholders
- Build public/private partnerships The PCF aims to build partnerships between the public and private sectors to address the risks posed by climate change.

The PCF has extensive project documentation and screening process that mirrors the processes required for the CDM and JI. This includes the independent certification and verification of emission reduction and extensive public consultation. To date the PCF has successfully closed three projects. An additional 10 projects are currently being negotiated. Purchase prices have ranged between US$ 3 and US$ 5 per ton CO_2.

CerUPT

CerUPT/erUPT are carbon project investment programs run by the Dutch Government. ErUPT focuses on potential JI investments while CerUPT focuses on CDM investments. A consortium of private and public businesses and the Dutch Government funds the programs.

CerUPT will not invest in sequestration projects, but will consider biomass projects. This reduces its potential for the LULUCF sector.

As with the PCF, the CerUPT aims to invest in high quality carbon projects that will comply with the CDM. It will invest in projects that produce carbon benefits of more than 100,000 t CO_2. A detailed and comprehensive project development and assessment process is applied, designed to meet the requirements of the CDM, including public consultation.

In the first phase of its program, 107 submissions were made for the purchase of permits. Of these 32 have been invited to submit a detailed proposal. Center expects these to generate about 37 Mt of permits at an average price of 5 Euros per ton CO_2.

CerUPT is currently considering making an investment in two Indonesian geothermal projects being developed by UNIOCAL. Baseline development is currently progressing, financed through grants from UNDP.

2.4.6.4. Objectives of Buyers

It is apparent that there are many different buyers in the marketplace with a number of diverse objectives. In general, they could be summarized as follows:

- Purchase of low cost emission reductions. Most of the buyers in the market have a degree of sensitivity towards price differentials. However, while price is a key credit purchase criterion, the fact that most buyers are currently paying well above the modelled long-term prices indicates that there are other factors motivate purchasing.

- Minimization of risk. With the market in its early stages of development and the modalities of the market are yet to be finalized (especially in the LULUCF sector), many purchasers are highly cautious over the risks associated with credit streams. Comprehensive project documentation, external verification and certification are all measures purchasers are implementing to manage the risk associated with offset streams.

Investors will also consider jurisdiction-specific risks. This includes the risks associated with asset appropriation, the transparency of the regulatory and legal systems governing business and the general economic and political stability within a given country where investments are being planned.

It should be noted that Indonesia has recently been viewed relatively poorly in all the above-mentioned areas, which has acted as a significant barrier to any form of foreign investment. The same factors will also act as barriers to investment in CDM and other climate change related projects.

- Building Institutional Capacity. For many of public and private participants in the marketplace institutional capacity building is a major objective. Both the PCF and the CerUPT programs have also listed capacity building as their major objective. As another example, BP has always signaled that its internal emissions trading program was designed to build experience in emission trading for long term comparative advantage.
- Market development/protection. The 'stapling' of carbon offsets to coal exports from Australia may be the beginning of a new trend – the trend of energy importers wishing to have emission permits attached to hydrocarbon imports. There may be price premiums attached to such"low emission" coal/oil.
- Companies interested in the public relations benefits of CDM investment. Specifically, there are a number of companies investing in a variety of projects, particularly LULUCF projects that provide sustainable development benefits. Such companies use this investment to market their community and environmental responsibility to consumers. In certain cases companies might be looking for ways in which an emissions mitigation portfolio containing substantial quantities of "hot air" can be "greened". Of key importance to these investors is the integrity of the sustainable development benefits delivered by the project, and project design will need to take account of potential "leakage" of these benefits (for example illegal logging of an area being funded for preservation).

The wide range of factors considered by credit buyers suggest that, in the short term, the market is likely to remain fragmented with most transactions being bilateral. This will allow purchasers/investors to find projects that meet their requirements. However, with a large number of potential projects to consider, the search costs involved could become significant. The development of a centralised registry of potential projects (potentially by the proposed Clearing House) may be useful to assist potential purchasers/investors find suitable projects in Indonesia.

2.4.6.5. Emergence of Other Markets

One of the features of the market place has been the emergence of a number of climate change related markets that operate in parallel with the CDM. This suggests that the CDM is not be the only market for GHG reductions. A number of other markets are currently under development or could be potentially initiated in the long-term:

- The existing domestic trading schemes (referred to above) may be widened to include emission reductions in other jurisdictions. It is likely that permits would need to be recognized by both credit-generating and host Governments -- either in the form of an equivalent trading scheme or through some other mechanism that ensures the integrity of emission reductions. As noted previously, investors appear to be showing some preference for instruments that have a transparent pricing mechanism (Natsource, 2001).
- The Development of a parallel US emissions reduction market. At present, the US climate change policy does include the recognition of any international emissions trading market but a long-term change in the US policy position has been widely speculated. Considering such a change, the future form of international GHG credit market is speculative. However, given current US policy, it possible that project eligibility would widen the current CDM framework. While the inclusion of the United States will increase the international demand for carbon credits, price increases are not guaranteed. The US appears to be highly sensitive to the costs of climate change mitigation and may not introduce measures that force the price of abatement beyond current permit prices.
- The integration of climate change into emerging markets for other environmental and social services. There is increasing evidence that climate change benefits are becoming integrated into emerging markets for other environmental and social benefits. This results in a more integrated view of projects.

This trend has been recognized by the World Bank, which is launching two additional Carbon Investment products – the Bio-Carbon Fund and the Community Development Carbon Fund (Box 3). The Bio-carbon Fund will invest in LULUCF projects that produce a range of sustainable development benefits, including climate change benefits. It will consider investing in projects that are not eligible under the Kyoto Protocol. The CDCF will concentrate on projects that deliver benefits to rural communities. Again, it will consider projects that may not be Kyoto compliant.

Although both these Funds have yet to secure financing , it illustrates that one of the major market participants believes that the market is broadening beyond investments that are focused purely on the CDM and assumes some elements of an integrated environmental services market. This trend may not become a significant feature of the integrated market in the long term, but it does represent a medium-term opportunity for the development of a wider range of projects, while broadening access to a different pool of funds.

The emergence of these markets that operate in parallel with the CDM (or which are co-integrated with the CDM) may compensate for the smaller than expected size and permit price of the CDM. These 'co-integrated' markets may offer additional demand for climate change benefits that bring new investors into the marketplace.

With such markets being in an embryonic state, it is not possible to forecast their potential share of Indonesian CDM contribution. However, the importance of co-integrated services in attracting new investors still needs to be noted, particularly in the early stages of the CDM, where understanding the needs and motives of investors may give a project developer (or a country) a critical edge.

Market intelligence will be a critical issue of competitive advantage at the early stages of market development while there is relatively poor transparency in the marketplace. Proper market intelligence would allow the accurate targeting of key market segments with strong synergies between the demands of investors and Indonesian national interests. In particular,

there may be market players with a strong interest in investing in LULUCF projects (the Japanese power generation sector comes to mind).

The collection of market information and its dissemination to project developers could be a key market development role played by Government. In doing so it could develop the skills and resources internally or outsource part or all of the service.

Box 3. The Community Development Carbon Fund and the Bio-Carbon Fund

The Carbon Finance Unit at the World Bank has recently announced that they intend to develop two new Carbon investment Funds. These funds aim to produce verified carbon reductions and a range of other sustainable development and environmental benefits. However, unlike the PCF, it is possible that these funds will invest in projects that are not full compliant with the Kyoto Protocol.

Community Development Carbon Fund

The CDCF will seek to invest in projects that produce a range of sustainable development benefits, particularly on rural communities. However, it will be focussed on projects that produce emission reductions rather than sequestration. The fund was officially launched at the 2002 World Conference on Sustainable Development in Johannesburg. Initial capitalisation is planned to be $100 M drawn from public and private sources. Investors will receive emission reductions that may be recognized under the emerging international, national and regional carbon markets. This may include the CDM.

As with the Bio-carbon fund, there is a strong emphasis on capacity building for participants in the fund and host countries. The fund also seeks to leverage the climate change related investment in projects, increasing the financial resources available for the implementation of clean technologies in developing countries.

It is anticipated that the strongest appetite for such a fund is likely to come from investors in the EU.

Both funds will require emission reductions to be verified, suggesting that there will be costs involved with project documentation and approval and independent verification of the claimed carbon savings. As a result, it is unlikely that there will be any substantial reduction in the level of costs associated with the CDM project cycle.

The Bio-Carbon Fund

The Bio-Carbon fund will initially seek $100 M in funding from Government and Private sector entities. It will make investments in projects that sequester carbon in forest and agro-ecosystems. Participants will receive emission reductions that have the potential to be recognised under emerging international, national and regional emissions trading programs. This includes but is not limited to the CDM.

One of the Key objectives of the Bio-Carbon fund is to "learn through doing" and illustrate the potential of LULUCF projects to deliver verified emission reductions and a wide range of social and environmental benefits. It will allow participating companies to diversify their emission reduction strategies. Project developers will have an incentive to innovate and test projects. At the same time, it will allow governments to leverage expenditure on environmental projects.

For host countries the fund will offer the opportunity for mobilization of financial resources into sustainable development projects that support national objectives in areas such as improving rural livelihoods, stopping soil erosion and combating desertification. It will also assist in technology transfer and project development and implementation capacity building.

Initially the Carbon Finance Unit anticipates that the major source of finance is likely to come from Japan.

III. CDM, CARBON TRADE IN THE NATIONAL PERSPECTIVE

3.1. Land Use, Land Use Change and Forestry (LULUCF)

3.1.1. Land Use

Indonesian territory has an area of about 780 Millions ha (Mha), and about 191 Mha of the territory is land area. It locates between latitudes 6° North and 11° South and longitudes 94° West and 141° East. More than half of the land is covered by forest[2], *i.e.* about 108,571,713 ha (45% of Southeast Asia tropical forest; Table 3.1). Other land use types are plantation (8.6%) especially big plantation of rubber and palm oil, and followed by shifting cultivation area (6.7%) and fallow land (5.4%). The last two vegetation types are mostly considered as an idle and unproductive land that potential for replanting. About 9.4 % of the land area is still considered as mosaic of mixed vegetation cover and others. This is because, the data were taken from different sources, so that the consistency of data is very low, likewise the accuracy of the data.

To increase the consistency, the Ministry of Forestry and the Bureau of Statistic have tried to coordinate the database. However, the results are still unsatisfying. In the analysis of the potential carbon sequestration of the project types, particularly for the land use cover such as *shifting cultivation /waste land /garden* and *other unclassified lands,* the number should be used with caution since it is derived from a poor data set. However, data in Table 3.1 gives rough estimates of land area potential for carbon-sink projects.

Table 3.1. Land use cover in Indonesia of the year 2000

No	Land use cover	Area (Ha)	% of land cover
1	Forest cover *)	108,571,713	56.7 %
2	Wood land / agroforestry	8,905,200	4.7 %
3	Agriculture / paddy field	8,106,356	4.2 %
4	Plantation	16,543,663	8.6 %
5	Fallow land	10,260,492	5.4 %
6	Grassland	2,424,469	1.3 %
7	Shifting cultivation / waste land / garden	12,768,711	6.7 %
8	House compound and surroundings	5,131,727	2.7 %
9	Dyke / ponds	642,905	0.3 %
10	Mosaic of mixed vegetation cover & others	17,922,705	9.4 %
Total land area *)		191,277,938	100 %

Source: Bureau of Indonesian Statistic (BPS, 2001), *MoF (2001)

3.1.2. Forest Cover

According to its function, Indonesia forest is categorized into six forest types, *i.e.* protection forest, conservation forest (nature reserve, wild life sanctuaries, national park, grand forest park and nature recreation park), limited production forest, non-convertible production forest, forest with specific function, and convertible production forest. The grouping is aimed to indicate the expected function of the forest,

[2]In Indonesian context, forest is defined as an area dominated by a group of trees having height usually more than 5 meters, with forest canopy cover bigger than 40%, and having at least 2 canopy layers, rich in biodiversity, perform specific micro climate, and dense ground forest layer.

however, in fact, it is often that various types of degraded vegetation cover such as bushes, thickets, grasses, secondary re-growth and shifting cultivation mixed with crops, fallow and unproductive lands, are present in each forest type.

Protection forest is defined as forest that is extremely vulnerable to soil and water degradation. The primary role of these forests is to provide protection to the soils. These forests are often located on very steep slopes. Protection forests are not available for logging activities. Conservation forests are defined as forest that is reserved for use as scientific reserves, parks and wildlife sanctuary. Limited production forests is defined as forest that is vulnerable to soil and water degradation but less than those classified as protection forest and can be managed for material supply but only with very extensive and relatively good performance of management. Non-convertible production forests is forest that is considered to be sufficiently robust to be used as industrial forests under state of the art forest production and management practices. Convertible production forest is defined as forest that is not destined to be a part of the permanent forest estate but is allocated for conversion into agriculture and other land uses. Forest with specific function is a unique forest area that is assigned as education forest, experiment forest and other uses according to science and technology development in forestry and as a place for student practical field works.

Based on consensus made by a number of agencies related to the use of forest lands (known as Forest Land Use Plan by Consensus or TGHK[3]), total of forest area agreed in 1993 was 153,966,046 ha (Table 3.2). In the year 2001, the forest area agreed was reduced to 108,571,713 ha (MoF, 2002). This was made as the need for land has increased, in particular for plantation (mainly rubber and oil palm) and land for regional development as settlements and agricultural annual crops. Of the 108,571,713 ha, only 12.6% was allocated as convertible production forest (Table 3.2). Hence the actual forest cover that may be considered as forested areas (permanent forest areas including plantation forest) in the year 2000 was about 94,901,178 ha. According to FWI calculation from National Forest Inventory data in 1996 (FWI and GFW, 2001), around 8% from total forest land or 8,899,976 ha is considered as completely deforested, so that the actual forested areas in 1996 was only 99,946,406 ha. Based on FWI finding, it is possible that the actual forested areas in the year 2000 might still be lower than the number as presented earlier (94,901,178 ha).

Table 3.2. Forest land allocation according to it function

No	Forest land allocation (TGHK)	1990[1]		2000[2]	
		Area (ha)	% of Total	Area (ha)	% of Total
1	Protection forest	47,515,437	30.9 %	29,036,994	26.7 %
2	Conservation Forest (nature reserve, wild life sanctuaries, national park, grant forest park and nature recreation park)	19,152,525	12.4 %	21,824,627	20.1 %
3	Limited Production Forest	29,570,656	19.2 %	16,209,112	14,9 %
4	Non Convertible Production Forest	33,401,656	21.7 %	27,823,177	25.6 %
5	Forest with Specific Function	-	-	7,268	0.01 %
	Permanent forest areas	*129,640,274*	*84.2 %*	*94,901,178*	*87.6 %*
6	Convertible Production Forest	24,325,772	15.8 %	13,670,535	12.6 %
Total Forest		153,966,046	100 %	108,571,713	100 %

Note: [1]The data given in column 1990 are data from the year 1993. It is considered that the difference between 1990 and 1993 data were not significant,. [2]Data taken from recent publication up to April 2001. Source: MoF (2002).

[3] Forest Land Use Plan by Consensus or TGHK was defined as forest allocation according to its function which is not necessarily cover by forest.

3.1.3. Deforestation

Deforestation is the conversion of forest into other uses as a result of human activities such as agriculture, development areas for transmigration and infrastructure, shifting cultivation, illegal logging, and forest fires, and in previous time it was primarily a negative function of population density (Kaimowitz, 1998). Estimates of deforestation rates vary between studies. The FAO estimated the annual rate of deforestation in the early 1970s at about 300,000 ha/year, and in the early 1980s at about 600,000 ha/year. In the early 1990s, the rate of deforestation reached a level of 1 Million ha per year (MoF, 1990). Other estimate by the World Bank using estimates for smallholder conversion, development projects, poor logging practices and losses through fires which commonly quoted for the early 1990s was between 700,000 ha/year to 1.2 Million ha/year, while MoF (1990) arrived at a number of 1.3 Million ha/year from total natural forest of 108.57 Million ha in 1990. However, based on 1997 satellite imagery, the Ministry of Forestry and Estate Crops has produced new forest cover maps for the islands of Kalimantan, Sulawesi and Sumatra which show a shocking loss of more than 17 million ha within 12 years (Walton and Holmes, 2000). Based on these figures, Boer *et al.* (2001) estimated that nation wide annual deforestation rate might reach more than 1.5 million hectares. The same problem of data inconsistency was encountered during data compilation and analysis, merely due to different source used. The difference might be due to a different baseline used for various applications, slightly different in the method of inventory, different definition used for the same object, and might also due to level of interpretability of the human resource who done the work.

Due to high deforestation rate, the total forest cover of Indonesia has decline significantly. Based on forest cover data compiled from different sources (RePProt, 1990; Hannibal, 1950; Intag, 1990; MoF, 1998; MoF, 2002), it was shown that in the period between 1950-2000, the total forest lost is around 42.6 Mha (42%). Sumatra and Kalimantan known as the biggest island of Indonesia, severe a lot by this deforestation. Deforestation in Sumatra occurred in the 1980's was mainly due to the development of settlement through transmigration program, while in Kalimantan, it was mainly due to excessive timber harvesting (see Box 1).

Table 3.3. Total forest lost by island in the period 1950-2000

	Period 1950-1985		**Period 1985-2000**		**Period 1950-2000**	
	Total lost (ha)	**Rate (ha/yr)**	**Total lost (ha)**	**Rate (ha/yr)**	**Total lost (ha)**	**Rate (ha/yr)**
Indonesia	-42,589,400	-1,183,039	-24,806,690	-1,550,418	-67,396,090	-1,321,492
Kalimantan	-11,414,000	-317,056	-15,096,182	-943,511	-26,510,182	-519,807
Irian Jaya	-5,741,700	-159,492	-1,995,590	-124,724	-7,737,290	-151,712
Sumatra	-14,046,500	-390,181	-9,279,081	-579,943	-23,325,581	-457,364
Sulawesi	-5,780,600	-160,572	619,646	38,728	-5,160,954	-101,195
Java-Bali-NT	-4,654,600	-129,294	2,332,742	145,796	-2,321,858	-45,527
Maluku	-952,000	-26,444	-1,388,225	-86,764	-2,340,225	-45,887

Box 4. Logging as the major driving factor for decreasing forest cover in Indonesia

It is well accepted that directly, logging is not responsible for the deforestation of Indonesian forest. However, the road network system that is developed during timber harvesting is believed to be the main factor responsible for the open access into the forest area, either for timber extraction or non-timber forest products harvesting such rattan, fruits, latex, resin, wild pig, and other feeding materials. Tomich & van Nordwijk (1995) highlighted the important of road network of which in the most case is the logging road network in the forest to open the access of community to the forest. The other driving factors are attractiveness of timber product to be harvested, high agriculture income and open access market, have increased the insecurity of the tropical forest. Combination of logging coupled with encroachment and other driving factors as mentioned have prevented the forest from easily regenerating.

In general the deforestation in Indonesia is caused by forest concession (HPH), Illegal logging, forest fires, mining, development of big timber plantation (HTI), conversion into transmigration area and estate plantations mainly oil palm and rubber (FWI & GFW, 2001).

3.1.4. Land and Forest Rehabilitation Program

In order to maintain and to increase forest cover, Indonesia has implemented several forest rehabilitation programs. There are three main activities, namely; afforestation (commonly called as regreening) on private community lands, reforestation (commonly called as *rebosasi*) in state forest lands having very degraded vegetation condition, and industrial forest plantation in un-production permanent production forest. The implementation of the programs was quiet intensive during the period of 1993 to 1997, but it decreased from 1998 up to now due to the economic crisis (Figure 3.1). The decline was significant for industrial forest plantation, many believes that the reduction in plantation was due to the shortcut of *rebosasi* fund. However, result of the ITTO mission on the "Hutan Tanaman untuk Penciptaan Sumber Daya" (ITTO, 2001) to achieve the sustainable forest management in Indonesia, give a serious attention on the low performance and achievement of plantation forest development (only 20%) especially to support the pulp and paper industries. The failure to achieve the plantation target was not only due to the unavailability of *Rebosasi Fund* (*Dana Reboisasi*) but also due to complex interaction of many factors such as lack of incentive from the government to the private sector to establish plantation, establishment cost is higher than timber price, land tenure, high price of the raw material for the industry that will reduce profit, no auditing for the plantation since no longterm planning, species site matching, no access for credit due to high risk and low productivity, and law enforcement from the Government to the HPHTI (Forestry company that have legal aspect to establish plantation forest), socio economic aspects of the local community that have been marginalized very often by large plantation (both forestry and estate crops) resulted to the unresolved potential conflict. This trend will likely be the same in the future since availability of budget for developing plantation forest is completely stopped, while for rehabilitation of critical land and degraded forest, a new scheme is being prepared with the involvement of community in its implementation.

As the rate of deforestation is much higher than rate of rehabilitation, the area of critical land tended to increase. In 1990, the total critical land was about 6.8 Mha and in 2000 it increased to 23.7 Mha. Of 23.7 Mha, about 65% are in community land while 35% in state land.

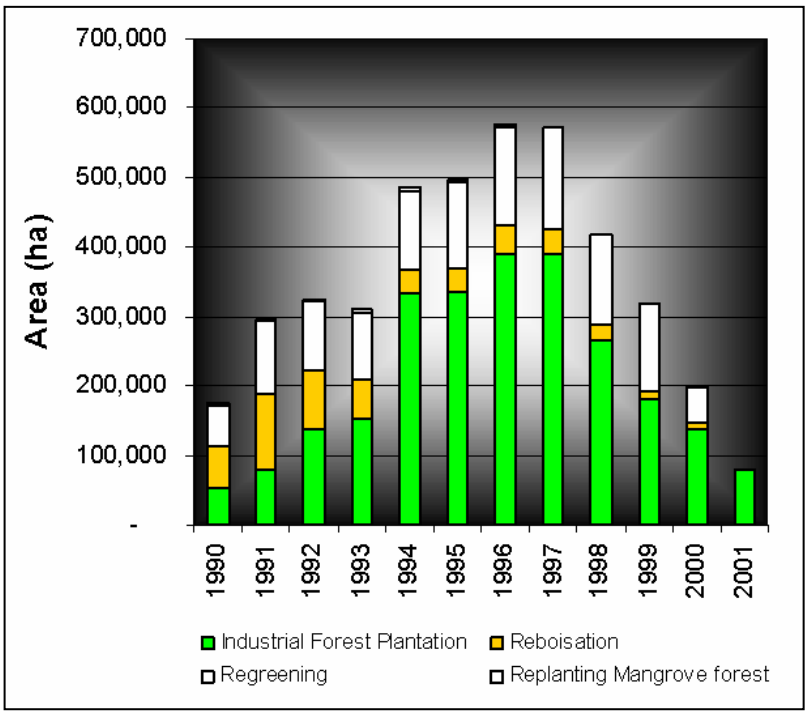

Figure 3.1. Implementation of land and forest rehabilitation program

3.2. Policies and Regulations

The strategic policy of the Ministry of Forestry, as stated in the National Forestry Program (MoF, 2001) has highlighted 5 priority issues to be focused on during the period 2001 – 2004, namely:

- combating illegal logging;
- combating forest fires;
- recalculating timber values and restructuring of the timber-based industry;
- rehabilitation of the degraded natural forest through encouraging forest plantation
- promotion of good forest resource management at the district level by implementing the forestry sector decentralization.

To achieve those five priorities, increase human resources and capacity building in forestry sector is a must, as well as law enforcement, implementation of science and technology, multi-function of forest ecosystem, community empowerment, and collaboration in the national and international level. If this strategic policy could be implemented in the field through the program performed by the Ministry of Forestry, it is most likely that deforestation rate will decline gradually in the near future. Although the pulling factor such as over capacity of the forestry industry is still there, the law enforcement and increase of awareness of the community will tend to support the reduction of deforestation rate.

One of potential opportunities to get funding support for implementing activities related to those five strategic policies is *Clean Development Mechanism* (CDM). This mechanism allows developing countries to participate in the reduction of GHG concentration in the atmosphere and

also assists the developing countries to achieve their sustainable development. Project activities carried out under the mechanism will yield carbon credit for developed countries that partly support the investment of the projects. Under current regulation, activities that provide carbon credits fall under category of environmental services. Therefore, the activities will be regulated though the issuance of permit called '*Ijin Usaha Pemanfaatan Jasa Lingkungan*, *IUPJL*' (*Permit for Environmental Service Activities*). This regulation is under PP No. 34/2002, *i.e.* about '*Forest Land Allocation, Forest Management Planning, Forest and Forest Land Use*'.

The aspects under PP34/2002 relevant to various issues in LULUCF CDM projects include:

(a) The permit for 'carbon-based projects' can be carried out in forest areas under the category of protection forest as well as production forest, with the duration and areas up to 10 years and 1000 ha respectively.
(b) Individuals, cooperative, private and state-owned enterprises may apply for the permit, each with maximum 2 permits within one province.
(c) The permit holder who can satisfy the requirement under the regulation may be granted an extension.
(d) The permit holder is required to pay PSDH (*Provisi Sumber Daya Hutan*) and IIUPH (*Iuran Ijin Usaha Pemanfaatan Hutan*), and is also bound to collaborate with 'local cooperative'.

The application for the permit is directed to three different government institutions. The permit is granted by:

(a) Head of District (Bupati) for the area within the district jurisdiction, with CC to the Minister of Forestry, Governor, and forest-related authority in the region,
(b) Governor if the area is located in more than one district (across districts), with CC to the Minister of Forestry, Head of Districts, and forest-related authorities in the region,
(c) Minister of Forestry if the area is located in more than one province (across provinces), with CC to Governors, Head of Districts, and forest-related authorities in the region.

The issuing of PP 34/2002 is in line with the spirit of UU No. 22/999. This Act allows the Republic of Indonesia, as a united country, to decentralize government administration by giving autonomy to its regions (Provincial and District administrations). This Act empowers the community to enhance its own initiatives and creativity, improve community participation and strengthen the role and function of the Province, District and Council House of Representatives. A large proportion of this law deals with terminology, regional divisions, structures roles and forms of government, co-operation and conflict resolution, advisory, supervision and transition arrangements.

As the CDM projects may involve foreign investors, Presidential Decrees No. 118/2000 and No. 127/2001 that relate to aspects of Foreign Direct Investment ownership and participation need to be considered. In this decree, non-timber forest product plantations are only allowed for small-scale business and are included under the negative list for foreign investment/capital share. Thus, some activities under CDM projects may fall under category of 'restricted' or 'negative list' for foreign investment, depending on species or commodity and the scale of activities. For example, under this regulation simple agroforestry projects may not be allowed to be funded by foreign investor finance.

Box 5. Hierarchy of regulations

The Indonesian policy and regulatory framework is a complex interaction of a structured hierarchy mechanism. The following description of the hierarchy has been drawn from "A Review of Legal, Regulatory and Institutional aspects of Forest and Land Fires in Indonesia (Simorangkir and Sumantri, 2002) as part of Project Firefight South East Asia.

Under the constitution Indonesia regulations follow the hierarchy below (from the highest to lowest):

- Peoples National Assembly Decision (*Ketetapan MPR*)
- Act (*Undang-Undang*)
- Regulation Change of Act (*Peraturan Penggati Undang-Undang*)
- Government Regulation (*Peraturan Pemerintah*)
- Presidential Decree (*Keputusan Presiden*)
- Ministerial Decree (*Keputusan Menteri*)
- Local (Provincial and District) Regulation (*Peraturan Propinsi dan Peraturan Kota/Kabupaten*)

However, Act No. 22/1999 and Government Regulation No. 25/2000 that regulate the decentralization of authority from the central to local governments brought changes and generated an 'autonomy euphoria'. Most of the local, provincial and district governments became reluctant to acknowledge Ministerial Decrees. The situation has been changed with the issuance of the People's National Assembly Decision (*Ketetapan MPR*) No. III/MPR/2000 concerning regulation order/hierarchy, because it did not mention the Ministerial Decrees at all. The resulting confusion, conflicts and overlapping between Ministerial Decrees and Local Regulations necessitated a clarification from the central government through the Minister for Justice and Human Right Letter No. M.UM.01.06-27 dates 23 February 2001, stating that:

- The position of Ministerial Decree is between Presidential Decree and Local Regulation.
- The position of Ministerial Decree is higher then Local Regulation.

Furthermore, because a Minister functions as a sectoral regulator at national level, the Ministerial Decree usually contains issues of national importance, thus it prevails for the whole country.

3.3. Types of Forest Carbon Projects

In broad term, forest carbon projects can be categorized into three categories. First is conservation of forest carbon by controlling deforestation, protecting forests, changing harvesting regimes, and controlling other anthropogenic disturbances, such as fires and pest outbreaks. Second is enhancing and expanding carbon sink by increasing forest area and/or biomass and soil carbon density and by increasing storage in durable wood products. Third is by substituting the use of fossil fuel-based energy generation with biomass-based energy or the use of biomass products in place of energy-intensive ones. Types of projects under each category are presented in Table 3.4.

Table 3.4. Type of forest carbon projects considering to the reforestation and afforestation definitions of Marrakesh Accord

Categories and Project Type	Indonesian Definitions/Descriptions	Marrakesh Accord
1. Conservation and Forest Management • Protection Forest	Protecting forests from exploitation, and this will avoid the emission of GHG and conserve carbon stock in the form of biomass	This project type as one of the activities to avoid deforestation is not eligible according to Marrakesh Accord
• Enhanced Natural Regeneration (ENR) or Enrichment Planting	Planting a number of trees species (commercial species) in logged-over forests or in highly degraded forests. By regulation, enrichment planting is carried out if the number of seedling is less than 400 per hectare or the number of saplings is less than 200 per ha or the number of poles is less than 75 per ha, or if seedlings, saplings or poles are not evenly distributed. If the number of seedlings is more or equal to 400 per ha but not evenly distributed, the form of enrichment activities will aim at reallocating seedlings. Under this condition it is most likely that following Kyoto land definition, many open spots in the area are considered as non-forest.	It may classified as reforestation as long as the lands were already degraded (not forest) before 1 January 1990 At present this only allow for Joint Implementation (JI)
• Reduced Impact Logging (RIL)	Improving silviculture techniques to reduce tree damage during logging. Types of RIL in Indonesia are Selective Cutting and Planting (*Tebang Pilih Tanam Indonesia/TPTI*) and Selective Cutting and Line Planting (*Tebang Pilih Tanam Jalur/TPTJ*).	At present this only allow for JI
2. Sink Enhancement • Reforestation (*Penghutanan kembali*) or "*reboisasi"*	Planting trees in degraded lands (critical land and grasslands) of state forest land mainly for conservation purposes (e.g. fast or slow growing species without rotation)	It may classified as reforestation as long as the lands were already degraded (not forest) before 1 January 1990
• Forest plantation or Timber plantation estate (TPE) or *Hutan Tanaman Industri* (HTI)	Planting trees (normally fast growing species) in degraded lands (critical lands and grasslands) or depleted forest in state forest lands for wood production	As above
• Community Forest (Agroforestry)	Planting trees in degraded state forest lands carried out by state companies in collaboration with local community for wood production. Before the trees grow, community normally use the land for annual crops	As above

Table 3.4. *Continued*

Categories and Project Type	Indonesian Definitions/Descriptions	Marrakesh Accord
• Social Forestry (Agroforestry, and Multi Purpose Tree Species plantation /MPTS plantation)	Planting trees (mainly fruit trees) in buffer zones (between state forest lands and community lands). Commonly practiced by local people and further more specialised practicing in transmigration area.	As above
• *Afforestation or Regreening (Penghijauan)*	Planting trees in degraded lands (critical lands and grasslands) of community lands mainly for wood production and energy, meanwhile keeping the environmental benefit *i.e.* soil and water conservation	As above
• Private Forest	Planting trees in community lands mainly for wood production.	As above
• Conversion of agriculture land to forest	It might not be recorded that there were some agriculture land previously cultivated for annual crops, and then in a point of time it was used for perennial crops (rubber, fruit trees).	It may classify as afforestation if the lands have been used as agriculture lands since 50 years ago.
3. Substitution of Fossil Fuel-Based Energy with Biomass Energy	Planting trees in degraded land/garden or unproductive land for fuel wood production or other wood energies such as charcoal, bioelectricity etc.	

Based on the environmental, social and economic assessment to the forest carbon projects, it was found that social conflict will remains for the project types that disregard the community participation. In the past, projects such as forest plantation/timber estate, *rebosasi*, *regreening* were widely rejected by the community due to mismanagement and improper approach (Table 3.5). At present day, this situation may still occur in certain areas of Indonesia. On the contrary, agroforestry type-projects seem to be promising. Past experiences have shown the sustainability of the projects.

Table 3.5. Social impact on forest carbon projects

Project types	Job Opportunity (MM/ha/yr)	Poverty reduction	Social cohesion
Enhanced Natural Regeneration (ENR)	69	Not significant	-
Reduced Impact Logging (RIL)	nd	Not significant	-
Reforestation or *rebosasi*	88	Not significant	Potential conflict
Forest plantation (fast growing species)	92	Not significant	Potential conflict
Community Forest *(Agroforestry)*	64	Significant	Cohesive
Social forestry *(Agroforestry and MPTS plantations)*	109	Significant	Cohesive
Afforestation or Regreening	75	Not significant	Potential conflict
Private Forest	80	Significant	Cohesive

Note: nd = no data. Job opportunity data were calculated from data of "work achievement" of HTI development and forest plantation of *Perhutani*. The above project types may fall under category of reforestation.

From rapid assessment conducted during field visit, it was indicated that forest management type-projects (RIL and ENR) might have better impact on environmental (Table 3.6), while others might give lower impacts. Mitigation potential varied between project types. Reforestation has higher mitigation potential, while forest plantation is lower.

Table 3.6. Environmental impacts on forest carbon projects.

Project types	Mitigation potential (tC/ha)	Biodiversity		Watershed			Use of Pesticide / Input
		Flora	Fauna*	Drainage	Water quality	Air quality	
Enhanced Natural Regeneration (ENR)	254	3	3	3	2	3	0
Reduced Impact Logging (RIL)	3-10	3	2	3	2	3	0
Reforestation or *reboisasi*	204-256	3	2	3	2	3	0
Forest plantation (fast growing species)	48	1	1	2	1	2	1
Community forest *(Agroforestry)*	109-256	1-2	1-2	1-2	1	1-2	1
Social forestry *(Agroforestry and MPTS plantations)*	198-306	1	1	1	1	2	0
Afforestation or Regreening	278	2	1	3	3	2	0
Private Forest	119	2-3	2	2	2	2	1

Note: * big animal; 0 = absent ; 1= low/bad ; 2 = medium/good ; 3 = high/very good

Economic benefits of forest carbon projects also varied between and within project types depend on species, management system and locations. In general MPTS, agroforestry and community type-projects would give high economic benefits and followed by forest plantation/HTI, RIL and ENR (Table 3.7). Further analysis on the economic aspects of the project types has shown that of the community forestry systems, the damar system is the most attractive, with an NPV of over US$ 10 thousand per hectare. Followed by agroforestry of durian and mango, with an NPV of US$ 1,762 and US$ 1,726 per hectare respectively. The macang (*Anacardium* sp.), pinang (*Arenga pinanga*) and candle nut (*Aleuritus molluccana*) system are also attractive, with NPV of US$ 941, US$ 907 and US$ 824 per hectare respectively. Mangrove silvofishery produces an acceptable NPV (US$ 3,009/ha). In contrast, meranti (*Shorea* spp.) and rubber (*Hevea braziliensis*) systems produce the least NPVs, *i.e.* about US$ 67-70 and US$ 64 per hectare respectively. The systems also require high life cycle costs. This may be an important barrier for adoption. The highest life cycle cost is found in rubber systems, which take US$ 201 per ha, followed by timber estate of sengon (*Paraserianthes falcataria*), with the life cycle costs of US$ 365/ha.

Table 3.7. Economic impacts on forest carbon projects

Project types	Initial Cost ($/ha)	Life Cycle Cost ($/ha)	NPV of benefit ($/ha)	B/C ratio
Enhanced Natural Regeneration (ENR)	27-30	118	67	1.1
Reduced Impact Logging (RIL)	30	118	1,110-1,173	7.3
Reforestation or *rebosasi*	27-30	115	67-70	3.2
Forest plantation (fast growing species)	74	365	1,110-1,173	7.3
Community forest (*Agroforestry*)	39-107	166 - 201	65-1,462	1.2-6.6
Social forestry *(Agroforestry and MPTS plantations)*	55-613	179 – 608	733-5,738	1.1-9.1
Afforestation or Regreening	65	nd	1,726	nd
Private forest	65	122 – 186	621-1,762	3-7.3

Note: nd = no data; an exchange rate of Rp10,000 per US$ and discount rate of 10% were used in the analysis. The above project types may be fall under category of reforestation.

3.4. Barriers for Project Implementations

Understanding barriers is very important for the successful of project implementation. Projects with lower barriers are likely to perform well than those with high barriers. Unless adequate measures have been put in place to overcome the potential barriers at the project level. Barriers for the implementation of the projects can be grouped into three, namely technical barriers, institutional barriers and economical barriers. Difficulties to access to location, access to technology, availability of planting materials, availability of technical guideline, expert availability, labor availability, land availability, land productivity, land suitability etc can be categorized as technical barriers. Low commitment of local government, possibility of having low community support, potential of conflict due to land tenure problem, difficulties in getting permit and inconsistent policy and regulation can be considered as institutional/regulation barriers. Difficulties to access to credit or getting support from other financial sources, low of benefits, high opportunity costs, long gestation period, small market size etc. can be considered as economical barriers. The following section discusses how to assess level of barriers of different projects according to type of the barriers.

The assessment of the relative position of project types according to the level of barriers can be done qualitatively or quantitatively depending on the availability of data. One of approaches that can be used for this type of assessment is Analytical Hierarchal Process (AHP; Saaty, 1988). The possible CDM projects can be ranked based on the criteria used in each hierarchy (technical, institutional/regulation and economical barriers). Based AHP analysis, it was found that institutional barriers appear to be main barrier for CDM implementation. Among the institutional barriers, the most important barriers are land tenure and followed by policy and commitment of local government. Access to credit and competition with other land use appears to be most important economical barriers, while labor availability and access to location are important technical barriers. These barriers need to be reduced before the potential project can be implemented (Table 3.8).

Table 3.8. Barriers and options for barrier removal by project type

No	Types of Activity	Potential Barriers (Ranked from lowest to highest)	Options of Removing Barriers
1	Community Forest	Access to credit	• Provide special scheme of credit • Provide good information system on potential other funding sources (see Technical Report: Chapter 3)
		Competition to other land use	• Flexibility in market arrangement • Attractiveness of non GHG market
		Land tenure	• See Technical Report: Chapter 2
		Policy and regulation	• Build political and social support • Low enforcement
2	Mangrove Management	Access to credit	• See above
		Competition to other land use	• See above
		Land tenure	• See Technical Report: Chapter 2
3	Multipurpose Tree Plantation	Access to credit	• See above
		Competition to other land use	• See above
		Land tenure	• See Technical Report: Chapter 2
4	Bioenergy	Access to credit	• See above
		Land tenure	• See Technical Report: Chapter 2
		Government commitment	• Binding agreement • Build political and social support • Capacity building
		Policy and regulation	• Build political and social support • Provide related policy and regulation
5	RIL	Policy and regulation	• See above
		Land tenure	• See Technical Report: Chapter 2

Note: Analysis was based on in depth interview with 15 respondents. The consistency ratio (CR) of the respondent in answering the questions was between 1% and 8%. If CR is less than 10%, it is considered that the respondents are consistent.

3.5. Indonesian Market Share

Share of Indonesia to global carbon market will be determined not only by global decisions but also by national conditions. There a number of scenarios that could be developed to describe global decisions, *i.e.* restriction of hot air, and increasing size of the cap for LULUCF-CDM projects, and national condition, *i.e.* costs of carbon abatement and cost of transaction

The introduction of the LULUCF sector into the CDM in the Marrakesh Accords provides Indonesia with significant gains in market share and revenue (Table 3.9). Indonesian LULUCF CER sales are 53 Mt CO_2 with US participation. This more than offsets the fall in credit price to US$ 0.76 per ton of CO_2, and total Indonesian gains from trade rise from US$ 18 M to 39 M. However, with US withdrawal a significant decline in Indonesian revenues and gains occurs, mainly as a result in the collapse in the credit price. Total Indonesian gains from the CDM decline to US$ 7 M per year. Indonesian CDM volumes fall by 43%, mainly the result of a 49% decline in Indonesian LULUCF volumes.

Table 3.9. Indonesia's share of the carbon market for Marrakesh outcomes and US withdrawal

		Energy NSS outcomes	**Marrakesh outcomes with the US in**	**Marrakesh outcomes with the US out**
Indonesian CDM Volume	(Mt CO_2)	14	64	33
Indonesian CDM Share	(%)	1	7	10
Indonesian gains from trade	(US$ million)	18	39	1
Indonesian CDM volumes (Mt CO_2)	Energy	6	4	0
	LULUCF	0	53	28
	Gas flaring	4	3	0

Note: The sums of the Indonesian energy, LULUCF and Gas flaring at the bottom of the table are not the same as the CDM Indonesian volume at the top line since no regret options were excluded. The PET model was run using assumption of no restriction on selling Hot Air.

Increasing the LULUCF cap has significant impact on Indonesia's market share and net gains from the CDM (Table 3.10). In moving the cap from 1% to 5% the gains in Indonesia's volume of LULUCF are enough to offset the decreased permit prices and Indonesia's CDM revenue increases. However, increasing the LULUCF cap to 10% causes a small gain in volume and a larger decline in permit price, so Indonesia's CDM revenues actually decline. Modeling illustrates that the value of the CDM to Indonesia is maximised when the LULUCF cap is between 5% and 6% of Annex B 1990 emissions.

Table 3.10. Impact of changing the LULUCF cap on Indonesia

		% of 1990 Annex B emissions allowable as CDM LULUCF CERs		
		1	5	10
Permit Price (US$ /tCO_2)		0.25	0.11	0.04
Indonesian CDM Volume	(Mt CO_2)	36	161	257
Indonesian CDM share	(%)	6	23	32
Indonesian LULUCF CDM Volume	(Mt CO_2)	28	154	252
Indonesian CDM LULUCF share of total	(%)	54	50	48
Indonesian CDM LULUCF revenue	(US$ M)	7.0	17.4	9.1
Indonesian gains from trade	(US$ M)	7.2	14.6	7.0

Note: The analysis was done based on Marrakesh outcomes with the US out (see column four of Table 3.9)

These results reflect the relatively low initial cost and relatively steep MAC curve for Indonesia's LULUCF sector compared to other non Annex B countries. Indonesia tends to have a small number of very low cost LULUCF mitigation options, but soon becomes higher cost than other countries. As a result, it gains most of the increase in market share when the initial relaxation of the cap occurs, and the increased volumes offset the reduced permit prices. As the cap moves beyond 5%, other countries make larger volume gains at the expense of Indonesia, and the smaller increases in volume gained by Indonesia are not enough to offset the decreasing permit price.

Increasing the cost of CDM projects through the impost of charges or taxes or through the impost of complex requirements for their registration (see Box 6) will impact on demand. As the costs of CDM projects increase, demand will fall. Table 3.11 shows that Indonesian CDM volumes decrease significantly as cost imposts are applied. This is driven by a dramatic fall in Indonesia's LULUCF volumes. This fall is due to a decrease in Indonesia's relative cost competitiveness in the LULUCF sector as the cost of producing a ton of CO_2 is increased uniformly across the CDM (it is the relative costs that determine market share).

Table 3.11. Impact due to changes in transaction and mitigation costs on Indonesia's CDM share

		Base	Mitigation Costs		
			Equal transaction cost increases	LULUCF transaction costs twice energy	Indonesian cost increases twice other countries
Indonesian CDM Volume	(Mt CO_2)	36.3	16.5	16.1	13.6
Indonesian CDM share	(%)	6.4	4.4	4.2	3.6
Indonesian LULUCF CDM Volume	(Mt CO_2)	28.3	6.5	6.1	3.8

Note: Base is identical with the baseline scenario in column four of Table 3.9 or column two of Table 3.10

Box 6. Types of transaction costs associated with the CDM

Dudeck and Wiener (1998) recognise a number of transaction costs associated with potential CDM investments. They are:

- Search costs associated with the investor finding suitable projects for investment and project developers finding suitable investors. This includes project identification and conducting feasibility studies. These are often internalised in staff costs, but may also be externalised through the payment of brokerage or consultancy fees. These costs are not specific to CDM projects.
- Negotiation Costs which arise from potential investors negotiating the terms and conditions of any investment in a project. This includes costs associated with the development of contractual arrangements between the parties. These costs will occur n any project although the need to negotiate CDM specific arrangements (such as carbon purchase agreements) may increase negotiation costs.
- Approval costs associated with the preparation of project documentation, including baseline preparation, development of a monitoring plan, verification and approval by both the host Government and the CDM Executive Board, including any fees charged for project approval. These are CDM specific costs.
- Costs associated with ongoing monitoring of the project, including inventory costs and the cost of external verification of sequestered carbon. These are CDM specific costs.
- Enforcement costs which arise from the administration of the program to ensure that there is compliance with the procedures set down. These costs will be met from the administration charge on the CDM agreed under the Marrakesh accords
- Insurance costs associated with ensuring that the risks to delivery of CER's are managed. These costs may be borne internally through risk mitigation procedures or externalised through the use of derivatives or insurance policies.

3.6. Financing and Developing Projects

From the long and short term market analysis it appears that Indonesia has opportunities to access the CDM and other climate change related financing. However, as previously noted, the CDM or other climate change related markets are unlikely to provide complete financing for projects in the short term, although it may act as an important catalyst as a source of hard funds. As a result it will be necessary to source other capital and revenue streams to finance projects. These funds can be drawn from a number of different sources, both domestic and international.

3.6.1. Domestic Funding

The CDM specifically allows for a wide range of investment modalities. Countries can unilaterally develop and finance potential projects and retain or sell the CERs. Cost-Rica is well known for having a number of unilateral climate change projects. Moura Costa *et al.* (2001) identify domestic funding as the key component for funding sustainable forestry activities. Historically, the Indonesian forestry sector development has relied heavily on government funding sources.

The major public source of funding for reforestation activities has been the Reforestation Fund (*Dana Reboisasi*), which is funded by a fee charged to the holders of forest concessions. Collections for this fund were US$ 193M and unspent accumulation was US$ 1.6 B in 1998 (Gautam *et al.,* 2000). 40 % of the funds collected are now allocated to the region in which the concession is located and the remaining 60 % are retained by the Central Government. Although

the Fund is meant to fund reforestation and rehabilitation activities where the performance of the concession holder has been inadequate, Gautam *et al.* (2000) note that historically it has acted as a source of general support for the Ministry of Forestry.

Allocation of the monies held in the *Dana Reboisasi* for forest and land rehabilitation is carried out through a variety of Bank and/or non-Bank funding institutions. It is allocated to private and state owned enterprises, Autonomous Region enterprises, Cooperatives, and Forest Farmers Group to carry out reafforestation and rehabilitation activities.

There are likely to be some difficulties with ensuring financial additionality with respect to the application of these funds to CDM projects, as they are part of a long-standing arrangement to finance reforestation activities. However, it is still possible that they could be used to support some elements of projects that contain a CDM element.

3.6.2. Other Source of Funding under the UNFCCC and the Protocol

There are a number of funding mechanisms under the UNFCCC and the Protocol that may be able to co-finance some elements of CDM projects. These include:

- The Financial Mechanism under the UNFCCC operated by the GEF. Article 11 of the UNFCCC establishes a financial mechanism to assist non-Annex I Parties implement their responsibilities under the Protocol. Developed Annex I countries make a commitment to provide funding the financial mechanism.
- The Financial Mechanism funds both enabling activities and specific project activities that have adaptation and/or emission reduction benefits. The projects funded not only produce green house gas emissions reductions and assist the host country in adapting to climate change and its impacts, but they also have an important technology transfer and capacity building element. Since 1991 approximately US$ 1.3 B has been provided to climate change related projects by the GEF. Of this, US$ 94.7 M has been allocated to enabling activities. Some US$ 8.2 B has been raised in co-financing. (GEF, 2001) Currently carbon sequestration is not eligible to receive funding under the GEF climate change program, despite its inclusion in the CDM. The issue of the inclusion of sequestration activities is currently under review.
- The climate change fund be established, established by COP7 in 2001 to finance activities complimentary to those funded by the Financial Mechanism and from other climate change related bi-lateral and multi-lateral sources. Activities to be funded include adaptation, technology transfer and projects in the energy transport industry, agriculture, forestry and waste management. Funding is to be committed from 2005.
- The Least Developed Country Fund, also established at the COP7 in Marrakesh, was designed to assist the least developed countries to institute national adaptation programs. Funds have already been committed to this fund and are pending. The fund is to be operated by the GEF.
- The Adaptation Fund, financed by the 2% charge on the proceeds of CDM projects and other sources. This fund will finance adaptation projects, and will require the approval of the MP of the Protocol before coming into operation. Given the relatively low CDM revenues projected by models, there may be a need to provide the adaptation fund with supplementary financing.

Some of these UNFCCC and Kyoto Protocol funding sources could be used to fund elements of LULUCF projects, especially those relating to capacity building and adaptation.

3.6.3. Other Climate Change Related Funding Sources

Funding for climate change activities is available from a wide range of sources. These include traditional ODA and from other public/private climate change initiatives.

3.6.3.1. ODA Funding Sources and Financial Additionality

Bilateral funding is available from a range of sources for climate change related activities. This includes financing for capacity building, adaptation and technology transfer. Major donors for climate change related activities include Australia, Germany, the Netherlands, Norway, the United Kingdom, The United States, the EU and Japan. Multi lateral funding has been made available from am number of sources, including the World Bank, UNDP and UNEP.

The decisions of the COP make it clear that any funding for the CDM is to be additional to and not substitute for other forms of bi and multi lateral funding. These requirements prevent any direct investment of ODA funds in a CDM project, although they may be applied to capacity building, technology transfer or other activities that are not directly related to project implementation. Such demands also ensure that development aid is not redirected from other areas to CDM projects.

However, this raises a number of interpretational questions. Project developers may be able to overcome the ban on the use of ODA by artificially dividing projects into capacity building and other elements. Clear guidelines on the way in which the decisions of the COP are to be interpreted by the CDM Executive Board and by the Indonesian Government are required to provide greater clarity to investors.

The majority of projects are likely to rely on finance from a mix of sources – private and public, commercial and non-commercial, and bilateral and multilateral funding may be an important element of this. Such a strict interpretation of financial additionality ignores the important role that the CDM can play in leveraging all existing funding sources (both private and public) and could increase the difficulty of funding beneficial LULUCF projects. It would also ignore the important capacity building and wide range of social and environmental benefits provided by LULUCF projects, that might legitimately be funded from bi or multi lateral sources. Moura Costa *et al.* (1999) note that the use of public funds in this way is likely to be an important element in SFM project financing.

Banning the use of ODA funding in the CDM element of any project might be an option that would allow legitimate ODA funding of a project. This would prevent any CER's being received from ODA investments, but would still allow direct ODA investment in a project on the grounds of other social or environmental benefits.. The disadvantages of this approach is that it might result in ODA funding becoming tied to CDM investments made by entities from the donor country. This concern could be overcome by preventing ODA funding from being used where any CERs were to be generated for meeting emission reduction targets in the donor country.

3.6.3.2. Other Sources of Funding

As discussed in Chapter 2.4.5, there are indications that some investors are willing to fund projects that produce climate change and other sustainability benefits, but might not be Kyoto-compliant. In particular, funding from the US and from Japan is likely to be important in this area. While the projects may not be Kyoto compliant, it is likely that for such projects there will still be a requirement to demonstrate that emission reductions are real, additional and have a third party certification.

Accessing these sources of finance will require an intimate knowledge of the market place and promotion of Indonesia as a place for investment in climate change programs and specific projects. It is considered that this is a key role that the proposed national CDM clearing-house could undertake.

3.6.3.3. Other Non Climate Change Related Funding Sources

A wide range of funding is available for forestry projects that are not directly related to climate change benefits. This includes bi-lateral and multilateral funding mechanisms, private non-commercial financing pools (through funding from NGOs and other non commercial sources) and capital markets (funding for the commercial aspects of projects).

An important source of bilateral funding that should be mentioned is the GEF biodiversity program area. The GEF acts as the financial mechanism for the Convention on Biodiversity, and funding for forestry activities is available under the biodiversity program area. Operational programs for long-term biodiversity protection and sustainable use will be have been developed for arid and semi-arid ecosystems; coastal, marine, and freshwater ecosystems; forest ecosystems; and mountain ecosystems.

The GEF has tended to concentrate on the preservation of areas, rather than on the sustainable management of forests (Moura Costa *et al.,* 1999). As a result, projects such as forest preservation (avoided deforestation) and reserve management that have climate change benefits could gain funding under the GEF forestry program area. However, it may be more difficult to obtain GEF funding for project activities such as reduced Impact logging. Other project types such as mangrove management and agroforestry may be eligible for funding under the coastal management and mountain ecosystem management programs.

Moura Costa *et al.* (1999) provided a comprehensive overview of the mechanisms available for funding SFM activities. They note that while there is ongoing debate about the adequacy of financial flows to SFM, the real issue appears to be the relative proportion of capital that flows to SFM verses unsustainable forest management. This is set in a context where private sector capital flows are increasing as a proportion of total capital flows to the forestry sector.

They identify that there are a number of impediments to the implementation and funding of SFM (especially from commercial sources) that need to be addressed if significant capital flows are to be attracted. Various funding programs are available to assist in structural reforms to overcome these impediments and a number of such structural reform programs are already underway in the Indonesian Forestry sector.

They also identified a number of project financing sources that may be available to co-finance or wholly finance sustainable forestry projects that are ineligible for the CDM. Specific funding for the implementation of operational projects is available from a wide variety of sources (Table 3.12). This includes both public and private and commercial and non-commercial sources. Different projects will have funding elements that appeal to different financing sources.

It is important to note that SFM projects often involve pulling together complex financing packages with a number of domestic and international funding sources participating. Some of the contributions may be "in kind" financing, particularly from local sources. Likewise, it would be an exception to see a project that is entirely funded through the CDM. Other sources of commercial or non-commercial finance will normally be required to fund the project in addition to the CDM.

Funding may be contributed on a number of basis, according to the project requirements and objectives and the source of funding. Such funding may include:

- Grants for specific elements of projects, usually for wider capacity building, technology transfer, social or environmental benefits
- Concessional loans from public and private sources;
- Commercial debt or equity investments from public or private sources;
- Micro-financing of small and medium enterprises on a commercial or non-commercial basis;
- Transfer payments through debt for nature swaps and other conditional conservation payments; and
- Payments from the commoditisation of non-traditional forest products and services, including bio-prospecting fees, water use charges, tradable development rights and marketable forest rights and obligations.

As indicated earlier, it is likely that SFM projects will develop innovative financing packages form a variety of sources, both domestic and foreign. While the CDM is a significant source of hard-currency revenue for SFM projects, the development of financing for some projects not eligible for the CDM is still possible.

Table 3.12. Examples of institutions providing sources of capital to the forestry sector

Source of funding	**Funding providers**		
	Public Sector	**Private Sector**	
		Non-Commercial	**Commercial**
Domestic	• Government Departments • Government Agencies (national and decentralized) • Research Institutions	• Forest companies • Sectoral Investors • General Direct Investors • Large Scale Land Owners	• Subsistence Farmers • Rural Communities (including indigenous Communities) • Community Based Organisation • NGO's
International	• Bilateral Donors • Multi Lateral Donors (including funding instruments of international conventions) • Research Institutions	• International Forestry Companies • Sectoral Investors • Specialist direct investors (*e.g.* revolving environmental funds) • General Direct investors • Institution equity investors	• Foundations` • Specialist concessionary funds (*e.g.* sinking environmental funds) • Philanthropists, benefactors • International NGO's

Source : Moura Costa *et al.* (1999)

3.6.4. Project Development Capacity

Indonesia's share of the CDM will not only depend on its investment climate and the regulatory and policy structures put in place, but also on its ability to develop projects. As we have discussed previously, the development of LULUCF projects in particular will require a set of complex skills. These include:

- An understanding of local communities traditional land ownership patterns and the ability to effectively negotiate secuire tenures with those communities;
- The ability to identify all project-related value streams;
- An understanding of the existing regulatory arrangements and how those may impinge on value streams produced by the project, and the ability to negotiate with the various levels of Government; and
- An understanding of innovative financing mechanisms and how they might be applied to each of the value streams produced by the project.

It is unlikely that there will be many, if any, groups in Indonesia with this range of skills. Indeed, there are few organizations *internationally* with the capacity required to successfully develop LULUCF projects. ewer than a dozen international groups have been involved in the facilitation and development of most projects to date.

The lack of project-development capacity may be a major constraint on the ability of Indonesia to service the emerging LULUCF market. Indeed, it is possible that the time required to develop projects and the limited skills and resources will mean that there are capacity constraints on the development of LULUCF projects globally which may effect the potential of the sector, especially if the 1% cap was to be increased.

If Indonesia is to minimise the impacts of such capacity constraints on its ability to develop and finance projects, it has to urgently develop greater capacity in land use project development and financing. The development of the skills base necessary to ensure that Indonesia has the capacity to take full advantage of the opportunities presented carbon offset markets is best achieved through both the implementation of formal capacity building programs and through a "learning by doing" approach.

The former would potentially involve workshops, training programs and other processes designed to increase awareness of the potential of carbon markets and build the skills needed for project development and financing. However, there are likely to be significant capacity building benefits from actually developing and implementing a series of pilot projects. This might involve bringing in the expertise in market analysis, project development and financing from overseas in the first instance. If a mechanism is put in place to ensure that the experiences from these pilot projects are widely disseminated, the capacity building benefits can be highly leveraged This is a role that could be effective fulfilled by the proposed clearing house.

As a result, it is suggested that a high priority be put on the development of pilot projects, and ensuring that the experience from these projects is captured and disseminated further. Again, this is a roll that may be appropriate for the proposed clearing house (refer to Working Report One).

IV. IMPLICATIONS AND STRATEGIES

4.1. Development of Carbon Market for Indonesia

Indonesia gains significantly from the inclusion of the LULUCF sector in the CDM. As a highly cost competitive provider of LULUCF CERs, it can be expected that it will capture a significant share of the market. On the basis of the abatement costs used in the modeling, the inclusion of sinks in the CDM leads to a rise in Indonesian CDM volumes from 14.1 Mt CO_2 to 64 Mt CO_2 if the US had remained in the Protocol. Even with US withdrawal, Indonesian volumes still remain at 33 Mt CO_2. However, the collapse in permit prices with US withdrawal cause Indonesian revenues to fall substantially.

If hot air sales are restricted the recovery in permit prices increases Indonesian CDM volumes increase. This combined with an increase in permit price lifts total Indonesian CDM revenues.

Indonesian CDM volumes are relatively insensitive to changes in overall CDM market volumes. Most of Indonesia's CDM projects are in the LULUCF sector, which remains at the 1% cap regardless of overall market volumes (as low cost mitigation options, LULUCF CERs amongst the last to be lost as market size declines).

However, market scenarios that reduce permit price will have a substantial impact on Indonesia's revenues and net gains from the CDM. This includes restrictions on the sale of hot air and increases or decreases in the annex B abatement costs.

Because of Indonesia's relatively strong competitive position in the LULUCF sector, it benefits from any relaxation of the 1% cap. As the cap is relaxed, the increase in Indonesian CDM volumes outweighs the decrease in permit prices, and Indonesia's revenues and net gains increase. However, as the Cap exceeds 5%, Indonesia becomes less relatively competitive, and the rate of volume increase slows, while permit price falls increase. This leads to a maximization of Indonesian CDM revenues when the cap is 5%.

The relatively large market share of the LULUCF CDM gained by Indonesia is a reflection of a significant relative cost advantage. If the costs of CDM projects are increased by the same amount by the imposition of taxes, charges or through complex approvals processes, the relative cost advantage that Indonesia enjoys in the LULUCF sector becomes smaller. This leads to a loss in market share to other countries. Both volumes and total revenues decline.

This situation is exacerbated if the increases in costs are greater in the LULUCF sector than others sectors or in Indonesia than other countries. In order to protect its comparative price advantage Indonesia should seek to ensure that cost imposts in the CDM are minimized at the international and domestic levels.

4.2. Approaches to Address Key Policies and Regulations

There are a number of laws, regulations and decrees that bear influence upon the land use sector and may impact land use CDM project development in Indonesia. However, only three key regulations were identified which may have the greatest impacts on LULUCF-CDM project development or prevent some activities from taking place, namely:

a. UU No. 22/1999 – Regional Autonomy
b. PP No. 34/2002 – Forest land allocation, forest management planning, forest and forest land use.
c. Keppres No. 118/2000 – Positive and Negative lists for Foreign Investment / Capital Share

4.2.1. Act No. 22/1999 – Regional Autonomy

In the process of restructuring, policy and institutional reform, Indonesia faces considerable challenges in the implementation of these changes. A number of the challenges are associated with the changes from centralized to decentralized government system in which for the case of Indonesia is more appropriate to be called as 'learning process'. Forestry is one of the most affected sectors by the consequences of the decentralization process. The decentralization process started immediately after this Act was promulgated in 1999. However, it was not immediately followed by necessary regulations to enable its interpretation for the implementation on the ground, particularly in view of meeting the requirement of the decentralized system and the need to address various issues related to the sustainability of the forest resources.

Lack of appropriate preparation for changing the governance system from centralized to decentralized system has resulted in an ongoing and severe depletion of forest resources in forest-rich regions. The development of regulations such as PP (governmental regulation), Keppres (Presidential Decree), Kepmen (Ministerial decree) consume considerable time in their preparation. This time period is increased when these regulations and decrees now require synchronization through multi-stakeholders dialogue. A number of initiatives to limit further forest resource depletion have emerged across the country. The Ministry of Forestry, as an institution responsible for formulating forestry (macro) planning has carried out multi-stakeholder' dialogues in the framework of the National Forest Program in order to synchronize forest policy and planning at various levels. The decentralized provincial and district governments are the key stakeholders to be involved in the process as the implementation of their local policies will considerably affect the sustainability of forest resources in the regions.

Considering the current condition of forest resources, resulting from vast rate of deforestation during the last 10 years, the National Forest Policy initiative will place an emphasis on 'forest and land rehabilitation and nature conservation' for the next twenty years. The following five issues have been identified by the Ministry of Forestry as its focus for the period of 2001 – 2004: (i) combating illegal logging, (ii) controlling forest fire, (iii) timber-based industries restructuring, (iv) forest plantation development, and (v) smoothing decentralization.

Community development will be embedded into each of the programme activities that address the five priority issues. The mechanism to deliver these five focal initiatives is still needed to be developed. Another challenge is how these five four year targets can be directed in a way that contributes to the more long-term goals.

The effectiveness of these policy directions will very much depend on how they are interpreted further into legal measures and regulations that are implemented on the ground in the provincial and district areas. Under the current era where democracy, transparency, and participatory, become requirement, the National Forest Program may offer an ideal 'policy framework' for sustainable forest management. It is based on a participatory approach from policy formulation, implementation, monitoring, and evaluation, and policy review, involving a wide ranges of stakeholders. The challenge is to conduct the policy and regulatory development to be effective on the ground.

The promulgation of this Act has seen significant change in the shape of regulatory development across Indonesia. It is also taking a role in the rate and shape of land use change, in particular the increased rate of forest conversion. The Act has lead to a period of transition moving authority and responsibility from central government to provincial and district government. The transition can be characterized as a period of learning and development of new regulations and decrees to implement and deliver change on the ground.

Many of the regulations that will be required to implement this law across all sectors are still to be developed at a provincial and district level, this is apparent in the forest and land use sector. The implications that these changes bring to the development of CDM projects are difficult to assess. During the period of transition there will be some uncertainties surrounding the development of CDM land use projects without the backing of tried and tested regulations in place.

The development of CDM projects will require cooperation across district, provincial and central government. The CDM is an international convention whose rules and regulations are set at the Conference of Parties negotiating table under the auspice of the UNFCCC. The Marrakech Accord has determined the requirements and role to be played by a government host entity, namely the Designated National Authority. However, the mix of stakeholders to comprise the Designated National Authority is not prescribed.

During the period of transition it is likely that the most appropriate CDM development path will be a "project by project" mechanism. This is an appropriate development path, however, as projects are developed in a transitional regulatory environment there is a danger that multiple, ad hoc or disconnected regulations could result, if a project or project type requires regulatory certainty or clarity to proceed. This is not a desirable outcome and part of the role of the Designated National Authority may be to assist in the early development of broad, user friendly and regionally targeted regulations applicable to the development of CDM projects in the land use sector.

4.2.2. PP No. 34/2002 – Forest Land Allocation, Forest Management Planning, Forest and Forest Land Use

The Government has recently put into effect regulation PP No. 34/2002 regarding *Forest land allocation, forest management planning, forest and forest land use*[4]. This regulation has been introduced to being to regulate the prospects for carbon trading and related carbon trading projects that could come into effect in Indonesia.

What does the PP No. 34 mean for land use CDM projects? PP No. 34 appears to be directed at land use CDM project types however this is not explicit to project types and may bear influence on energy or other project types as well.

PP No. 34 applies to two of the three land tenures, as identified by the Ministry of Forestry. These are protection and production forest tenure, yet land use CDM projects may be introduced on conservation tenure. At present the PP No. 34 definition does not cover the full scope of land tenure to which a land use CDM project could potentially operate under.

PP No. 34 places a cap on the area over which a project can occur. This cap is 1000 ha. It is believed that this cap may be an arbitrary cap. Similarly there is a time constraint over which a project can operate, 10 years. The intent of these constraints are unclear and may deter or stop possible projects from being developed. However, PP No. 34 does identify some flexibility built into the timing of projects through an extension facility, although the requirements and mechanisms to do this are not specified. PP34 is relatively broad in terms of who can apply for a CDM project so this is unlikely to cause any restrictions on who can be a project developer.

It is understandable that a number of aspects (that may affect CDM projects) are not clearly defined in PP 34/2002, since a PP (Government Regulation) is not designed to be detail but for its implementation, a PP need to be elaborated further in 'the Ministerial Decrees (KEPMEN)'.

[4] PP No. 34/2002 tentang ' Tata Hutan dan Penyusunan Rencana Pengelolaan Hutan, Pemanfaatan Hutan dan Penggunaan Kawasan Hutan '.

Based on the above analysis, the PP34 could potentially conflict with the development of some carbon forestry projects. Some further implications of PP No. 34 will be on the transaction costs, and that it is important in prioritizing the projects to choose the lease transaction costs. In terms of CDM projects, this arrangement gives more opportunity to small holders in district levels as the permit for IUPJL can be obtained locally (by Bupati). However, as CDM involves commitment among states, it should be discussed further among relevant government institutions and other stakeholders regarding procedure of approval for CDM projects. It is in line with the need to form Designated National Authority (DNA) that is in fact not only required under the KP but also seem to be the most preferred option in accommodating different interest of stakeholders.

The present area limit of 1000 ha may cause prevent large-scale enterprise from being involved in CDM projects. Furthermore, PP34 is likely to discourage project proponents to gain collateral benefits from the activities since the other environmental benefits such as ecotourism, watershed and biodiversity conservation, as it requires, will have to have separate permits. Table 4.1 provides options that may be considered to alleviate some of the issues identified above.

4.2.3. Keppres No. 118/2000 and No. 127/2001– Positive and Negative lists for Foreign Investment /Capital Share

Presidential Decrees (Keppres) No. 118/2000 and No. 127/2001 relate to aspects of Foreign Direct Investment ownership and participation. Some activities under CDM projects may or may not fall under category of 'restricted' or 'negative list' for foreign investment, depending on species or commodity and the scale of activities. For example, under these regulations, non-timber forest product plantations are only allowed for small-scale business and are included under the negative list for foreign investment/capital share. This may prevent some agro-forestry projects from being funded through foreign investor finance.

The Decree is not clear about the treatment of small-scale timber plantations, but for medium to large-scale timber plantations of a minimum 12,000 ha are opened to foreign investment. This plantation minimum size limit may conflict with PP No. 34 that stipulates a maximum carbon project size limit of 1000 ha.

Keppres No. 118 may have an impact upon possible CDM projects through the banning of foreign investment in some aspects of forestry activities. The banned activities for foreign investment include:

a. Strategic activities relating to natural assets (in nursery production)
b. Forest Concession ownership
c. Harvest contractors for forest harvesting

The legal and regulatory environment in Indonesia is in a period of transition. The decentralization and de-concentration of authority is being undertaken in an environment that is characterized as a learning process but has also been viewed as autonomy euphoria leading to impacts including forest over-exploitation.

While the laws that govern land use activities may be in place, the regulations and decrees that will enable and provide practical implementation of these laws on the ground are not all in place. The impact of this regulatory environment on possible CDM project development is unclear. However, aspects of CDM project development that do require regulatory support and legal backing should be undertaken in an environment that reduces impacts such as ad hoc changes, narrow focus, unclear arrangements or a top down approach.

Table 4.1. Possible options for alleviating some issues in PP 34/2002 which may affect CDM projects

Option	Advantages	Disadvantages	Comment
1. PP 34/2002 at the present form	• Restriction on size of projects may reduce the likelihood of large-scale projects and market monopoly in Indonesia (1000 ha per permits) • The rules are already outlined	• Not defined with all carbon projects in mind; lack of clarity on how it will work. • Process of application may discourage project developers. • Project guaranteed for 10 years only in first instance • Limit number of projects per district (two permits per district)	• If the PP34 is to be applied to all carbon projects then further clarification on exactly how it will work for all project types needs to be clarified. Alternatively project screening needs to take this into account, if at all possible
2. Simplified PP34 – in terms of the application process. Project applies directly to designated national authority (DNA), which coordinates application procedure.	• Simple application process attractive to project developers and investors. • Attract early participation in CDM possible, given rules in place, and process is streamlined. • As for option 1	• Could overload the DNA • May reduce the number of projects as a result of centralization. • As for option 1	• Simplified application procedure to overcome some of the difficulties without modifying the underlying principle of PP34, • Project can be applied directly to designated national authority (DNA) with copy carbon to local authorities and the community affected by the projects
3. Affirmative Policy – develop a new policy for CDM projects for acceptance at the presidential level.	• Opportunity to define appropriate regulations based on existing international requirements • Could provide a simple and clear procedure.	• May be difficult to discuss, build consensus and regulate across sectors. • Could take considerable time to put decree in place	• This is not a legal procedure at present but is a common practice that is undertaken in Indonesia
4. Streamlining permit issuance for other environmental services	• Attract financers since the project will have multiple benefits • Attract project developers since one permit will cover all others aspects • Will benefit the local communities for the improvement of their environment	• Reduce income from levy	• The projects will produce collateral benefits other than carbon that can be internalized in the projects activities

It was noted by Simorangkir and Sumantri (2002), that there is no mechanism in Indonesia to deliver new regulations or regulation updates to stakeholders (government or other) following preparation. Consideration of a system of 'gazettal' notices that are circulated to all stakeholders may improve the dissemination of regulation and decree information and enable those staff directly impacted by the regulation to ensure compliance with it. Detail of possible approaches to regulatory development can be seen in Appendix 2.

The Law concerning autonomous government has put in place a mechanism that enables each province and district to duplicate and re-create regulations and decrees as they see fit. The implication of this working environment may impact upon CDM project development and increase the transaction costs as each project in a new area may have to re-establish the regulatory framework in which it will take place.

The government regulation (PP) No. 34 has a direct impact on CDM projects and does need some reconsideration in respect of clarity, its wider relevance across non-forest land tenure and restrictions placed on the size of a project.

Keppres No. 118 can be noted as possibly stopping some land use CDM projects from being able to be undertaken at all. Clarification of this will be required to enable some types of agro-forestry projects to proceed.

The impacts of these circumstances on the development of land use CDM projects may have the following effects:

- Increase transaction cost (thereby preventing some borderline projects from proceeding)
- Increase the timeframe for scoping and pre-project design phase
- Investors may shy away from Indonesia due to uncertain aspects of legal and regulation environment.
- Restrict CDM projects to one or two types of project only.

4.3. National Institutional Setting

Unlike other investments, CDM is unique in the sense that it has to follow sets of rules governed by an international agreement. It has not only economic implications but also political and social implications, as well as forest-related environmental aspects such as impacts on biological diversity and sustainable forest management. For this reason, the existing institutional structures without some adjustments may not be able to deal with requirements and various issues to be addressed under CDM projects. An independent institution which represents all related institutions and other stakeholders can be one possible option in the effort of bringing CDM in Indonesia to have competitive advantages rather than comparative advantages as of other investments.

The first National Strategy Study (NSS) proposed an institutional structure for CDM. For the purpose of this study, considering the existing regulations in forestry sector as well as other related sectors, alternative institutional setting is needed. One possible form of institutional structure is provided in Figure 4.1.[5] The roles and responsibilities under the proposed structure are listed in Table 4.2.

[5] The decentralisation of authority will bring with it a tension if this structure is perceived to be a centralisation of authority for the purposes of CDM projects. The development of a Designated National Authority will need to account for multiple stakeholders, cross-sectoral differences and the role of different tiers of government.

Table 4.2. The roles and responsibilities of National Board and Clearing House

National Board	Clearing house
• Initial and Final Approval • Focal Point • Liaison with National Committee on Climate Change[6] and UNFCCC • Policy setting and interpretation to be implemented by the clearing house	• Library / database • Technical assistance • All aspects of project design and development • Records keeping/documents storage/Administration • Outreach • Coordinate process if project development • Coordinate National Board/Secretariat

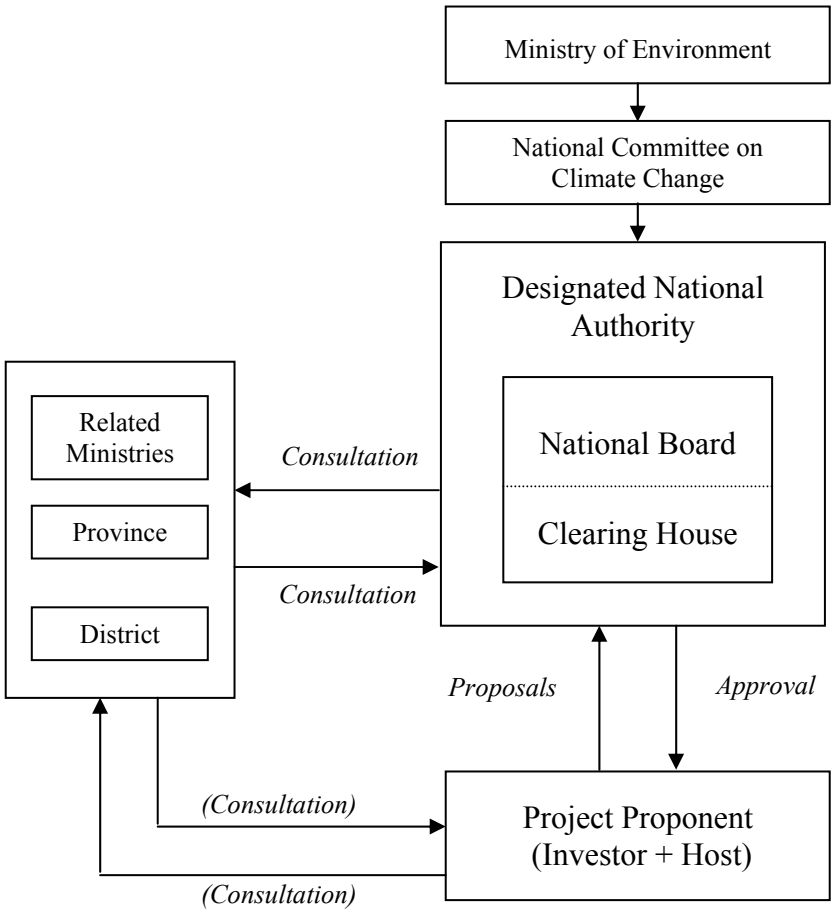

Figure 4.1. Possible structure for a Designated National Authority (DNA) and its link to related authorities. Note: In the case of CDM-LULUCF project, the box of 'related ministries' would be the Ministry of Forestry, although it has been represented by the National Committee on Climate Change, which is an inter-ministerial body.

[6] National Committee on Climate Change is inter-ministerial body assisting the Minister of Environment to implement government policies related to the anticipation of climate change impacts on environment and related sectors. In conjunction with current progress on global climate policies, the Government of Indonesia will enhance the role of this body through Presidential Decree.

4.3.1. The Structure

The focus of the Institutional structure proposed is to facilitate a 'one stop shop' for all aspects of project development and investment to a single point within Indonesia. The study suggested that Indonesia can implement a one stop shop in the early stages, together with other regulations, guidelines and aspects of the CDM requirements, the one stop shop mechanism may place Indonesia in a position of comparative advantage to attract CDM investment.

The Designated National Authority is proposed to be similar in design to that provided in the Energy NSS, except that an attempt has been made to further simplify the structure. The proposed structure is an attempt to streamline the information flows and reduce barriers to entry for both a CDM project proponent and potential investor. The structure should also cater for presently non-Kyoto eligible carbon projects, such as those eligible for the PCF, BCF and CCF, *e.g.* avoided deforestation activities.

4.3.2. The National Board

The Clearinghouse will do the work of the Designated National Authority and they will service (secretariat) the Board requirements. It is suggested that during the development stages of the Designated National Authority, Rules and Procedures for the Board is to draw up and mechanisms for Indonesia to select board members are also developed. The composition of the National Board should ensure that LULUCF projects are considered, and not excluded and that relevant cross sectoral and cross governmental authorities are represented on the Board. The composition of the Board should ensure that other carbon credit schemes may also be facilitated and considered without a duplicate organisation being set up.

There are several points of consideration that need to be accounted for when attempting to determine an appropriate mechanism to facilitate the role of the National Designated Authority. These include:

1. The Energy NSS identified that if Indonesia is to attract CDM projects the institutional arrangements should be independent from the political circumstance. In theory this would be an ideal mechanism for many entities in many different countries. However the landuse sector in Indonesia is very closely tied with the laws and regulations that govern it at all tiers of government and at present these tiers of government are undergoing a period of transition and regulatory refinement.
2. If the prospects of LULUCF-CDM opportunities are to be realised then the inclusion of all tiers of government in the development of a Designated National Authority will be required. The circumstance of not doing so may arise where the DNA exists and is not recognized by provincial and district authorities and they will not provide approvals or support the process of project development.
3. One aspect of a 'one stop shop' approach is aimed at providing Indonesia with a comparative advantage to CDM projects over other countries that could host projects. There is anecdotal evidence to suggest that the 'economic styled market model' that identifies the potential share of CDM projects between countries is not being borne out in practice. This evidence is suggesting that the area of "strategic marketing" such as streamline pre-project development timelines, ease of access to supporting information and strength of legal and regulatory support may be significant factors in the locations where CDM projects being to develop.
4. The role of the clearing house in the Designated National Authority may be facilitated through a 'service delivery model' approach. A service delivery model can be applied to governmental, non governmental and private sector entities and entails a series of

specific tasks and programs that it must undertake to meet its written or contractual terms of reference.

5. It must recognize that the size and arrangements for the Designated National Authority are quite flexible. The Marrakech Accord has recognized a desire to mobilize existing institutional resources and undertake capacity building activities to enable those resources to fully execute the role of Designated National Authority. In effect this can be viewed as a soft startup mechanism that does not over commit or over extend host country resources.
6. The National Board must be in a position to provide policy interpretation and guidance to the clearing house without reliance upon interpretation from the clearing house.

4.4. Sustainable Development Criteria and Indicators

One of the most important requirements should be met by CDM projects before it is approved by the DNA is that the projects must meet national sustainable development goals. It is one of principal eligibility criteria for CDM as states in Article 12 that CDM assist Non-Annex I Parties "in achieving *sustainable development* and contributing to the ultimate objective of the Convention." Thus, there is a need to define national criteria for sustainable development and respective information requirements to ensure a coherent, justifiable and transparent assessment in accordance with the national interpretation of sustainable development.

At a national level, sustainable development programs or national environmental plans may already be in place such as in area sustainable forest management. There are a number of criteria and indicators (C&I) are developed for sustainable forest management by various agencies. These C&I differ in the depth and breadth depending on the objectives in using the C&I. In general, most of them are formulated based on sustainable development principles *i.e.* environmental, social and economic with different stressing. Sustainable Development Criteria and Indicators (SDCI) developed by CIFOR, ITTO and LEI are focused mainly on sustainability of production function, policy and community development, and sustainability of ecological function respectively.

In the context of LULUCF-CDM, this study proposed 14 criteria of sustainable development, *i.e.* five for economic, four for environmental and five for social. The three criteria consist of 42 indicators (Table 4.3). It may not be imperative to use all the indicators for evaluating all type of LULUCF-CDM projects. Each project types may only use some of the indicators relevant to it. Thus, the Sustainable Development Criteria and Indicators (SDCI) proposed in Table 4.3 should be treated as a generic template and it has to be carefully tested and evaluated in line with the objectives of implementing the projects. It has to be born in mind that the assessment procedures should be cost effective, quick, simple, transparent and plausible. Examples of the implication of using SDCI for Natural Forest Management and Agroforestry and forest plantation are given in Box 7 and 8.

As stated in Article 12.2 of the Kyoto Protocol, the Clean Development Mechanism (CDM) has a dual purpose. In one hand it is to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitment. In the other hand CDM is also to assist Parties not included in Annex I in achieving sustainable development and in contributing the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC).

Sustainable development should permit continuing improvements in the present quality of life at a lower intensity of resource use. The process will leave behind for future generation's enhanced stocks of assets (*i.e.* natural and social capital) that will provide undiminished

opportunities for improving their quality of life. In short, sustainable development simply means 'development which lasts'.

Regarding forestry practices in general and sustainable forest management (SFM) in particular there are a number of criteria and indicators (C&I) developed by various agencies. Among others are the template developed by FSC, CIFOR, ITTO, LEI and other certification agencies. These C&I differ in the depth and breadth depending on the objectives in using the C&I. However, most of them categorize the template into principle, criteria, and indicator. A more detailed assessment even uses verifiers for the indicators. The principles are mostly formulated based on sustainable development major elements or objectives, which are economic, environmental and social aspects of sustainability. The criteria are meant to operationalize the principles and usually drawn from knowledge about the relevant activities. The larger the number of criteria are the more knowledgeable the developer (and user) of C&I. The indicators are the direct measures of the criteria that convey a single meaningful message or information. Hence, one criterion could have more than one indicator. From practical point of view they have to be measurable using credible methods.

These approaches may be adopted to develop SDCI for forest carbon projects under the CDM. The SDCI proposed here and shown in Table 4.3 should be treated as a generic template and it has to be carefully tested and evaluated in line with the objectives of implementing the projects. It has to be born in mind that the assessment procedures should be cost effective, quick, simple, transparent and plausible.

Box 7. Implication of C&I for SFM case study in forest concession company for natural forest management

Implication of the sustainable development C & I developed for SFM assessment result obtained from LEI (2001) that was conducted in one concession company in Indonesia indicates that; a sustainable forest management should has forest use efficiency at least 72%, and for the unit management financial record it can be said as sustainable if the profit reached Rp.13 billions of which 19% is re-invested, and the revenue generation achieved to Rp. 15 billions, with solvability more than 50% and liquidity more than 1.3 for the economic aspects.

For the social aspects, the forest is considered sustainable if recognition of farmer-developed options and their voice is consider as sufficient, recognition of locally-invented institutions is good, participation in local planning activities is sufficient, land-tenure security is sufficient, access to public land sufficiently open, human resource development in a good level, local employment is sufficient at the level of at least 50%, and good infrastructure for health, education and electricity facilities.

Sustainability indicators for environmental aspect are not easily measured, such as watershed functions (water supply, soil conservation), and water quality and nutrient cycles (physical, chemistry, biology). However, measurable indicators for biodiversity conservation (genetic resource, endangered species) is consider sufficient if the flora achieved 90% while fauna 80%, the environmental disturbance less than 25% and the number of protected area is relatively high.

Table 4.3. Proposed sustainable development criteria and indicators for forest carbon projects

Principle	Criteria	Indicator
Economic sustainability	1. Adequate source of funding	1. local sources
		2. external sources
		3. long-term
	2. Forest and land resource sustainability	4. use of proper forestry practices
		5. fire risks
		6. secured access to forest/land
	3. Business sustainability	7. company financial health
		8. staff professionalism
		9. demonstrated re-investment
	4. National and regional economical policies exist	10. reserved fund economic policies exist
		11. anti-corruption measures
		12. regional land-use plan
	5. Equitable distribution of economic rent	13. estimate government rent capture
		14. estimate operator rent capture
		15. estimate local dweller
Environmental sustainability	1. Biodiversity maintenance	1 .genetic variation/sp. richness
		2. changes in habitat diversity
		3. endemic species protected
	2. Water conservation	4. water yield and availability
		5. seasonal variations
		6. watershed functions
	3. Land degradation	7. erosion and sedimentation
		8. soil fertility
		9. area of abandoned land
	4. Ecosystem stability of protected areas	10. ecological sensitive area protected
		11. ecological important area managed
		12. intensity of wildlife disturbance
Social sustainability	1. Local community participation in planning	1. number of representative
		2. two-way communication
		3. voice heard
	2. Recognition locally-invented practices	4. adopted proven techniques
		5. publicity
		6. dissemination/impacts
	3. Recognition locally-invented institutions	7. adopted proven institutions
		8. intergenerational links
		9. dissemination
	4. Recognition of customary right	10. role of informal leaders right
		11. decision-making process
		12. agreements on right and responsibility
		13. property rights and land
		14. secured tenure system
	5. Legal framework on forest and land	15. transformation concession allocation

Box 8. Implication of C&I for SFM case study in agroforestry and forest plantation

Unlike the C & I for SFM of the natural forest resource, the forest plantation management and agroforestry and community forest, are yet need to be discussed and developed. The first test of FSC on forest plantation sustainable management and separated study on agorofrestry and community forest systems indicates in principle that; the economic aspect including forest use efficiency 65% - 85% for forest plantation, profitability, revenue generation, solvability, and liquidity should be high.

It is obvious that to have sustainable development in the agroforestry and community forest, the social aspects becoming significant, with assessment grade between good and sufficient, for farmer-developed options recognition and their voice, locally-invented institutions recognition, good participation in local planning activities while for forest plantation the sharing benefits and development of social program such as PHBM /collaborative forest management is performed, and fine land-tenure security. It is prerequisite that access to public land should be sufficiently open both for agroforestry, community forest and forest plantation, where human resource development maintained the traditional values, whilst local employment can be widely accepted and agreed at the sufficient level of worker. Other indicator that is not directly related with resource management but has a very significant influence on community livelihood is sufficient infrastructure (health, education, electricity).

Agroforestry and community forest are well known to have significant environmental function such as watershed functions (water supply, soil conservation), water quality and nutrient cycles (physical, chemistry, biology), biodiversity conservation (genetic resource, endangered species), where the environmental disturbance is usually less than < 25%, and the size of protected area is big enough to fill in the function as expected. For forest plantation, the protected areas must be near to 50% of the total forest areas.

4.5. Stakeholder Analysis and Capacity Buildings

4.5.1. Stakeholder Analysis

The Marrakech Accords established a set of principles to guide capacity building and technology transfer activities under the Convention. In particular, the frameworks noted the need for existing institutional resources to be mobilized, the important role of national focal points and the need for integrated strategies to be developed. Host countries are encouraged to identify their specific needs, options and priorities, to involve stakeholders and promote coordination of capacity building activities.

CDM on LULUCF sector will require involvement of various stakeholders at the national as well as at the local levels in various degrees, of which the capacity of stakeholders involved will be one of the determinants of how far Indonesia can benefit from hosting CDM project. It was also identified in this study that to be able to attract CDM projects, some inconsistencies between the requirement under Kyoto Protocol and national laws governing LULUCF sector need to be harmonized. And so, to be able to address these two issues appropriately, key stakeholders that will likely influence the process of CDM-LULUCF projects were identified. Information obtained through identification of stakeholders will also be useful in determining stakeholders to be represented in the Designated National Authority (DNA) for CDM and other carbon-based projects.

Stakeholders at the national and local levels in general (Table 4.4) was determined based on their roles and interests to forestry sectors related to CDM-LULUCF projects, whereas stakeholders in each of LULUCF projects were identified using information obtained from

various processes in each of the three types of forestry-related projects that contained relevant issues to CDM-LULUCF projects.

Table 4.4. Identified stakeholders at different levels and their roles or interests related to CDM on LULUCF

No	Level	Stakeholders	Role and/or Interest
1	National	• Ministries (MoE, MoF, MoFA, MoFin, BAPPENAS, MoEcon) • Investment Agency (BKPM) • Forest-based enterprise • DPR • Forestry-related NGOs	• Policy-related aspects • Investment (CDM vs other investments) • Policy-related aspects, public welfare. • Depending on the focus of activities (e.g. conservation, public welfare)
2	Local	• Local government • Related government institutions (e.g. forestry, BAPPEDA, a • Community/community groups, • Forest-based enterprise • DPRD • Local (forestry-related) NGOs	• Policy-related aspects, (different emphasis and scope) • Social-economic aspects (e.g. livelihood, access to forest resources). • Investment • Policy-related aspects, public welfare. • Depending on the focus of activities (e.g. awareness raising, activity collaboration)

At the national level, the success of harmonization between KP and existing regulations on LULUCF sector need a close collaboration between The Ministry of Environment (MoE) as the Focal Point of UNFCCC/ KP and the Ministry of Forestry (MoF) as the institution holding the authority towards forest resources management. Other government institutions responsible for national development planning, foreign affairs, and financial matter including revenue from forestry sector are also the key stakeholders that need to be involved in the harmonization process and be represented in the proposed DNA. Other stakeholders such as business communities, DPR, and forest-related NGOs, as well as stakeholders at the local level should ideally be involved in the process, although it does not necessarily all be represented in DNA.

4.5.2. Capacity Building

Considering the complexity of the issues related to CDM on LULUCF and the observation on the current status of stakeholders' understanding towards relevant issues of CDM on LULUCF, capacity building at the various levels is deemed necessary.

The Ministerial declaration in COP-7 stressed out the importance of capacity building and technology transfer in respect of key sectors of development. The Marrakech Accord also emphasized that capacity-building should assist developing countries in strengthening and enhancing their capabilities to achieve the objective of the Convention and the preparation for their effective participation in the Kyoto Protocol process. The Accord also included CDM as one of possible areas under the framework for capacity building in developing countries. The developing countries, under this Accord, should identify their specific needs, options and

priorities for capacity-building on a country-driven basis, taking into account existing capacities, past and current activities.

4.5.2.1. Identifying Capacity Building Needs

Capacity Building at the National Level

At the national level, capacity building needs identified in this study covered stakeholders shown in Table 4.5. The scope of their roles and/or interests was used as the departure for identifying capacity building needs for stakeholders at this level, taking into account sustainable development C&I proposed in the NSS (see Technical Report: Chapter 4) which need to be tackled through capacity building activities in meeting them. Table 4.5 shows capacity building needs for various institutions or stakeholders at the national level were identified in this study.

Table 4.5. Identified capacity building needs at the national level

No.	Stakeholders	Role and/or Interest	Capacity Building needs
1	• Ministries (MoE, MoF, MoFA, MoFin, BAPPENAS, MoEcon) • DNA (National Board and Clearing House)	Policy-related aspects See Table 3	• Negotiation skills • Consensus building • Institutional development
2	Investment Agency (BKPM)	Investment (CDM vs other investments)	• Strategic investments
3	Forest-based enterprise and other potential CDM developers	Investment viability (CDM vs other investments)	• Strategic marketing • Risk management
4	DPR (People Represenatives)	Policy-related aspects, public welfare.	• Awareness on relevant issues of CDM (political, social, economic and environmental issues)
5	Forestry-related NGOs	Depending on the focus of activities (*e.g.* conservation, public welfare)	• Awareness on relevant issues of CDM depending of the focus of activities (*e.g.* environmental, social-economic issues)
6	Potential CDM Operational Entities and/or existing Certification Bodies	CDM rules and procedures, and other relevant regulations	• Awareness on relevant issues of CDM (*e.g.* modalities, rules, procedures) • Technical skill building

In terms of the area for capacity building, legal and regulatory, and institution are two strategic areas for capacity building at the national level, with approach and activities as explained in the following sections:

1. Legal and Regulatory Capacity Building

   CDM is a project based mechanism that can offer wider development and training opportunities. The opportunities that present themselves in the legal and regulatory analysis include:

   a. Demonstration project using the CDM process to test case multiple stakeholders, cross-sectoral and inter-governmental regulation revision or development.
      - Key skills to be developed in this activity would include consensus building and some negotiation skills
      - Key outputs would include transparency of development procedures leading to consensus and implementation through stakeholders
      - Key knowledge to be derived includes the political, organizational and social drivers that will shape not only the CDM process but other land use programmes under a decentralized government. UU No. 41/1999 (~PP No. 34/2002) and UU No. 22/1999 (~PP No. 25/2000), could be used as a test regulation to work this through

   b. Development of a law, regulation and decree information dissemination mechanism to engage with and inform stakeholders about regulation development. UU No. 41/1999 (~PP No. 34/2002) and UU No. 22/1999 (~PP No. 25/2000), could be used as a test regulation to work this through

   c. Development of common regulation terms and definitions which will assist in coordination and harmonization of sectoral policies and planning at different levels

   d. Development of common terminology and definitions in the land use sector which will assist in cross referencing regulations.

2. Institutional Capacity Building

   Institutional capacity building is one of possible scopes for capacity-building in developing countries as broadly identified in the annex to decision 10/CP.5, in the compilation and synthesis document prepared by the secretariat, and in submissions by Parties, and is stated in Marrakech Accord. The Accord also emphasizes the important role of existing national institutions in supporting capacity-building activities. Such institutions can incorporate traditional skills, knowledge and practices, to provide appropriate services and facilitate information sharing. Below is possible area for and aspects to be considered in institutional capacity building related to CDM :

   a. Institutional development that may include training workshops for potential Designated National Authority (DNA) members to enable them to make decisions in a well informed environment

   b. Strategic marketing, that is a key area of skills transfer which can develop comparative advantages with potential CDM investors
      - Key outcomes include recognition of the primary drivers of CDM investment and a means to target those drivers
      - Deliverables may include documentation, brochures and guidelines targeting project developers and potential investors

   c. Broad based support can be achieved through information workshops, guidelines and opportunities to engage with CDM projects.

Capacity Building at the Project Level

At the project level, identification of capacity building needs in this study was mainly intended to address potential barriers in the five proposed project types for CDM identified by NSS Team, taking into account C & I of sustainable development proposed by NSS Team (see Technical Report: Chapter 4) which need to be tackled through capacity building activities in meeting those C & I. The five project types are the following: (a) community forest, (b) mangrove forest management, (c) multi-purpose tree plantation, (d) bio-energy, and (e) reduced impact logging (RIL). Table 4.6 shows approach for capacity building to address barriers identified in the five proposed project types which includes technical, institutional/regulatory, and economic barriers, as well as capacity building activities which can be carried out through one or more of the four different approaches.

The four different approaches to strengthen stakeholders capacity at the project levels modified from Lapera (2001), includes :

a. Political approach where the power/authority holders direct the policy to improve human resources and strengthen institutional capacity
b. Social approach that focus on empowerment of individuals/community groups, and local institutions as the media for social interaction and networking
c. Economic approach in the form of economic intervention that may improve people's welfare and
d. Technical approach for skill building

4.5.2.2. Strategy for Capacity Building

The Marrakesh Accord recognized Capacity Building as part of the framework of the Accord. The CDM is a component of capacity building activities and needs to integrate with the implementation of the decision. Key issues that need to be considered include:

- The most effective way to ensure that the priorities identified for the implementation of the CDM are consistent and support broader capacity building priorities.
- The interaction between the proposed CDM Board and other institutions/ coordinating authorities with regard to capacity building
- How the NSS can most effectively integrate into and participate in wider capacity building programmes.

Table 4.6. Approach for capacity building to address barriers identified in the proposed project types for CDM

Barriers	Approach for capacity building for each project type				
	Community forest	Mangrove forest management	Multipurpose tree plantation	Bioenergy	RIL
Technical barrier					
Land availability					
Labour availability				S, E, T	S, E, T
Expert availability					
Land suitability information	P, S,T	P, S,T	P, S,T		
Understanding the technology	P, S,T	P, S,T	P, S,T	P, S,T	
Land productivity					
Access to technology			S, E, T		
Access to location	P, S, E, T		P, S, E, T	P, S, E, T	
Growth rate		S, E, T			
Risk (fire, illegal logging etc.)		P, S, E, T			P, S, E, T
Institutional barrier					
Policy and Regulation	P	P	P	P	P
Commitment of the government	P	P	P	P	P
Community support	P, S, E	P, S, E	P, S, E	P, S, E	P, S, E
Land tenure	P, S, E	P, S, E	P, S, E	P, S, E	P, S, E
Permit	P	P	P	P	P
Economic barrier					
Market access	P, S, E, T	P, S, E, T	P, S, E, T	P, S, E, T	P, S, E, T
Internal Funding Sources	P, E	P, E	P, E	P, E	
External Funding Sources	P, E	P, E	P, E	P, E	
Access to credit	P, S, E, T	P, S, E, T	P, S, E, T	P, S, E, T	P, S, E, T
Investment	P, S, E, T	P, S, E, T	P, S, E, T	P, S, E, T	P, S, E, T
Benefits (Revenue and Profit)	S, E, T	S, E, T	S, E, T	S, E, T	
Tax and retribution	P, E		P, E		
Competition in land use	S, E, T	S, E, T	S, E, T	S, E, T	S, E, T
Payback period	S, E, T	S, E, T	S, E, T	S, E, T	S, E, T

Note :

P, S, E, T, are approaches for capacity building with explanation as follows:

P : Capacity building through **political approach** (form of capacity building activities: workshop/meeting involving government institutions in order to create a conducive policy to address the barriers).

S : Capacity building through **social approach** (form of capacity building activities: training, field trip or comparative study, extension programme, informal gathering, in order to empower stakeholders particularly local community).

E : Capacity building through **economic approach** (form of capacity building activities: training, information dissemination, comparative study; along with or part of the programme introduced by the government to improve people welfare.

T : Capacity building through **technical approach** (form of capacity building activities: training, comparative study, extension programme, in order to empower stakeholders).

In relation to capacity building, forestry or in a broader scope LULUCF sector has a long history in capacity building programme. Lesson learnt from various capacity building programmes in forestry sector suggested the following strategy for successful capacity building:

a. Include capacity building as a national programme.

   Capacity building for developing countries is an integral part of much bilateral and multilateral cooperation including the framework climate convention. The cooperation varies from one to another in their focus, and are attached in many different institutions and organizations, hence, the capacity building programmes in many cases are carried out partially, although there are overlapping in some areas and even the target groups.

   For this reason, in order to optimize the use of resources for capacity building, and to obtain maximum possible positive impact of it, capacity building should be included in a national programme, taking into account the specific issues to be addressed under different conventions and agreements, and specific capacity building needs for different stakeholders (*e.g.* government institutions, private companies, forestry-related NGOs, and community groups).

b. Create enabling condition.

   Capacity building programme, for some reasons, covers only limited scope and target groups. In order to gain a broader positive impact from a capacity building programme undertaken for CDM or LULUCF related projects, there should be a mechanism that enable the impact reach as broad as possible beneficiaries. One possible way is through developing or strengthening the link and coordination between various institutions engaged with: training and education, extension, research and development, and policy making. Through a strong link and coordination, it is expected that these institutions can develop an integrated programme for capacity building 'in the common areas' to be carried out by different institutions, with different focus and different target groups. Promoting as much as possible 'learning by doing' process, will increase the positive impact of the capacity building programme.

c. Enhance information sharing and networking at different levels (national, regional, and international levels)

   Information sharing and networking is known to be an effective way in building both individual and institutional capacity. The benefit from the enhancement of information sharing and networking among stakeholders at the various levels has been widely recognized. Information technology has played an important role in enhancing the interaction among individuals and organizations/ institutions from all over the world independent on time and space. Mailing-lists and other facilities for sharing knowledge and experience on climate-related issues (including CDM) using electronic media have benefited scientists, policy makers, practitioners, and other related stakeholders, in many countries including Indonesia.

   Under the Marrakesh Accord, South-South cooperation, is encouraged, by utilizing the services of institutions in developing countries that can support capacity-building activities at the national, sub-regional and regional levels. This open opportunity among developing countries which many of them share common problems in climate-related issues but have diversity of interests and priority in CDM projects, to enhance their collaboration particularly for sharing both effort and benefit.

4.5.2.3. Funding for Capacity Building

Under the framework of climate change convention, the main source of funding for capacity building is Global Environment Facility (GEF) and is distributed through various channels. Other than GEF, there have been a number of projects that give benefits in terms GHGs reduction similar to the effect of CDM projects, financed by public funding. In Indonesian forestry sector itself, there exist four carbon-based projects with different focus and scope, funded by the governments of Japan (JICA), Australia (ACIAR), and Canada (CIDA). However, there remain a debatable issue on the extent of what Marrakesh Accord stated that the use of public funding for CDM should not cause the 'diversion of ODA', be interpreted in its implementation.

The issue, nevertheless, is well anticipated in the Marrakesh Accord. Under the Accord, bilateral and multilateral agencies, and other intergovernmental organizations and institutions, are encouraged to consult with developing countries in formulating programmes and action plans to support capacity-building activities in accordance with the framework for capacity building, and report to the COP through the secretariat, on capacity-building activities conducted to assist developing countries with their implementation of the framework. This mechanism offers an opportunity to tackle the issue surrounding the use of public funding for CDM-related activities.

Under the Marrakesh Accord, it is clear that Capacity-building activities should be undertaken in an effective, efficient, integrated and programmatic manner, taking into consideration the specific national circumstances of developing countries.

Considering the current condition of Indonesia, two different levels of capacity building proposed in this study, national and project levels, are considered to be an appropriate way in addressing barriers for attracting investment on CDM and other carbon-based projects. As described in Table 4.4, there are some similarity in interests and roles of stakeholders at the two different levels (national and local), however, they have different scopes and emphasis in the needs for capacity building.

At the national level, the most strategic areas for capacity building include legal and regulatory aspects and institutional aspects. Consensus building and negotiation skills are crucial aspects of capacity building at this level especially under the current situation where a number of related regulations on LULUCF sectors are conflicting in various degrees, and that harmonization among them is the only option when amendment of the conflicting regulations are neither easy nor necessary. Knowledge on political, organizational, and social aspects that will shape CDM and other land use programme, should also be derived in the capacity building programme at the national level. On the institutional aspect, potential members of DNA are the main target in institutional development, as they have to be able to make decisions in a well informed environment.

At the project level, capacity buildings is targeted to tackle potential barriers in CDM and/or other carbon-based projects identified in the study, and the use of three different approaches - political, social, and economic- helped to further identify specific detail of activities to address each barrier for different project types. Although the specific detail of capacity building activities in this study was constructed based on limited data, which was obtained through observation and multi-stakeholders consultation in eight districts (coordinated by Task 3 and Task 4), the finding of the study sheds light on the problem in identifying capacity building needs at the lowest level which is generally difficult and time consuming. The approach used in this study may be adopted in other areas with similar condition.

The strategy for capacity building proposed in this study is in line with guidance under the Marrakesh Accord. The inclusion of capacity building as a national programme, creation of enabling environment, and enhancement of information sharing and networking, were proposed

in this study as the strategy for capacity building, based on lessons learnt from various capacity building programmes in LULUCF-related sector.

In regard with the use of public funding in CDM or CDM-related capacity building, the major implication is in the use of ODA. It has agreed that the use of public funding for CDM should not cause the diversion of ODA. While it is possible to introduce strong compliance under the Kyoto Protocol, however, there is no binding measure that control the amount of ODA which developed countries should put under their budget allocation. UN target of 0.7 % of GNP to be allocated by developed countries for ODA has not been met by majority of these countries, and in fact there is an indication that the total ODA has continuously declined.

4.6. Technical Implication of Kyoto Forest Definition in Indonesian Context

The use of the current Kyoto forest definition may create problems and some consequences for developing countries. The problems are (Dutschke, 2002):

1. Data may not be available. In many developing countries, time series data of forest cover more than 15 years is hardly available. The temporary limit of 31 December 1989 will create difficulties for the Annex-1 countries to determine the eligible Kyoto land for the CDM-sink projects.
2. Difficult to define the point of transition from forest to non-forest. If there is no explicit clear-cut, but rather a slow degradation, it is extremely hard to tell the point in time of land use change from forest to non-forest.
3. Limit the ability to participate. If forest cover threshold is set too low, this will limit the country's ability to offer Afforestation and Reforestation projects.

Based on the above fact, there is a need to define definition of forests in the context of Kyoto Land and assess the consequence of adopting the definition in Indonesian context. The following discussed the general consequences of adopting minimum area, crown cover and tree height on available eligible Kyoto Land and project types.

Minimum area. Adoption of minimum area of 0.05 may increase the potential land area eligible for CDM projects. It is quite easy to find bare land in many areas in Indonesia with size of minimum 0.05 ha. Number of project types that are eligible under CDM may also increase. For example, enhance natural regeneration may become eligible since many of degraded forests (logged-over forest areas) have a number of spots without tree with size of more than 0.05 ha. Thus, by increasing the adopted minimum area to 1 ha, total area eligible for CDM projects will decrease. However, it should be noted that transaction cost of CDM projects implemented in many small areas will be higher than that of projects implemented in a single larger area.

Crown Cover. Adoption of minimum crown cover of 10% may decrease the potential area for CDM projects, as many of degraded land may still have a number of trees which are able to grow and potentially to have tree crown cover of more than 10%. Thus, by increasing the adopted-minimum crown cover to 30%, the potential area of eligible Kyoto land may increase. Unlike the area definition, the crown cover definition is a trade off between the potential of the land to be Kyoto eligible (under the definition) and the potential for project activities to achieve a land use change and be eligible land use change activities (under the definition). The trade off is difficult to qualify or quantify without substantial crown cover spatial data sets across large areas of Indonesia. The 10% crown cover may enable potential wide spaced agroforestry projects to achieve a land use change and potentially be eligible, whereas the 30% crown cover may prevent some wide spaced projects being included.

Tree Height. Adoption of minimum tree height of 2 m may decrease the potential area for CDM projects, as many of degraded land and forest may have tree with height of more than 2 m. Thus by increasing the adopted minimum tree height to 5 m, the potential area of eligible Kyoto land may increase. Similar to crown cover, the tree height definition is also a trade off between the potential eligible Kyoto land area and the potential for projects to achieve a land use change. The trade off is also difficult to qualify and quantify without significant effort to analyses the impact of a decision.

In defining eligible Kyoto Land and eligible CDM project, the three criteria have to be used. The following example illustrates how the adoption of a forest definition will affect the eligible area and project types. Suppose, Indonesia will adopt definition of forest in the context of Kyoto as a land with a minimum area of 0.05 ha with tree crown cover more than 30% and the trees potentially to grow and reach 5 meters in-situ. Using this definition, it is very likely that enrichment planting in highly degraded forest will be eligible. The reasons are:

1. Highly degraded forest may have many spots with tree crown cover of less than 30%.
2. Naturally, the highly degraded forest may not be able to grow and reach a condition of having tree crown cover of more than 30% with height of more than 5 meters.
3. Many lands in highly degraded forests meet the above two conditions with area of more than 0.05 ha.

However, if the above definition is adopted, there is a possibility that some of agroforest projects will not eligible under CDM as some of agroforest systems (wide spaced agroforestry systems) may not be able to have tree crown cover of more than 30% with height of more than 5 meters. Table 4.7 shows the consequences of using various forest definitions following Kyoto rule on type of eligibility projects.

Development of capability to rapidly assess available eligible Kyoto land and eligible CDM projects at local level is very important. A simple procedure to define the eligible projects and eligible lands should be developed. This will enable policy makers and local stakeholders to assess quickly the potential areas and projects in their areas.

4.7. Technical Implication of Adopting Rational Baseline in Indonesian Context

Setting the baseline and determination of additionality are the two factors that will determine whether the reduction or enhancement of sequestration would occur in the absence of project activity. Thus, what would be the likely projection of carbon stock under the absence of the CDM projects should be estimated. The estimation of the projection could be done either using data generated by models, historical data or data based on strategic planning that has already been established by the project host in the absence of the CDM project (see above). However, the fact that different sources of information can be used to establish the baseline scenario, makes the exercise difficult and may result in a range of carbon offset estimations. This is not unique to land use projects, but it is a problem for all project based analyses of carbon benefits. For example, imagine a candidate CDM project host that already has plan to develop an agro-forest system on degraded lands at a rate of 100 thousand ha annually. However, based on historical data and considering the economic conditions, this planned rate of establishment may not be met by the host. The question is which figure should be used for setting the baseline and additionality arguments. Is it: a) only the planting that occurs on more than 100 thousand ha can be considered as additional; or, b) given the lack of capacity for the project to implement the 100 thousand ha plans, any new planting can be considered as additional.

Table 4.7. The consequence of adopting a given forest definition on types of eligible CDM projects

Forest definition[1]	Eligible Projects	Non-eligible projects
Tree crown cover 10% with height 2 meters and with minimum area of 0.05 ha	• '*Simple agroforest system*' (coffee-based agroforest etc.) • Any project that meets the definition will be eligible	Enrichment planting of degraded forest. By having a lower crown covers large areas of currently degraded forest areas may qualify as forest. This will reduce available Kyoto lands.
Tree crown cover 10% with height 2 meters and with minimum area of 1 ha	• '*Simple agroforest system*' (coffee-based agroforest etc.) with size not less than 1.0 ha	Projects under one hectare would not be eligible unless bundling of land area is allowable, however it is unclear if this has to be in a contiguous block. For Indonesia, this means that activities taking place on blocks of less than one hectare may not be available.
Tree crown cover 30% with height 5 meters and with minimum area of 0.05 ha	• Enrichment planting of highly degraded forest • Agroforest (multi tree species types and added complexity, rubber-based agroforest) in land not less than 0.05 ha that will grow and meet the forest definition • Reforestation which use tree that can grow and meet the forest definition	*'Simple agroforest system' that can not grow and meet the forest definition*
Tree crown cover 30% with height 5 meters and with minimum area of 1 ha	• Enrichment planting of highly degraded forest • *Agroforest* (multi tree types and added complexity, rubber-based agroforest) in land not less than 1 ha that will grow and meet the forest definition	*Agroforest* (multi tree types and added complexity, rubber-based agroforest) in land less than 1 ha

Note: [1]Any values between the range set for tree crown cover, height and minimum area in the Kyoto forest definition can be adopted. In Indonesia, there are large of highly degraded forest available and can be rehabilitated through enrichment planting program. Adopting a definition that includes the enrichment planting as eligible project may be worthwhile.

In the case of many developing countries, the use of rational baseline (see Section 2.2.3) may be more appropriate. For example, in Indonesia, the forestry sector rate of afforestation and reforestation implemented in the field was much lower than government targets. The planned rate of reforestation, based on government plans, was 250 thousand hectares per year. However, in reality less than 250 thousand hectares per year were actually planted in most cases. From the last ten years data, the average of planting rater for reforestation was around 100 thousand hectares, much less than the planned rate, similarly for afforestation (Boer, 2001). The survival rates were also very low. For affforestation, the survival rate was normally about 60-75%, and in some areas it can be as low as 6% due to the use of poor quality planting stock, repeated fires after planting, and lack of post-planting tending. For reforestation program, the survival rate was lower than that of afforestation (about 30-40%) due to poor maintenance (FAO and MoF,

1990). Considering these conditions, Boer (2001) developed a rational baseline with assumption that in the future within a certain given period the rate of planting for forests and land rehabilitation program would follow the historical pattern as well as rate of deforestation.and then improve slightly in the subsequent periods considering the improvement of economic condition. Using this assumption, it was found that the national carbon pool under the rational baseline would decline continuously through 2030, whereas, under potential mitigation scenario (all degraded land, unproductive forest and critical lands are used for forest mitigation projects), the national carbon pool will decrease at a slower rate up to 2010 and then increase through 2030. However, the increase of carbon stock will not be enough to offset the loss of carbon due to deforestation since 1990. Under the rational baseline, the national carbon pool in 2030 will be about 87% of the 1990's carbon pool and under the mitigation scenario will reach up to about 98% of the 1990 carbon stock. As under rational scenario the national carbon stock will be difficult to increase without any new initiatives, therefore, any new planting activities from new initiatives can be considered as additional.

4.8. Potential Areas for Forest Carbon Projects

Following the Kyoto rule that for the first commitment period, reforestation activities will be limited to those areas that were not forested on 31 December 1989. Considering Canada proposal to change the define date to 31 December 1999, this study also provided an estimate of degraded forest/lands for both baseline years, 1990 and 2000. The difference between data from 1990 and 2000 is quiet significant (16.6 millions ha; Table 4.8). In term of accuracy, the 2000 estimates were also more accurate than the 1990 estimates.

Table 4.8 shows that in 1990, there were about 32.5 Mha of degraded forest/lands. Of 32.5 Mha, about 30% is in the form of critical or degraded lands and grassland. In 2000, the total degraded forest/lands in Indonesia are about 49.2 millions ha, and about 53% of these lands are in the form of critical or degraded lands and grassland. In term of Kyoto rule, most of critical or degraded lands and grassland can be categorized as Kyoto Lands. Whereas, it is very likely that some of the fallow lands and shifting cultivation/waste land/garden could not be categorized as Kyoto eligible lands since their crown cover might be more than 30% (assumed the adopted critical crown cover is 30%; see section 2.2.1). On the other hand, some of the 1990's critical or degraded lands and grassland might have been converted into other uses or planted with trees for *rebosasi* and regreening programmes.

Table 4.8. Estimated potential area for forest carbon projects in Indonesia

No	Land use cover	1990 Area (Ha)	2000 Area (Ha)
1	Critical lands (inside & outside forest areas)	6,787,800 [1]	23,725,552
2	Fallow land	9,823,175 [2]	10,260,492
3	Grassland	3,219,648 [1]	2,424,469
4	Shifting cultivation / waste land / garden	12,718,787 [3]	12,768,711
	Total lands	32,54 9,410	49,179,224

Source: Central Bureau of Statistic (BPS; 1990,2001), *data year 1990, FAO (1991). [1]Some of the critical lands and grassland might have been converted to other uses or planted by trees (*rebosasi* and regreening programmes) after 1990. [2]Not all lands of the fallow lands are considered as eligible, since some might have trees with crown cover more than 10-30%. [3]Shifting cultivation/garden may be eligible if the crown cover less than 30% with an area more than one hectare (assumed the adopted critical value of minimum area for forest is one hectare).

Using assumption that only half of the fallow lands and shifting cultivation/waste land/garden meet the Kyoto forest definition, and only one-fourth of the critical or degraded lands and grassland had been used for *rebosasi* and regreening programmes or converted to other uses, the total estimate of eligible land for CDM projects would be only 17 Mha. If the baseline year were shifted to 2000, using the same assumption, the total eligible land for CDM would double. Following to the Indonesian practices, each type of land may be appropriate for a certain project type. Table 4.9 provides estimate of area that can be used for the implementation of forest carbon projects by type as well as potential mitigation of the projects. It was found that mitigation potential of the projects was estimated to be about 5.5 Gt C. If it is assumed that the average of life cycle of the projects is 30 years, total carbon that can be absorbed by projects annually is about 184 million tons. This result suggested that Indonesia potentially could absorb all forest carbon projects as during the first commitment period, size of carbon market for forest carbon projects was only 25 million tons C per year.

Table 4.9. Forest carbon project types and areas available for mitigation options

LU cover	Baseline tC/ha	Potential Carbon sink project types	Available area for mitigation (Ha)[1]	Mitigation Potential (tC/ha)	Total mitigation potential
1	2	3	4	5	6 (4 x 5)
Critical lands	5	*Rebosasi*	4,898,800	199	947,702,000
Critical lands	5	Forest plantation/ HTI (Timber estate)[2]	1,889,000	48	90,672,000
Fallow	37	Community forest	9,823,175	109	1,070,726,075
Grassland	10	Regreening	3,219,648	278	895,062,144
Shifting cultivation	11	Agroforestry [3]	12,718,787	198	2,518,319,826
			32,549,410		5,522,482,045

Note: [1] Assumed that all the 1990's degraded forest/lands were used for forest carbon projects. Mitigation potential in column 5 is an average value obtained from calculation of various type activities using COMAP (Sathaye *et al.,* 1995) , while baseline carbon in column 2 is an average value of predicted biomass calculated from various sources (Boer, 2001). [2] short rotation of fast growing species (7-8 years). [3] in the form of social forestry/MPTS plantations or private forest.

4.9. Project Pipelined and Portfolio

In order to minimize risks and barriers for implementation, selection of sites is very crucial. Sites that have high potential conflict should not be selected as for project location even though mass eligible Kyoto lands are available. Therefore, a set of criteria for site selection should be applied. It is suggested that for initial screening, sites selected for projects should have the following condition:

1. Local institution/organization well function
2. Community extension exist
3. Stakeholder network well function
4. Commitment of local government is high
5. Deforestation rate is low and accessibility of the sites is high
6. Social conflicts are minimum.

West Sumatra, Jambi, Lampung, West Java and South Kalimantan provinces were considered as provinces that may meet some of the above conditions. In these provinces, there are a number of pilot projects related to carbon sinks that have been initiated by a number of stakeholders. In Lampung, ICRAF and AMAN (local NGO working with "adat" indigenous culture) have implemented agroforestry projects. In Kerinci-Jambi, FORDA Min. of Forestry supported by the Government of Finland has implemented a carbon project for rehabilitating grassland using cinnamon (*kayu manis*). In West Java, LATIN and local NGOs working with local community, local government and private company to establish Community Forest. Similarly in South Kalimantan, West Sumatra and Yogyakarta, there are also a number of projects are underway. In addition, the local governments of these three provinces have shown their strong commitment to implement forest carbon projects. Estimation of land availability as well as potential project types for these provinces is given in Table 4.10.

Table 4.10. Land availability for forest carbon projects of selected province in Indonesia, based on data extracted from year 1990 (in thousand ha)

Carbon Project types	West Sumatra	Jambi	Lampung	West Java	DIY	South Kalimantan
AGROFORESTRY	**156. 90**	**155. 07**	**268. 19**	**550. 19**	**23. 02**	**347. 03**
Regreening[1]	*28.70*	*20.34*	*13.42*	*41.06*	*0.03*	*151.75*
Agrofrestry and MPTS plantations[2]	*43.54*	*63.13*	*111.17*	*30.12*	*0.56*	*91.08*
Community Forest[3]	*84.66*	*70.60*	*143.60*	*479.01*	*22.43*	*104.20*
REHABILITATION	**127. 368**	**2,841.82**	**409. 37**	**172. 57**	**4.92**	**1, 540. 57**
Rebosasi[4]	*12.30*	*8.72*	*5.75*	*17.60*	*0.01*	*65.04*
Forest plantation/HTI or Timber Estate[5]	*114.10*	*171.1*	*403.43*	*154.97*	*4.91*	*352.03*
ENR[6]	**968**	**2,662**	**190**	**-**	**-**	**1,123. 50**

Note: [1]calculated from 70% of *alang-alang* areas, [2]calculated from 30% of shrubs & thickets (non *alang-alang*), [3]derived from critical areas in private land minus community forest established, [4]calculate from 30% of *alang-alang* coverage, [5]obtained from 70% of srubs & thickets (non alang-alang) in addition to the value resulted from subtraction of critical areas of forest state land and reforestated areas, [6]predicted from natural regeneration and mangrove management.

In order to assess in more detail the potential of these provinces in implementing carbon projects, the NSS Team has conducted field visits to eight districts. During the visit, it was indicated that all local stakeholders were very interested in participating in the forest carbon project under CDM. They understand that CDM funding might not covered all cost for implementing the projects. Description of the projects for each district is given in Table 4.11.

Following the Kyoto rule that for the first commitment period reforestation activities will be limited to those areas that were not forested on 31 December 1989 and considering Canada proposal to change the define date to 31 December 2000, this study provide an estimate eligible Kyoto land for the year 1990 and 2000. Although the difference between data from 1990 and 2000 are not significantly different (16.6 millions ha), it is worth to present the calculation based on year 2000, since this figure is more accurate and reliable. For the year 2000, it was found that, the total Kyoto eligible lands in Indonesia is about 49.2 millions ha, and about 53% of these lands are in the form of critical or degraded lands and grassland (Table 4.8). Fallow lands and shifting cultivation/waste land/garden might still have high potential of eligible lands if the

crown cover less than 30% with an area less than 1 ha. Following the Kyoto forest definition, most of these lands may be considered as non-forest area and therefore eligible for reforestation projects. However, it is certain that, most of eligible projects could not be categorized as afforestation according to Kyoto forest definition ("land that has not been forested for at least 50 years"), since most of Indonesia lands were still covered by forest 50 years ago.

V. STRATEGIC RECOMMENDATION

The strategic recommendations are drawn from the discussion presented in previous chapter, in particular Chapter 4. The recommendations are grouped into two aspects namely non technical, and technical aspects.

5.1. Non-Technical Aspects

1. At the international level, definition of afforestation and reforestation in CDM, the lifetime for CDM in LULUCF sector, and a number of key issues for the LULUCF activities in CDM that was unable to be resolved in COP 8 and be differed to COP-9, should be backed up by the work of SBSTA in developing modalities for the inclusion of LULUCF in CDM, as it will affect substantially to the final form of LULUCF CDM projects. Indonesia as potential country for LULUCF-CDM should play dominant role in the forthcoming meetings and negotiation. Therefore, strong negotiating team back up by technical team should be formed within the related agencies, in particular at the Department of Forestry.
2. Inconsistencies between requirement under Kyoto Protocol and national regulations such as PP No. 34/2002, UU No. 22/1999, PP No. 25/2000, and Keppres No. 127/2001, need urgently be resolved by related sectors.
3. As the existence of DNA (Designated National Authority) is very important to be set up in the country that want to participate in CDM projects, it is urgent for the Ministry of Environment (MoE), the Ministry of Forestry (MoF), and other relevant institutions or stakeholders to negotiate on the structure and other issues surrounding the establishment of the DNA. The study recommended that the DNA structure should facilitate a 'one stop shop' for all aspects of project development and investment to a single point within Indonesia. With this structure, it is expected that Indonesia will be in the position of comparative advantage to attract CDM investment. In addition, a close collaboration between The Ministry of Environment (MoE) as the Focal Point of UNFCCC/ KP and the Ministry of Forestry (MoF) as the institution holding the authority towards forest resources management is deemed necessary for the success of harmonization between KP and existing regulations on LULUCF. Related Ministries such as Ministry of Energy and Mineral Resources, Ministry of Transport, Ministry of Agriculture, and government institutions responsible for national development planning, foreign affairs, and financial matter including revenue from forestry sector are also the key stakeholders that need to be involved in the harmonization process and be represented in the proposed DNA. Other stakeholders such as business communities, DPR, and forest-related NGOs, as well as stakeholders at the local level should ideally be involved in the process, although it does not necessarily all be represented in DNA.
4. Capacity building at the national level should be focused on two strategic areas namely: legal and regulatory, and institution. Consensus building and negotiation skills are crucial aspects of capacity building at this level especially under the current situation where a number of related regulations on LULUCF sectors are conflicting in various degrees, and that harmonization among them is the only option when amendment of the conflicting regulations are neither easy nor necessary. Knowledge on political, organizational, and social aspects that will shape CDM and other land use

programme, should also be derived in the capacity building programme at the national level. On the institutional aspect, potential members of DNA should be the main target in institutional development, as they have to be able to make decisions in a well informed environment. For the success of capacity building activities, capacity building should be included as a national programme, enabling environment should be created, and information sharing and networking should be enhanced.

5.2. Technical Aspects

1. Implementation of CDM project will require long process. The existence of a CDM Manual and Guideline should be developed as soon as possible. This manual should be freely accessed and widely applicable. The CDM Manual and Guideline should cover a key steps in project cycle in Indonesia, a simple approach to roughly estimate the baseline and carbon mitigation potential of a projects (carbon stock measurement and estimation), a practical guideline to assess the eligibility of land for implementation of CDM projects.
2. Understanding of stakeholders on technical aspects of LULUCF-CDM projects should be increased. Universities and research agencies should be encouraged to conduct such research works and the results could be used to support the Indonesian negotiator in the negotiation forum.
3. In order to access the information of available land in Indonesia that is compliance to the Kyoto eligible land, improvement of the database quality on critical unproductive land is strongly recommended. The fact that information provided so far was not so easily found in the field, justified the need of the availability of distribution map of potential eligible lands in Indonesia by province and idealistically by district for the time frame 1989 and 1999. The Ministry of Forestry has been initiated to develop good database on forest inventory of Indonesia. Further step is delivering such database into province and district as the national strategic program of the Ministry of Forestry.
4. Based on the environmental, social and economic assessment to the LULUCF Projects, it was found that community participation is crucial in order to avoid and minimize social conflict for the project activities. Therefore, agroforestry type-projects are promising and should be further promoted for small-scale CDM project types. However, a simple technical procedure and low transaction cost remains to be resolved.
5. At the project level, identification of capacity building needs in this study was mainly intended to address potential barriers and to remove the risks in the five proposed project types of CDM namely: (a) community forest, (b) mangrove forest management, (c) multi-purpose tree plantation, (d) bio-energy, and (e) reduced impact logging (RIL). The important barriers that have been identified in the studies are low commitment of local government, possibility of having low community support, potential of conflict due to land tenure problem, difficulties in getting permit and inconsistent policy and regulation, difficulties to access to credit or getting support from other financial sources, low of benefits, high opportunity costs, long gestation period, small market size etc. can be considered as economical barriers. Removing the barriers through political approach where the power/authority holders direct the policy to improve human resources and strengthen institutional capacity, social approach that focus on empowerment of individuals/community groups, and local institutions as the media for social interaction and networking, economic approach in the form of economic

intervention that may improve people's welfare, and technical approach for skill building should be initiated.

6. Enhance information sharing and networking at different levels (local, national, regional, and international levels) should be promoted to accelerate the CDM project implementation.

REFERENCES

APPI, 2000. Liberalisasi Perdagangan Pada Komoditas Kopi dan Kelapa Sawit. Asosiasi Penelitian Perkebunan Indonesia.

Aukland, L., Moura Costa P., Bass S., Huq S., Landell-Mills N., Tipper R., and Carr R. 2002. A Quick Guide to the Clean Mechanism. IIED, London

Aukland, L., Moura-Costa, P., and Brown, S. (in Press). A conceptual framework and its application for addressing leakage on avoided deforestation projects. EcoSecurities and Winrock International

Babiker, Musafa, Henry Jacoby, John Reilly, David Reiner. 2002. The Evolution of Climate Change: Kyoto to Marrakesh. MIT Joint Program on the Science and Policy of Global Change. Report No 82.

Biro Pusat Statistik (Central Bureau of Statistic, BPS). 1990. Statistical Year Book of Indonesia 1990. Central Bureau Statistic, Jakarta.

Biro Pusat Statistik (Central Bureau of Statistic, BPS). 2001. Statistical Year Book of Indonesia 2001. Central Bureau Statistic, Jakarta.

Blanchard O., Criqui, P. and Kitous, A. 2002, After the Hague, Bonn and Marrakesh: the future international market for emission permits and the issue of hot air. Reference Paper 27bis, Institut de Economie et de Politique de l.Energie, Grenoble 28p

Boer, R. Upik R. Wasrin, Nur Masripatin, D. Murdiyarso, M. van Noordwijk, K. Hairiah. 2001. Improving Estimates of Annual Biomass Increment and Forest above ground biomass in Southeast Asia using GIS Approach and Site- or Species-Specific Allometric Regressions INDONESIA. Project Report Submitted to The Institute for Global Environmental Strategies (IGES) and The National Institute for Environmental Studies (NIES)

Boer, R., N. Masripatin, T. June, E.N. Dahlan. 2001. Greenhouse Gas Mitigation Technologies in Forestry Sector: Status, Prospects and Barriers of their implementation in Indonesia. Final report submitted to State Ministry For Environment under UNDP-Climate Change Enabling Activity Project.

Boer, R. 2001. Economic Assessment of Mitigation Options for Enhancing and Maintaining Carbon Sink Capacity in Indonesia. Journal Mitigation and Adaptation Strategy for Global Change 6:257-290.

Boer, R. 2001. Options for Enhancing and Maintaining Carbon Sink Capacity Mitigation and Adaptation Strategies for Global Change, 6, 213-232.

Brown, P., Cabarle, B. and Livernash, R. 1997. Carbon Counts: Estimating Climate Change mitigation in Forestry Projects. *World Resources Institut*e, Washington DC.

Brown, S., Calmon,M., and Delaney, M. 1999a. Development of deforestation and forest degradation trend model for the Guaraquebaca Climate Action Project. Winrock International, Carbon Monitoring Program, Arlington, VA, USA, 14pp.

Brown, S., Calmon,M., and Delaney, M. 1999b. Carbon inventory and monitoring plan for the Guaraquebaca Climate Action Project. Winrock International, Carbon Monitoring Program, Arlington, VA, USA, 26pp.

Brown, S., Burnham, M., Delany, M., Vaca, R., Powell, M., and Moreno, A. 2000a. Issues and Challenges for Forest-Based Carbon-Offset Projects: A Case Study of the Noel Kempff Climate Action Project in Bolivia. *Mitigation and Adaptation Strategies for Global Change.*

Brown, S. O. Masera, and J. Sathaye. 2000b. Project-based activities. In Watson, R.T., I. R. Noble, B. Bolin, N. H. Ravindranath, D. J. Verardo, and D. J. Dokken (eds.)., Land use, Land-use change, and forestry; Special Report to the Intergovernmental Panel on Climate Change, Cambridge University Press, Ch. 5, pp.283-338.

Chomitz, K.M. and Gray, DA. 1995. Roads, land, markets, and deforestation: a spatial model of land use in Belize. *World Bank Economic Review*. 10: 487-512.

Chomitz, K.M. 2000. Evaluating carbon offsets from forestry and energy projects: How do they compare. World Bank Report (unpublished).

Dudeck, D. J. and Wiener, J.B. 1998. Joint Implementation Transaction Costs and Climate Change. OECD, Paris, 69p

Ellis, J and Bosi, M. 1999. Options for project emission baseline. OECD and IEA Information paper, Paris

Ellis, J. 1999. Experience with emission baselines under the AIJ Pilot Phase, OECD/IEA Information Paper, OECD, http://www.oecd.org/env/cc/freedocs.htm

FAO and MoF. 1989. UFT/INS/065/INS: Forestry studies. Field Document No 1-2, October 1989. RePPProT, Vol. 2, Tabulating existing TGHK categories. Range 1972-1986, approx. date 1982.

FAO and MoF. 1990. Situation and outlook for the forestry sector in Indonesia: Forest Resource Base. Directorate General of Forest Utilization Department of Forestry and Food and Agriculture Organization of the United Nations. Indonesia UTF/INS/065/INS: Forestry Studies Technical Report No.1 Volume 2. Jakarta, Indonesia.

FAO 1991. Indonesian Tropical Forestry action programme. Ministry of forestry of the Republic of Indonesia, Jakarta

FAO, 2000. FAO Strategic Plan For Forestry. Food and Agriculture Organization of the United Nations, Rome. 12 pp.

Fearnside, P.H., Lashof, D.A. and Moura-Costa, P. 2000. Accounting for Time in Mitigation Global Warming through Land-Use Change and Forestry. Mitigation and Adaptation Strategies for Global Changes 00: 1-32.

Figueres, C., and Gowan, M. 2002. The operation of the CDM. In C. Figueres. Establishing National Authorities for the CDM. International Institute for Sustainable Development and the Center for Sustainable Development of the Americas, Canada. pp:21-31.

FWI and GFW. 2001. Potret Keadaan Hutan Indonesia (Indonesian Forest Condition), Forest Watch Indonesia & Global Forest Watch.

Gautam, M, Lele U., Hyde W, Kartodihardjo H., Kahn, A, Erwinsyah I. And Rana S. 2000. The Challenges of the World Bank Involvement in Forests: An evaluation of Indonesia's forests and World Bank Assistance. Operations Evaluation Department, World Bank, Washington D.C. 2000 120p

GEF. 2001. Report of the GEF to the Seventh Conference of Parties to the United Nations Framework Convention on Climate Change. Global Environment Facility, Washington.

Hannibal, L.W. 1950. *"Vegetation Map of Indonesia"*. Planning Department, Forest Service, Jakarta. Dalam: International Institute for Environment and Development & Government of Indonesia. 1985. *"Forest Policies in Indonesia. The Sustainable Development of Forest Lands"*. Jakarta 30 November. Vol 3(4).

Intag. 1990. "Inventarisasi Hutan Nasional, Indonesia." Direktorat Jendral Inventarisasi dan Tata Guna Hutan. Departemen Kehutanan, Jakarta.

IPCC. 2000. Summary for policy makers: Land Use, Land Use Change and Forestry. Geneva, Switzerland, United Nation.

ITTO. 2001. Mewujudkan Pengelolaan Hutan Lestari Di Indonesia ; Hutan Tanaman Untuk Penciptaan Sumber Daya. Seri 3 Hasil Laporan Misi Teknis ITTO untuk Indonesia. Jakarta.

Jotzo, F. and Michealowa, A. 2002. Estimating the CDM Market Under the Bonn Agreement, HWWA Discussion Paper No. 145, Hamburg Institute of International Economics, Hamburg. 47 p

Kaimowitz, D. and Angelsen A.. 1998. Economic Models of Tropical Deforestation A Review. CIFOR. Bogor, Indonesia.

Lapera, 2001. Politik Pemberdayaan "Jalan Menuju Otonomi Desa". Lapera Pustaka Utama. Yogyakarta.

Makundi, W.R. 2000. Framework for Analyzing GHG Leakage in LUCF Mitigation Projects in F-7 Countries. F7 Discussion Paper. LBNL and US-EPA. March 6, 2001.

Michaelowa, A., 1999. Monitoring, verification, and certification of project -based emission reduction. Paper presented at the Seminar Climate Change Business Opportunities, St. Gallen, March 23, 1999. 2 p.

Michaelowa, A., and Fages, E. 1999. Options for baselines of the Clean Development Mechanism. *Mitigation and Adaptation Strategies for Global Change* 4:167-185.

MoE. 1999. Initial National Communication for the United Nations Framework Convention on Climate Change. Ministry of Environment. Jakarta.

MoE. 2000. Implementation of Sustainable Reforestation of Degraded Grassland in Jmabi Province, Carbon Offset Projects in Land Use and Forestry Sector as A Climate Change Mitigation Option; Demonstration Plot of Cinnamon at Sarko and Candlenut at Kerinci.

MoE. 2001. National Strategy Study on the Clean Development Mechanism in Indonesia. Jakarta.

MoF. 1990. Forestry Statistics of Indonesia 1988/1989. Agency for Forest Inventory and Land Use Planning, Jakarta.

MoF. 1990 – 2000. Statistik. Sekretariat Direktorat Jendral Rehabilitasi Lahan dan Perhutanan Sosial (SetDitjen RLPS), Jakarta.

MoF. 1998. Forestry Statistics of Indonesia 1996/1997. Agency for Forest Inventory and Land Use Planning, Jakarta.

MoF. 2000. Forestry Statistics of Indonesia 1998/1999. Agency for Forest Inventory and Land Use Planning, Jakarta.

MoF. 2000. Urutan DAS Prioritas dan Lahan Kritis. Direktorat Jendral Rehabilitasi Lahan dan Perhutanan Sosial (Dirtjen RLPS), Jakarta.

MoF. 2000. Rencana Stratejik (RENSTRA) tahun 2001 – 2005. Agency for Forest Inventory and Land Use Planning, Jakarta.

MoF. 2001. Forestry Statistics of Indonesia 1999/2000. Agency for Forest Inventory and Land Use Planning, Jakarta.

MoF. 2002. Forestry Statistics of Indonesia 2000/2001. Agency for Forest Inventory and Land Use Planning, Jakarta.

Moura Costa, P.H., Stuart, M., Pinnard,M., and Phillips, G. 2000. Issues related to monitoring, verification and certification of forestry-based carbon offset projects. Mitigation and Adaptation Strategies for Global Changes.

Moura Costa, P.H., Stuart, M.D., and Trines, E. 1997. SGS Forestry's Carbon Offset Verification Service. In Riermer, P.W.F., Smith, A.Y., and Thambimuthu, K.V. (eds.), *Greenhouse gas mitigation. Technologies for activities implemented jointly. Proceedings of Technologies for AIJ Conference, Vancouver,* Oxford, Elsevier, pp. 409-414.

Moura Costa, P.H., and Wilson, C. 2000. An equivalence factor between CO_2 avoided and sequestration-description and applications in forestry. Mitigation and Adaptation Strategies for Global Changes

Moura Costa P.H, Salmi, J., Simula, M.and Wilson, C. 2001. Financial Mechanisms for Sustainable Forestry. UNDP, New York. 226p.

Moura Costa, P.H. 2002. Carbon Accounting, Trading and Temporary Nature of Carbon Storage. USAID Publication.

Natsource. 2001 Report on the Carbon Market. Prototype Carbon Fund, Washington DC.

Phillips, G. 2002. LULUCF Projects in the CDM: Accounting regimes and proposals for simplified rules and modalities. SGS.

Point Carbon. 2002. "*The Carbon Market in 2002*", February 28, 2002 Private subscription.

Prototype Carbon Fund. 2000. Learning Form the Implementation of the Prototype Carbon Fund. http://prototypecarbonfund.org/router.cfm?Page=DocLib&Dtype=4.

Puhl, I. 1998. Status of research on project baselines under UNFCCC and the Kyoto Protocol, OECD/IEA Information paper, http://www.oecd.org/env/cc/freedocs.htm.

Puhl, I., Hargrave, T., and Helme, N. 1998. Options for simplifying baseline setting for clean development mechanism projects, Center for Clean Air Policy, Washington DC.

RePPProT. 1990. *"The Land Resources of Indonesia, A National Overview"*. Regional Physical Planning Programme for Transmigration. Final report dated 1990. Land Resources Department of the Overseas Development Administration, London (Government of U.K.), and Ministry of Transmigration (Government of Indonesia), Jakarta.

Saaty, T.L. 1988. Decision Making for Leaders: The Analytical Hierarchy Process for Decision in a Complex Word. University of Pittsburgh, Pittsburgh.

Sathaye, J. Makundi, W., and Andrasko, K. 1995. "A Comprehensive mitigation assessment process (COMAP) for the evaluation of forestry mitigation options", Biomass and Bioenergy 8, 345-356.

Simorangkir, D., and Sumantri. 2002. A legal, regulatory and institutional review of fire fighting in Indonesia. Published project report, Project Firefight South East Asia.

Vrolijk. C. 2000 Quantifying the Kyoto commitments. Royal Institute for International Affairs. 10p.

Walton, T. and Holmes, D. 2000. *Indonesia's forests are vanishing faster than ever*, International Herald Tribune, January 25.

Watson, R., Noble, I.R., Bolin, B., Ravindranath, N.H., Verardo., D.J., and Dokken, D.J. (eds.). 2000. Land use, land-use change, and forestry. A Special Report of the IPCC. Cambridge Univ. Press. 377p.

Willems, S. 2000. Framework for baseline guidelines. OECD Information paper. Organization for Economic Co-operation and Development, Paris, 20pp.