Kyoto Mechanism and the Conservation of Tropical Forest Ecosystem
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The Clean Development Mechanism and LULUCF Projects in the Philippines[1]

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Abstract
Landuse, landuse change and forestry (LULUCF) projects are eligible under the CDM but limited to reforestation and afforestation. The objective of this paper is to explore potential LULUCF CDM projects in the Philippines.
The first part of the paper briefly describes the rich biodiversity resources of the Philippines. The second part analyzes the potential of LULUCF CDM projects in the Philippines. Specifically, the potential project areas and project types are identified. In addition, the potential carbon sequestration rates of trees in the Philippines are presented. Finally, the paper analyzes the potential benefits and threats arising from the implementation of CDM projects in the Philippines.

1. Introduction

In 1997, during the Third Conference of Parties (COP) the Kyoto Protocol was drafted which is the first international agreement that places legally binding limits on GHG emissions from developed countries (UNFCCC, 1997). The Protocol provides for flexible mechanisms to meet carbon reduction obligations. The most relevant to developing countries is Article 12 otherwise known as the Clean Development Mechanism (CDM). Essentially, the CDM allows Annex 1 (developed) countries to meet their carbon reduction quota via activities in developing countries. Landuse, landuse change and forestry (LULUCF) projects are eligible under the CDM but limited to reforestation and afforestation.

2. Forest and Biodiversity Resources of the Philippines

When the Spanish colonizers first set foot in the Philippines in 1521, 90 % of the country was covered with lush tropical rainforest (ca. 27M ha out of 30M total land area). By the year 1900, there were still 70% or 21M ha of forest cover (Garrity et al. 1993. However, by 1996 there were only 6.1 M ha (20%) of forest remaining (FMB 1997). Thus, in the last century alone, the Philippines lost 14.9 M ha of tropical forests. The average deforestation rate from 1969 to 1973 was 170,000 hectares per year (Forest Development Center 1987). For the past 20 years, it was about 190,000 to 200,000 hectares per year (Revilla 1997). In the last few years it was estimated to be about 100,000 ha (Lasco and Pulhin 1998). The direct and indirect causes of deforestation include shifting cultivation, permanent agriculture, ranching, logging, fuel wood gathering and charcoal making (Lasco et al., 2001b; Kummer 1992).

[1] The objective of this paper is to explore potential LULUCF CDM projects in the Philippines.

Philippine forests have extremely high floral and faunal diversity and the country is regarded as one of the biodiversity "hot spots" in the world (McNeely et al., 1990). These forests harbor 13,000 species of plants, which comprise 5% of the world's total diversity (Department of Environment and Natural Resources/United Nations Environmental Program, 1997).

The main strategy for biodiversity conservation is through the implementation of the National Integrated Protected Area System (NIPAS) Law. At present, 18 terrestrial and marine reserves have been proclaimed as initial components of NIPAS. Among forest areas, those under protection include: all old-growth dipterocarp forests, mossy forests (and forests in areas greater than 1000 m altitude), forests in slopes greater than 100%, and mangrove forests. However, many of these areas are protected merely on paper because of lack of resources.

3. CDM Potential in the Philippines

3.1 Potential forest lands for CDM

In general, it seems that those that need to be permanently forested for legal, ecological or social reasons are the most likely candidate areas (Lasco et al., 2001a). These will include the following areas:

- critical watersheds
- forest reserves (including those under the management of other government agencies and government controlled corporations such as Philippine National Oil Company and National Power Corporation, academic institutions and the military)
- forest lands under the Integrated Protected Area system (IPAS) including those with 50% slope and 1,000 m asl altitude.

The total area of the above forest lands amounts to 4.6 M ha. (FMB, 1997) of which a large portion need to be either protected or rehabilitated. Even if only half of these areas are suitable for CDM, it will still be a significant area.

Another way of estimating potential areas for CDM is to look at the degraded areas needing rehabilitation. Grasslands and brushlands in the uplands cover 3.5 M ha (Lasco and Pulhin, 1998). In addition, many of the supposed agroforestry lands (5.7 M ha) are actually shifting cultivation areas or simply degraded farmlands that need stabilization most likely through some form of real agroforestry and soil conservation practices.

3.2 Potential CDM projects in the Philippines

3.2.1. Reforestation and tree plantation establishment

Perhaps the simplest type of project that could easily meet the requirements of a carbon offset project is the establishment of trees in a denuded area as part of a reforestation or tree plantation establishment. The baseline scenario can be established in many upland areas in the Philippines which have been historically unable to recover due to a grass-fire-grass cycle. The carbon sequestered could also be readily quantified as a function of the biomass accumulation of trees over time.

3.2.2. Agroforestry and community forestry

In the Philippines, community or social forestry projects typically promote shift to agroforestry practices from unsustainable farming practices. The increased planting of trees and the use of soil conservation techniques could help reduce carbon in the atmosphere. However, there may be higher risks associated with working with many individual farmers (e.g. farmers may decide to cut trees sooner than planned).

3.2.3. Biomass energy

The use of tree biomass to produce energy has been explored in the Philippines during the 1970s using *Leucaena leucocephala*. The project did not prosper but this is mainly because of management problems rather than technical problems. By substituting renewable biomass to fossil fuels, there is less carbon released to the atmosphere. The technology is already available for this type of project but the cost-effectiveness is still uncertain.

3.3 Potential carbon benefits

Table 1 Rate of carbon sequestration of Philippine tree plantations

Species	Age	Biomass MAI (Mg/ha/yr)	Carbon MAI (MgC/ha/yr)	Place	Source
Mahogany	44	14.2	6.4	Makiling	Racelis, 2000
Dipterocarps	66	7.4	3.3	Makiling	Racelis, 2000
A. auriculiformis	16	9.1	4.1	N. Ecija	Lasco et al., 2000
Mahogany		8.4	3.3	Leyte	Lasco et al., 1999
Gmelina		18.8	8.2	Leyte	Lasco et al., 1999
Gmelina	7	11.3	5.5	Mindanao	Kawahara et al., 1981
Gmelina	9	10.5	4.4	Mindanao	Kawahara et al., 1981
Gmelina	9	9.6	6.0	Mindanao	Kawahara et al., 1981
P. falcataria	4	20.2	7.8	Mindanao	Kawahara et al., 1981
P. falcataria	5	11.2	6.8	Mindanao	Kawahara et al., 1981
P. falcataria	7	8.4	6.2	Mindanao	Kawahara et al., 1981
P. falcataria	7	2.2	0.5	Mindanao	Kawahara et al., 1981
P. falcataria	9	5.3	5.4	Mindanao	Kawahara et al., 1981
P. falcataria	9	3.7	1.4	Mindanao	Kawahara et al., 1981
Mahogany	16	19.6	7.3	Mindanao	Kawahara et al., 1981
Mahogany	80	7.1	3.2	Makiling	Lasco 2001
Mahogany	80	7.9	3.6	Makiling	Sakurai et al., 1994
Dipterocarps	80	6.7	3.0	Makiling	Sakurai et al., 1994
Dipterocarps	80	3.5	1.6	Makiling	Sakurai et al., 1994

* Data of Sakurai et al., 1994 converted to biomass using the allometric equation from Brown, 1997; Carbon content assumed to be 45%

Being a humid tropical country, tree growth and carbon sequestration is rapid in the Philippines. Various studies have shown that tree plantations in the country can sequester up to about 8 MgC/ha/yr depending on the site conditions (Table 1).

4. Opportunities and Threats from LULUCF Projects

4.1 Opportunities

4.1.1. Ecological and socio-economic co-benefits

At the present rate of reforestation (ca. 100,000 ha/yr), it will take more than 100 years to fully rehabilitate denuded areas in the Philippines. In addition, up to 20 M people are living in the uplands half of whom rely on some form of shifting cultivation. This situation has spawned numerous ecological and socio-economic problems. The government does not have adequate resources to effectively address the environmental and socio-economic problems in forest lands areas, even with the current level of foreign support. There is therefore a need to generate support from elsewhere to speed up the rehabilitation and development process in the uplands. The CDM offers a unique opportunity as source of financing and technology to rehabilitate and conserve Philippine forest resources.

4.1.2. Participation in CDM promotes long-term Philippine environmental security

The Philippines as an archipelagic country composed of numerous small islands is very vulnerable to the impacts of climate change. Sea level rise as a result of the rise in global temperatures will submerge lowlying coastal areas where many of the major urban areas are located (Perez, 1997). It is therefore a major environmental security issue for the country. Thus, by participating in activities that mitigate GHG in the atmosphere, the Philippines will in fact be acting on its own long term interest.

4.1.3. Meeting obligations under the Biological Diversity Convention

The Philippines is one of the biological hotspots in the world. For instance, of its 1084 species of terrestrial vertebrates, 45 % are endemic (DENR/UNEP, 1997). A key strategy in the conservation of biodiversity is the delineation and proclamation of protected areas. Aside from the UNFCCC, the Philippines is also a signatory to the Biological Diversity Convention. LUCF projects offer another opportunity to meet the goals of both conventions. As implied earlier, forestry conservation and rehabilitation projects could directly lead to greater biodiversity conservation.

4.2 Threats

4.2.1. Overemphasis on plantation forests using exotics over indigenous species

In an attempt to obtain higher carbon credits in the short term, CDM developers may focus on exotic species at the expense of native trees.

4.2.2. Lack of technical expertise

The country may not be able to formulate adequate guidelines and safeguards to ensure that national sustainable development goals are met by CDM projects. The results of UNFCCC COP-9 negotiations on modalities will greatly help remedy this gap.

4.2.3. Failure to capture co-benefits

There is a possibility that developing countries will not be able to fully capture the co-benefits from CDM projects and will therefore be merely exploited. Aside from lack of technical readiness, other potential causes of this are:

- lack of integrated area planning in sites where CDM projects will be located
- graft and corruption
- inadequate implementation guidelines
- lack of local community participation

4.2.4. Loss of opportunity to develop forests for national development

Forests lands that will be used for CDM projects will not be available for other uses since it is necessary to keep the carbon "locked-up" for a long period of time. There are concerns that such will deprive developing countries with the use of those lands to pursue their development goals. However, this will not happen if host countries ensure that CDM projects are compatible with the national landuse plan. In addition, temporary credits will likely be approved by the UNFCCC.

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