POTENTIAL CARBON SEQUESTRATION PROJECTS IN THE PHILIPPINES

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Abstract

Philippine forest lands have a great potential to sequester and store carbon. Here we present proposed climate-change mitigation projects in the Philippines through carbon sequestration, including current buyers and sellers. Two organizations are relatively advanced in developing sinks projects: the Laguna Lake Development Authority - Tanay and Conservation International Philippines. The former's main proponents/sellers are the Municipality of Tanay and the Laguna Lake Development Authority. Farmers from the Tanay watershed are the implementers. The 2004-2014 project period envisions total net carbon benefits of 3,204tC (11,759 tCO_2-e) and 1,424tC (5,230 tCO_2-e) under the high and low scenarios, respectively. The low scenario anticipates a Total Emission Reduction Purchase Agreement value of US$31,380; US$70,554 for the high scenario. The Conservation International project is expected to sequester a total of 512,000tC for 30 years, most of which will come from the reforestation component. No buyer has yet been identified.

1. Introduction

Climate change is one of the primary concerns of humanity today. The most recent Inter-governmental Panel on Climate Change (IPCC) assessment report concludes that there is strong evidence that human activities have affected the world's climate (IPCC 2001). The rise in global temperatures has been attributed to emission of greenhouse gasses, notably CO_2 (Schimell et al. 1996). Forest ecosystems can be sources and sinks of carbon (Watson et al. 2000). Deforestation and burning of forests release CO_2 to the atmosphere. Indeed, land-use change and forestry are responsible for about 25 per cent of all greenhouse emissions. However, forest ecosystems also help reduce greenhouse gas concentrations by absorbing carbon from the atmosphere through the process of photosynthesis. Of all the world's forests, tropical forests have the greatest potential to sequester carbon primarily through reforestation, agroforestry and conservation of existing forests (Brown et al. 1996).

Philippine forest ecosystems have likewise been a source and sink of carbon (Lasco and Pulhin 2004; Lasco and Pulhin, 2001). Since the 1500s, deforestation of 20.9 million ha of Philippine forests contributed 3.7 billion tonnes of C to the atmosphere of which 70 per cent (2.6 billion tonnes) were released this century (Lasco and Pulhin 2000). However, present land-use cover also absorbs carbon through regenerating forests and planted trees. The vast areas of degraded land in the Philippines, in fact, offer great potential for carbon sequestration through such rehabilitation activities as reforestation and agroforestry.

The objective of this paper is to present potential climate-change mitigation projects in the Philippines through carbon sequestration.

2. Description of the Environmental Service: Climate Change Mitigation

The basic concept behind this service is that trees are able to absorb CO_2 from the atmosphere through photosynthesis. Part of the carbon absorbed becomes part of the biomass. In general, tress compose 50 per cent carbon based on oven dry weight. In addition to trees, there are other carbon pools in a forest ecosystem: soil, litter, and understorey vegetation.

There are three ways by which forest ecosystems can help mitigate climate change: conservation of existing carbon stocks, expansion of carbon stocks by increased carbon sequestration, and substitution of wood products.

(a) Conservation of existing carbon stocks

The goal of this strategy is to maintain or improve existing carbon pools in forests by protecting forest reserves, by the use of appropriate silvicultural practices and by controlling deforestation. Tropical forest ecosystems contain substantial amount of carbon. Activities that destroy forests, such as slash-and-burn farming, logging and conversion to other land uses (deforestation), could significantly reduce the stored carbon in the forest. For example, logging of tropical forests in Mindanao could reduce carbon stocks by about 50 per cent. Similarly, land-use change, such as converting forests to agricultural plantations. could likewise decrease total carbon stocks.

Activities that promote conservation of the remaining forest cover, or that reduce deforestation, could help mitigate carbon emissions by preventing the release of stored carbon to the atmosphere. Certain silvicultural practices, such as enrichment planting of sparse forests, could also lead to increased carbon sequestration in existing forests. As a general rule, the more biomass produced the greater the amount of carbon sequestered.

Another way of minimizing carbon emission from forest lands is by preventing fire, which is common in grassland areas of the country. The exact area affected by burning is not known, but is likely to have been substantial especially in drier zones. Aside from CO_2, other GHGs, such as methane, are also released to the atmosphere during fires. Program aimed at fire prevention could result in conservation of carbon in plant biomass.

(b) Expansion of carbon stocks

The goal of this strategy is to expand the amount of carbon stored in forest ecosystems by increasing the area and/or carbon density of natural and plantation forests and increasing storage in durable wood products.

Since carbon sequestration is a function of biomass accumulation, the simplest way to expand carbon stocks is to plant trees. For example, in Mindanao the rate of carbon sequestration of two plantation species was estimated to be 1.4-7.8tC/ha/yr.

The choice of species to be planted will affect the potential to sequester C (Muora-Costa 1996). Fast-growing species, such as *Paraserianthes falcataria* and *Casuarina equisitifolia*, are commonly used. They accumulate more biomass and carbon than slow-growing species for the same period of time. However, fast-growing species typically have lower wood density and thus contain less carbon per unit volume than wood of slow-growing species.

Under the Clean Development Mechanism (CDM) of the Kyoto Protocol, only reforestation and afforestation projects are allowed during the first commitment period.

(c) Substitution of wood products for fossil fuels-based products

Substitution aims at increasing the transfer of forest biomass carbon into products (e.g. construction materials and biofuels) that can replace fossil-fuel-

based energy and products, cement-based products and other building materials (Brown et al. 1996). This approach is considered to have the greatest mitigation potential in the long term (>50 years). For instance, the substitution of wood grown in plantations for coal in power generation can avoid carbon emissions by an amount up to four times that of carbon sequestered in the plantation (Brown et al. 1996).

3. Who are the Providers/Sellers

At present, there are many organizations in the Philippines that are interested in undertaking carbon sequestration projects. Two organizations are relatively advanced compared with the rest: the Laguna Lake Development Authority (LLDA)-Tanay and Conservation International (CI) Philippines.

3.1 The LLDA-Tanay Streambank Rehabilitation Project

The main proponents/sellers of this project are the Municipality of Tanay and the LLDA. The implementers will be farmers in the Tanay watershed.

LLDA was established in 1966 as a planning, regulatory and development authority to protect and manage the ecological resources of the Laguna de Bay watershed. Its main activities include environmental monitoring and regulatory enforcement, including collection of resource-user fees (fees for operating fish pens and pollution fees for industries) from which most of its revenues are derived. LLDA has experience in both the development of local government and community projects and in managing funds for use at the local level. In particular, LLDA has established multistakeholder river councils, and has organized and funded community-level programs and investments in river rehabilitation and restoration. The local governments will, through multistakeholder river councils, identify and implement the subprojects. They will also be responsible for the collection of monitoring data to verify carbon emissions reductions and through participatory, transparent processes, and will allocate revenues from subproject ERs to activities in the microwatershed and participating communities.

The main objective of the project is to reduce greenhouse gases (i.e. CO_2) in the atmosphere while helping rehabilitate the Tanay watershed and providing socioeconomic benefits to the local people. Specifically, the project aims to:

- Reforest 70ha of private lands
- Established 25ha of agroforestry farms in public lands
- Sequester 10,000-20,000t of CO_2 from the atmosphere in 20 years.

Streambank rehabilitation: The purpose of this activity is to increase the riparian forest cover of the Tanay River to reduce erosion. Under this component, owners of private lands will be encouraged to plant trees along river banks within their property. Seedlings will be given free after an information and education campaign and a pledge of commitment to the project. Provision of seedlings and support services will be contracted through the Katutubo village, an upland village of indigenous Dumagat and Remontado groups. A total of 20ha will be reforested with 33,333 trees.

Ecological Enhancement in Upland Areas: The purpose of this second subcomponent will be to reforest upland areas near the headwaters of the Tanay river to reduce erosion. A total of 50ha of denuded and grassland areas will be reforested at 2x3m spacing with 83,333 trees. The Katutubo village will select the species that will be planted and maintained in order to provide the community resources for timber, fruits and medicines.

Agroforestry orchard: The purpose of this subcomponent is to provide income for the Katutubo village through agroforestry while reducing erosion in the upland areas. This component will be undertaken in an area of 25ha of communal land belonging to this IP community. It will integrate mango trees at 10x10m spacing with cash crops using a alley cropping design. A total of 2,500 trees will be planted.

The expected GHG benefits were calculated using a high and low scenario. The 2004-2014 project period will have total net carbon benefits of 3,204tC (11,759 tCO_2-e) and 1,424 tC (5,230 tCO_2-e) under the high and low scenarios, respectively (Santos-Borja et al. 2005). The anticipated Total Emission Reduction Purchase Agreement Value is US$31,380 for the low scenario and US$70,554 for the high scenario. Total carbon sequestration for the 20-year project duration,is shown in **Figure 1** under various scenarios.

3.2 CI-Philippines Sierra Madre Project

The proposed carbon sequestration project is part of CI-Philippines' concerted efforts to build alliances with local communities, private sector, government agencies and non-governmental organizations (NGOs) to facilitate the management of the Sierra Madre Biodiversity Corridor and strengthen enforcement of environmental laws. It uses a multifaceted approach to alleviate threats and to restore and protect 12,500ha of land within the Corridor.

The CI's ultimate objective for the project is to demonstrate that a properly designed and implemented carbon offset project not only offers an economically attractive, risk-managed portfolio option, but also generates multiple benefits, such as biodiversity protection, watershed restoration, soil conservation, and local-income generation. It also demonstrates that tradeoffs, such as soil erosion, watertable decrease, and loss of livelihoods, can be avoided.

Specifically, the project has the following objectives:

- Protect 5,000ha of natural forests (old growth and second growth) slated for cutting and conserve biodiversity in the long term
- Reduce pressure on the natural forest and provide incentives for local communities, by establishing an agroforestry project on 2000ha of brushland areas that will, in turn, provide the population a more stable income and lessen their reliance on forest projects

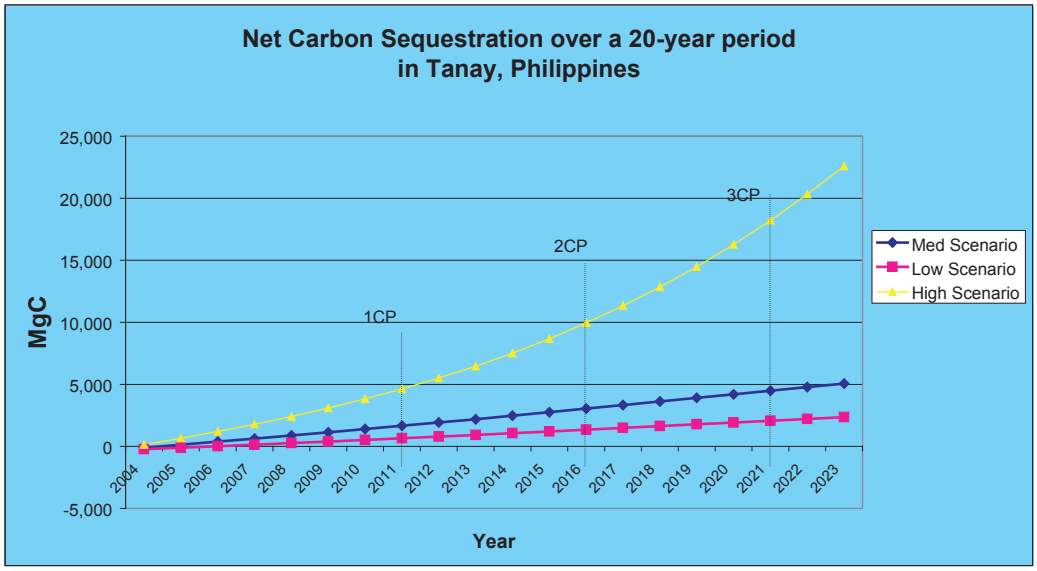

Figure 1: Net carbon sequestration under various scenarios of the LLDA project in Tanay, Rizal

- Restore 5,500ha of grassland areas to original hardwood forests using a mix of fast-growing and native species, and consequently help sequester carbon dioxide from the atmosphere and increase the connectivity of sensitive habitats with the world's most threatened species

The main strategy of the project will be community-based forest management. The key stakeholders of the project will be as follows: the local community/ people's organization (PO), local NGOs, local government unit (LGU), the DENR, the project monitoring team, and the funding organization. After 30 years, the project shall have sequestered a total of 512,000tC, most of which shall have come from the reforestation component (453,000tC)

Over the last few months there has been renewed interest in carbon sequestration projects in the Philippines. Japanese organizations have been visiting the country exploring the possibility of implementing CDM forestry projects.

4. Who are the Buyers

In the Philippines, the World Bank is the only firm buyer thus far of emissions reductions from sinks project through its Laguna de Bay Institutional Strenghtening and Community Participation (LISCOP) project with the LLDA.

Globally, the World Bank manages eight carbon funds comprising public and private participants: Prototype Carbon Fund (PCF), Netherlands JI and Netherlands CDM Funds, Community Development Carbon Fund (CDCF), BioCarbon Fund, Italian Carbon Fund, Spanish Carbon Fund, and Danish Carbon Fund. These funds are either public or public-private partnerships managed by the World Bank as a trustee. They operate much like a closed-end mutual fund; they purchase greenhouse gas emission reductions from projects in the developing world or in countries with economies in transition, and pay upon delivery of those emission reductions. The emission reductions can be used against obligations under the Kyoto Protocol or for other regulated or voluntary greenhouse gas emission reduction regimes.

For sinks projects, the BioCarbon Fund purchases emission reduction units. The BioCarbon Fund provides carbon finance for projects that sequester or conserve greenhouse gases in forests, agro- and other ecosystems (www.carbonfinance.org). It is designed to ensure that developing countries, including some of the poorest countries, have an opportunity to benefit from carbon finance in forestry, agriculture and land management. It is envisioned to help reduce poverty while reducing greenhouse gases in the atmosphere. The BioCarbon Fund is testing how land use, land-use change and forestry (LULUCF) activities can generate high-quality ERs with environmental and livelihood benefits that can be measured, monitored and certified, and stand the test of time.

Most recently, there has been an influx of interested carbon buyers from Japan to the Philippines. The ratification of the Kyoto Protocol seems to have perked up the market for sinks projects.

5. Intermediaries

For the LISCOP project, LLDA will act as the carbon financing intermediary and technical advisor for the proponent local governments in the Laguna de Bay watershed. During preparation, LLDA will act as technical advisor, ensuring the subproject is technically sound, meets environmental and social safeguard policies, and undertakes the necessary analysis and administrative requirements for carbon finance. It will monitor the execution of the subprojects from a technical, environmental and social perspective and act as intermediary in monitoring and verifying emissions reductions and channeling revenues from carbon credits back to local governments.

6. Compensation Mechanisms

For the LISCOP project the BioCarbon Fund is expected to pay US$4/t CO_2-e, which is on the high side of carbon prices offered by the World Bank's other carbon funds. The details of the compensation mechanism are still being worked out at the time of writing. Key issues are: (a) how will the carbon income be divided among stakeholders? (b) will farmers receive their share individually or as a group? (c) what types of projects will the carbon income finance, if any?, and (d) what is the role of LLDA in fund administration?

7. Lessons Learned, Opportunities and Challenges

There is great potential for carbon sequestration projects in the Philippines, primarily due to its biophysical condition and the presence of land areas that could and should be reforested (Lasco et al. 2001). There are literally millions of hectares in the uplands that pose ecological and economic threat if forest cover is not restored. There are challenges, however, that need to be overcome in order for the full potential of the carbon market to come to fruition.

A fundamental challenge is the lack of clear signal from the government on whether carbon sinks projects are welcome in the Philippines. There is a perception that the country—or at least some sectors within—is against sinks projects. The Inter-Agency Committee on Climate Change (IACCC) must resolve this issue soon if we are to take full advantage of the carbon market. Incidentally, our neighbors and fellow G77 members, China and Indonesia, have been moving forward in laying the groundwork for carbon sequestration projects. It will be unfortunate if the Philippines fails to capitalize on this emerging opportunity.

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