GUEST ARTICLE

GREENHOUSE GAS MITIGATION: A PROSPECT FOR ESTABLISHING CARBON OFFSET INDUSTRY IN PAPUA NEW GUINEA

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Introduction

One of the most prevailing global concerns to which we are a part is climate change and its effects on global, regional and local weather patterns, sea level rise and how these changes will affect our environment and socio-economic survival in the future. This global climate change has been going on over centuries, but became more so after the industrial revolution, in particular through the burning of fossilized fuels such as oil, gas and coal causing what is known as the greenhouse effect.

Causes of Greenhouse Effects

This greenhouse is the result of gases in the atmosphere trapping the sun's warmth and raising the temperature on earth by about 33°C. This is a natural process, without which the earth would be much colder and inhospitable to plants and animals, including humans. However, over hundreds of years man's activities have substantially increased the atmospheric concentrations of greenhouse gases, such as carbon dioxide, especially in recent times compared with pre-industrial times. This human induced warming is known as the enhanced greenhouse effect. Scientists studying greenhouse effects have concluded that the continually growing emissions of greenhouse gases will accentuate the natural greenhouse effects. Thus, resulting in wide ranging potential impacts on the natural environment and national and global socio-economic systems.

The most important greenhouse gases are carbon dioxide, methane and nitrous oxide. Also making a relatively small contribution are various halocarbons, products of the chemical industry. These include the chlorofluorocarbons, better known for their prime role in ozone depletion, and the perfluorocarbons, a group of potent greenhouse gases.

Projections of Global Warming

Global emissions of the main greenhouse gas, Carbon dioxide have grown from about 2 Gt (or billion tonnes) of carbon a year in the first half of this century to the current estimate of over 7 billion tonnes a year due to human activities. Further increases are inevitable, at least in the short term.

In deriving the projections for global warming, the Intergovernmental Panel on Climate Change (IPCC) looked at six scenarios for future carbon dioxide emissions based on a wide range of assumptions about population and economic growth, land use and technological changes and energy use. Its lower estimate has emissions rising slightly until 2025 and then falling to 5 Gt a year by 2100. At the other extreme, emissions keep rising at a fairly steady rate, reaching 35 Gt a year by 2100.

Based on these scenarios, the IPCC concludes that global mean surface air temperature is likely to rise between 1°C and 3.5°C by 2100. With all the scenarios put together producing an average rate of warming probably greater than any seen in the past 10,000 years.

Implications

What this means is that the effects of global warming will vary around the globe. Temperature increases are expected to be greater towards the poles than nearer the equator, and over land than at sea. While rainfall is expected to increase in some areas and decline in others, predictions for particular regions are still highly uncertain.

In addition, it is expected that there will be a number of impacts of the changes in the climate, including the following:

- reduction in biodiversity as plants and animal species not adapted to the changed con-

ditions in a region may die out;

- changes in the intensity of droughts and floods, and the availability of water for domestic, industrial and other uses;
- changes in agricultural productivity, which is expected to increase in some areas and decrease in others;
- threats to human health due to increase in geographical range of insects that carry diseases such as malaria; and,
- increases in the intensity and duration of heat waves.

Situation in Papua New Guinea (PNG)

PNG is highly vulnerable to the impacts of climate change as it encompasses more than 17,000 km of coastline, 600 islands and has almost 2,000 coastal villages and a rural coastal population of about 500,000 making it vulnerable to sea level rise and other weather-related manifestations of climate change. Our fisheries and marine resources, although currently abundant and at least less exploited, could prove susceptible to temperature and other changes. Our terrestrial ecosystems are particularly diverse and complex, and the impacts of climate change on them are not well established and understood.

The IPCC's projections of average sea level rise from 15 - 19 cm by 2100 due to global warming, with sea levels continuing to rise beyond this time frame. The extent of the rise will vary around the world. In some areas, problems caused by rising seas may be intensified by an increased risk of storm surges. The populations of some delta areas and low-lying islands will face increased danger from flooding and being submerged under water. Other likely impacts include erosion of shores and associated habitats, and increased salt levels in estuaries and freshwater aquifers in coastal margins.

International Concerns

At the 1992 United Nations Conference on Environment and Development (UNCED) meeting at Rio, world leaders, including PNG, signed a landmark international agreement, known as the "*Framework Convention on Climate Change*" (FCCC). The purpose of this agreement was for the parties to the Convention to begin developing strategies to mitigate the effects of atmospheric pollution on the global climate. Under the FCCC terms, industrialized countries are committed to the goals of balancing their greenhouse gas (GHG) emissions at 1990 levels by the year 2000 and also to assist developing countries in mitigating their longer-term emissions' trends.

This FCCC promotes two types of mitigation strategies to achieve a GHG balance. The first strategy consists of emissions reduction efforts involving energy conservation and conversion to renewable energy sources. The second strategy involves the protection and enhancement of GHG sinks such as the large areas of forests and coral reefs. The FCCC does not set country-specific obligations or seek to quantify broad emissions reduction goals; rather it establishes a general organizational, procedural and technical support framework. Thus allowing each party the flexibility to determine how to pursue its own commitments, the specifics of which are to be set forth in their respective National Action Plans.

The FCCC also contemplates that the parties to the Convention will initiate Joint Implementation (JI) projects that seek to reduce or sequester GHG emissions. The Convention also states that the Parties can reduce emissions either individually or jointly.

Further, according to the FCCC, the Parties "*shall adopt national policies and take corresponding measures*" to limit their emissions of greenhouse gases, with the ultimate objective of "*stabilizing GHG concentration in the atmosphere at a level that would prevent dangerous human interference with climate system.*"

US Initiative on Joint Implementation (USIJI) for reducing Greenhouse gas emissions

Given the high level of industry interest, the US has taken the lead in supporting the concept and implementation of JI projects. The Clinton administration has established a program; known as the US Initiative on Joint Implementation (USIJI), which had an allocation of some US$1 billion over a five year period to support pilot projects involving US companies or other entities (including NGOs) in other countries. This USIJI is one element of the US Climate Change Action Plan (CCAP), that the Clinton Administration has taken to implement in respect to the FCCC strategy for reducing emissions of greenhouse gases.

The emission reductions are achieved by projects such as fuel switching from fossil fuels to renewable energy sources (e.g., wind, hydro, solar, biomass) and improved energy efficiency. Greenhouse gas storage, or sequestration, is achieved through forest conservation and reforestation.

The aim of this USIJI is to:

(i) encourage US private-sector investment and innovation in the development and dissemination of technologies and procedures for reducing or sequestering emissions of greenhouse gases;

(ii) promote cost-effective projects that encourage technology cooperation and sustainable development projects in developing countries and emerging economies;

(iii) promote a broad range of projects to test and evaluate methodologies for measuring, tracking and verifying costs and benefits; and,

(iv) encourage participating countries to adopt more complete climate action programs.

The FCCC and the USIJI create an unique opportunity for developing countries to help assist in mitigating GHG emissions, while simultaneously harnessing the emerging interest in a carbon market to support sustainable development and biodiversity conservation of the forest resources.

PNG estimated GHG emissions

PNG is a relatively small source of GHG emissions, and its primary source is currently coming from the change in land-use patterns. According to the World Resources Institute (1994) report for the period 1994-95, land-use change in 1991 accounted for 29 million tons of carbon dioxide emissions, while energy and industrial-related emissions accounted for only 2.2 million tonnes. Methane emissions in PNG are estimated at around 10,000 tons per annum from a combination of solid waste disposal and livestock. All of these figures must be viewed as highly uncertain. However, we will shortly know our GHG emission levels when the present GHG inventories are finalised.

Hydropower provides the mainstay of PNG's electricity requirements, and the potential for expansion is quite enormous. Increased export-oriented exploitation of the country's oil and gas reserves, however, could increase our energy-related emissions over time. The same can be said for the growing transportation sector.

As PNG is a signatory to the United Nations Framework Convention on Climate Change, we have an obligation to prepare annual GHG inventories of our emissions of greenhouse gases according to international Guidelines. Some of the things that are required in these inventories include:

- establishing emissions patterns and trends;
- providing a starting point for the compilation of emission projections which was in 1994;
- providing essential information for the development of sectorial GHG mitigation measures and highlighting sectors requiring particular attention. For PNG we have identified six areas: agriculture, land-use changes and forestry, energy, industrial products, solvents and other products use and wastes;
- identifying potential sinks whose enhancement could provide offsets for emissions from other sectors;
- providing information/data to assist in assessing the effectiveness of mitigation measures; and,
- providing for comparison of PNG's GHG emissions vis-à-vis other parties to the FCCC.

Mitigating GHG emissions

At a seminar on GHG mitigation (or carbon offset) projects held in April 1997 in Port Moresby, a number of issues were raised and discussed. These include the policy initiatives taken by industrialized countries on reducing greenhouse gas (GHG) emissions such as the USIJI, and the realization by companies and industries emitting GHG that by 2008 they will be legally required by their host countries to reduce the quantity of their emissions. Such an obligation will, to an extent, be very costly, but there is a less costly alternative provided by developing countries. International emissions trading mechanisms are emerging, in which companies could invest in projects in developing countries that reduce GHG emissions e.g., carbon, and in return obtain "*carbon credits*" which they could use to trade off against the emissions they produce in their own countries. This new market place thus offers an economic opportunity for developing countries to obtain money through reduced impact logging,

reforestation, afforestation, agro-forestry, solar, hydro, wind and biomass power generation, as well as other new technologies that may be developed in the future, which can account for carbon savings. While reducing greenhouse gas is voluntary at present, companies now know that by year 2008 it will become mandatory, as endorsed by all parties following the Kyoto meeting of the Conference of the parties (COP). The race is now on to find the best model agreements for carbon offset projects.

One of the major greenhouse gases is carbon dioxide, and this carbon is released into the atmosphere by biomass that is left to rot on the forest floor as a consequence of logging or being burnt for shifting cultivation. American power companies, seeking to be involved in model carbon offset arrangements, are now funding projects in South America for example, that log more selectively, enabling carbon to be saved, or preserve national parks from being cleared for agriculture. PNG could easily tap into this new trading mechanism. Right now PNG is well ahead of many South Pacific countries in having already had formal Government to Government approval with the United States on a carbon offset project. This will enable similar projects to fast track. With the United States already on line, Australia, the Netherlands, Japan and other European countries who have already set up their own carbon emissions trading offices will soon follow.

These carbon-offset projects are an investment, which reduce projected greenhouse emissions to the atmosphere or increases the projected biological uptake of greenhouse gases from the atmosphere. Thus, the GHG mitigation projects are modification of conventional energy supply sources, energy utilization techniques, and land use patterns which have the greatest capacity to serve as project opportunities (Saulei, 1998). Generating electricity or power from non-polluting sources, such as the wind, hydro or solar energy supplies a GHG mitigation service. For example, a new wind electric generating facility produces both electricity and avoids carbon emissions relative to fossil fuel alternatives. Increasing the efficiency of capturing, transporting, generating and utilizing conventional energy provides a form of greenhouse gas mitigation by accomplishing more economic production with the same or fewer, overall greenhouse gas emissions.

In Papua New Guinea the forestry sector may provide the most obvious opportunities for carbon offset projects financing conservation of biodiversity.

PNG carbon trade project

The case for PNG is quite obvious. With over 100,000 ha of forests being cleared annually by shifting cultivation and a further 14 million ha of forests presently available to industrial logging interests, the scope for positive impact is quite substantial. For biodiversity conservation advocate, these GHG policy initiatives may offer new sources of finance for funding the implementation of management activities (Parsons and Saulei, 1998; Saulei, 1998).

Already one formal attempt has been made in PNG. In early 1995, the UNDP / DEC Biodiversity Conservation and Resource Management Program undertook the first comprehensive attempt to develop a carbon offset investment prospectus for a PNG Forest Management initiative. The prospectus was part of a sustainable forestry project associated with an integrated conservation and development project in Lak, New Ireland Province (Stuart and Sekhran, 1996). The project comprises a total of some 23,400 ha divided into the following uses: 9,400 ha conserved forest, 12,000 ha reduced impact logging and 2,000 ha reforested forest, was allocated for this purpose. The implementation of the project would have lowered local carbon emissions to the atmosphere by reducing the relative amount of dead matter left on the forest floor. The prospectus was designed to raise funds from outside parties to help implement the proposed project, in return for verifiable GHG savings. Unfortunately, the substantial efforts to develop this initiative were not sufficient to overcome the pre-existing economic, business and cultural hurdles at the project site. The project did not go ahead because industrial logging had taken away the resource base needed for the sustainable forestry project.

The Lak carbon offset project would have earned an estimated US$2 million, at that time of the project inception, for the local landowners by saving around 3.78 million tones of carbon over a sixty year period (Stuart and Sekhran, 1996). However, using the recent carbon trade value of US$10 a tone, this would have amounted to some US$30 million over the same period.

While it did not proceed, the Lak initiative was a valuable experience in this new field. PNG, to this day is still the only country in the Asia-Pacific region to have "*in-development*" status from the US Government for a carbon offset forestry conservation proposal. As such, PNG is now the country best placed in the whole region to establish a carbon

swap forestry conservation project with the USIJI.

Other similar projects

There are two major examples of forestry conservation carbon swap projects fully-funded Carbon Swap Forestry Conservation Projects and these are the Mercado Project in Bolivia and Rio Bravo Project in Belize (Stuart and Sekhran, 1996). Both projects involve The Nature Conservancy, the environmental non-government organization from the United States, which also assisted in the Lak sustainable forestry project. This environmental NGO is currently one of the stakeholders for the Josephstaal FMA timber concession area in Madang Province.

The US$8.78 million Mercado Project involves expanding the boundaries of the Mercado National Park threatened by poaching, logging, and unplanned agriculture, providing technical assistance to low-impact local logging firms, establishing commercial orchid farms, supporting an eco-tourism program, and assisting local landowners in alternative sustainable income generating activities. The US$7 million funding for the project has been sourced through the American Electric Power company, which is one of a number of American private utilities which believes that it is worthwhile to invest in establishing the feasibility of carbon offset projects. The project estimated that it could offset as much as 14.5 million tonnes of carbon over thirty years. A local Bolivian environmental NGO and The Nature Conservancy are assisting the company.

The US$2.6 million Rio Bravo Program in Belize involves five United States private electric power companies and The Nature Conservancy. The project will rescue a 14, 000 ha parcel of land from unsustainable agricultural clearance for biodiversity conservation. It also includes a sustainable logging project. The estimated carbon savings are 5.2 million tonnes over the next forty years.

In a seminar held in 1997 on GHG mitigation, the question about the future market for carbon was raised. To answer this we can give an example of what the Costa Rican Government is currently doing. The Government has in fact gone ahead making its own deals with private landholders for carbon savings, packaging them up and selling them overseas. Theoretically, groups working in small sustainable logging projects in PNG could also have their projects' carbon savings verified, bundled up as a package and also sold overseas if a buyer could be identified. At the moment, however, there is no real world market in carbon. Nevertheless, there is a market for model carbon projects. At the end of 1997 COP meeting at Kyoto, a Protocol was reached (Kyoto Protocol), which made the situation become clearer, where industrialised countries have agreed to a legally binding reduction of their overall GHG emissions by 5.2% to that of the 1990 levels, which will become effective by 2008. Thus, what this meant is that by agreeing to this Kyoto Protocol, such countries will force their respective companies to comply by reducing their carbon emissions. It is estimated that reducing emissions in countries like the United States could cost companies in excess of US$100 a tonne. In Costa Rica, they are already selling carbon savings at US$10 a tonne. At this point, a market will emerge, if the countries involved agree to allow it to happen.

Although PNG is one of the signatories to the UNFCC, to date we have no policy framework targeted specifically at climate change concerns. Despite our official recognition of the need to address the environmental issues facing our country, we are obliged to get our acts together to implement some of these conventions we have signed, including climate change. It may require us obtaining external assistance from Global Environment Facility or GEF in order to strengthen our institutional and technical capabilities needed to comply with the country's obligations under the UNFCCC, and to produce PNG's first national communication.

PNG's Obligation to UNFCCC

As a step towards implementation of our UNFCCC obligation, our Government through UNDF has drawn up and implemented a Climate Change Assistance project aimed at developing methods, building capacity and strengthening national institutions to assess the socio-economic and environmental impacts of climate change. The project is also aimed at increasing the capacity of our Government to identify and evaluate policy options and plan for adaptation to possible climate change. This project is being funded through the World Bank/UNDP - Global Environment Facility (GEF), which was signed early last year and has been implemented.

From what I have said above, it is very clear that we have to fulfill our obligations to the numerous International Conventions, including the climate change. The Climate change issue of greenhouse gas mitigation is very important to us as it provides our people the opportunity for implementing forest

conservation and development strategies and at the same time providing financial benefits, especially to the resource owners, compared with the current destructive and exploitative development of our forest resources.

In order to benefit from GHG mitigation investments we need to source assistance for establishing our baseline data that can be verified by certification. We need to market our potential in GHG investments to industrialized countries. However, whatever agreement we reached, we need to take into account our capacity requirements for implementing GHG mitigation projects.

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