

TRENDS IN FOREST-BASED CARBON
SEQUESTRATION IN ASIA:
IMPLICATIONS FOR THE UNITED STATES

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JULY 21, 2008



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Implications for the United States

Introduction

As Americans consider the role of forests in climate mitigation and possible mechanisms for rewarding forest-related carbon sequestration, it makes sense to look at how other nations and regions are proceeding with forest carbon sequestration programs. This article focuses on such programs in Asia, a region that may someday serve as a major source of forest-based carbon credits for American buyers.

While only a few Land Use, Land Use Change and Forestry (LULUCF) projects have been initiated in Asia to date, a number of recent developments may contribute to a much greater role for the region in the near future. These developments include increasing government support for forest-based projects in many Asian countries, improvements in standards and carbon accounting for forest projects, and building momentum to include forest conservation projects under the Clean Development Mechanism (CDM). Several initiatives in emissions trading may also offer increased markets for forest-based credits.

The United States could play an important role in driving demand for forest-based credits, both in the short and long term. If the US joins the regulated carbon market, it is expected to quickly surpass Europe in carbon trades as its key industries become regulated. With the US seemingly more open to forest-based credits than Europe, U.S. involvement could offer a huge boost in demand for such credits. However, many issues need to be resolved to clearly define the role of forest-based carbon credits in global emissions trading.

Forest Conversion and Greenhouse Gas Emissions in Asia

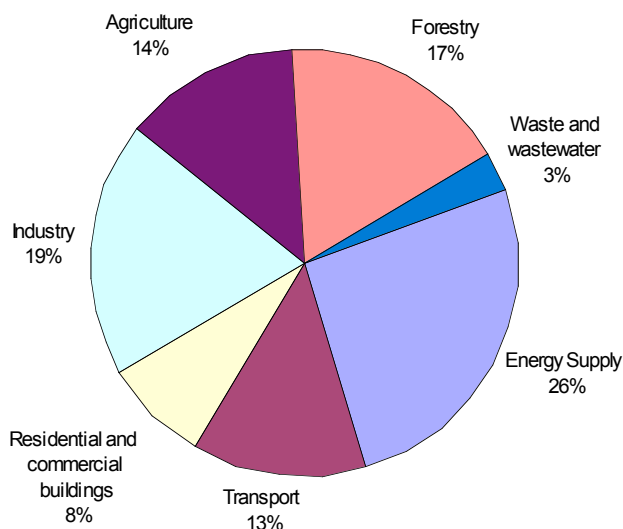
Forests play a critical role in the global carbon cycle. Forests moderate the net flux of some significant greenhouse gases (GHGs) between land and atmosphere, and forests store (sequester) carbon in biomass and soils. Forests act as carbon sinks when their area or productivity is increased, resulting in greater uptake of atmospheric carbon dioxide (CO₂). Conversely, forests can be a source of GHG emissions when they are burned or cut down, or when biomass or soil humus decays.

Due largely to tropical deforestation, forests are currently a net emitter of GHGs in the world. Between 1990 and 2005, shrinkage of global forests is estimated to have added around four gigatons (Gt)¹ of CO₂ to the Earth's atmosphere each year (Swallow et al. 2007). In 2004, the Intergovernmental Panel on Climate Change (IPCC) estimated that the forest sector was responsible for 17.4% of global greenhouse gas emissions, more than all the cars, trucks, planes, trains, and ships in the world combined (Figure 1).

In developing Asia, deforestation likely accounts for an even greater share of emissions. In the last few decades, there have been massive deforestation and land-use changes in tropical Asia due in large part to clearing of land for agriculture. The FAO put annual forest loss in South and Southeast Asia at 2.85 million hectares (7 million acres) or nearly 1% per year, between 2000 and 2005. Since tropical forest ecosystems contain substantial amounts of carbon, such losses significantly reduce carbon stocks in the region.

¹ One gigaton is 1 billion (or 1,000 million) metric tons.

Figure 1: Share of different anthropogenic GHGs in total emissions in 2004 (CO₂ equiv)



Source: IPCC. Climate Change 2007: Synthesis Report.
(<http://www.ipcc.ch/>)

The extent of deforestation and resulting GHG emissions differ greatly between countries (Figure 2). Some countries are experiencing a balance of carbon-emitting and carbon sequestering land use changes. For instance, among all countries in the world, China witnessed the largest annual net gain in forest area at four million hectares (9.9 million acres) per year between 2000 and 2005 (FAO 2005).² This increase is due to recent, large-scale afforestation programs, implemented to meet domestic fiber requirements.

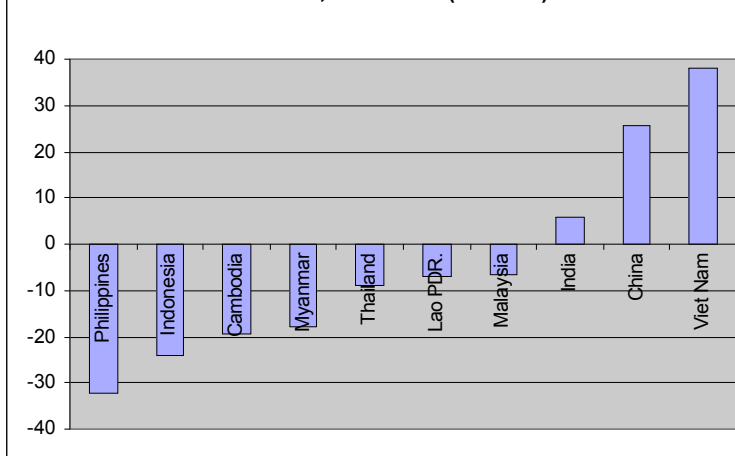
However, in most countries, carbon-emissions due to forest conversion vastly exceed carbon gains. In Asia, this is particularly evident in Indonesia. In this heavily-forested country, deforestation is occurring at

the rate of about two million hectares (5 million acres) per year, as old-growth rainforest is logged, burned, or converted to agricultural uses and palm oil plantations (World Bank 2007a). Largely due to deforestation and peat land degradation, Indonesia is the third largest source of greenhouse gas emissions in the world (Swallow et al. 2007).

There are increasing concerns about countries that still have abundant forest reserves, such as Lao PDR, Papua New Guinea, and Cambodia. In Cambodia, illegal logging of hardwood timbers for export was responsible for much of the 30 percent reduction in primary rainforest cover since 2000, one of the most rapid losses recorded by the FAO.

Another concern in the region is the rapid spread of large-scale commercial plantations, many of which are preceded by clearing of natural forests. While there is a heated debate about whether the potential benefits of commercial plantations outweigh the considerable environmental and social problems often associated with their development, there is little doubt that clearing primary or secondary forests to establish plantations reduces carbon stocks.

Figure 2: Total Deforestation in Select Asian Countries, 1990-2005 (Percent)



Source: Food and Agriculture Organization. *State of the World's Forests 2007*.
Note: Only includes countries with over 7,000 hectares of total forest area.

² Vietnam was third with 241,000 hectares (610,000 acres) per year.

Ironically, the growing eagerness to slow climate change by using biofuels has provided a new impetus for deforestation in Asia and throughout the world. For instance, the use of palm oil in production of biodiesel has markedly increased the rate of forest conversion. While biodiesel offers many environmental benefits, including reductions in air pollutants, increased demand for clean fuels is significantly impacting natural forests in Indonesia, Malaysia, and Thailand (Leahy 2007). Energy companies are investing billions to acquire or develop oil-palm plantations in developing countries, often on lands cleared for the sole purpose of plantation development. A high proportion of existing plantations have been established by governments, under aid programs, or under financial incentives to the private sector (Brown 2000).

Despite the lure of forest conversion for biofuels production, various forestry practices can make retention of natural forests attractive, while also helping to slow the accumulation of CO₂ in the atmosphere. Tropical forests have a large potential to mitigate climate change through conservation of existing carbon pools (e.g. forest protection, conservation and sustainable harvesting), expansion of carbon sinks (e.g. reforestation, agroforestry), storage management (e.g. longer rotations, reduced impact logging) and substitution of fossil fuels with biomass energy from sustainably managed forests.

A recent study conducted by an international consortium of researchers³ found that returns to landowners that come from clearing trees are generally so paltry that, if farmers and other land users were rewarded for the carbon stored in their trees and forests, it is highly likely that a large amount of deforestation and carbon emissions would be prevented. In most of the areas studied, the various ventures that prompted deforestation conversion rarely generated more than \$5 for every ton of carbon released and frequently returned far less than US \$1 per ton (Swallow et al. 2007).

Carbon Markets for Forest-Based Projects in Asia

Despite the important role of forests in mitigating climate change, establishing mechanisms to integrate forests into emissions trading or offset schemes has been fraught with difficulty, and the market for temporary credits from forest-based projects has been limited. Outside of Australia, the Clean Development Mechanism (CDM) under the Kyoto Protocol and voluntary (or carbon offset) markets are the only two outlets for forest-related sequestration credits in Asia.⁴ Forest-based projects in Asia do not yet figure prominently in these markets. In the following paragraphs, current forest-based carbon sequestration projects are summarized for these two main market outlets.

Clean Development Mechanism

For the first commitment period (2008-2012), the Kyoto Protocol primarily targets measures to mitigate climate change within developed countries. An important exception is the *Clean Development Mechanism*. The CDM is one of the Protocol's flexibility mechanisms that UNFCCC⁵ negotiators created to reduce costs of emissions reductions. Public or private entities may fulfill their obligations under the Protocol through investing in "Clean Development" projects in developing countries. While reducing emissions, CDM projects also aim to promote sustainable development in the host country.

The issue of sinks and the inclusion of Land Use, Land Use Change and Forestry (LULUCF) activities in the CDM has been one of the most contentious issues in negotiations aimed at making the Kyoto Protocol operational. Inclusion of forest-based carbon sequestration projects is seen by some as a potential

³ The World Agroforestry Center (ICRAF), the Center for International Forestry Research (CIFOR), the International Center for Tropical Agriculture (CIAT), and the International Institute for Tropical Agriculture (IITA).

⁴ While forestry sequestration projects are widely accepted under the Australia-based New South Wales Greenhouse Gas Abatement Scheme, these credits must come from local projects.

⁵ United Nations Framework Convention on Climate Change

loophole that can be used by developed countries to postpone the implementation of domestic measures to reduce green house gas emissions. Developing countries and environmental NGOs are also concerned that LULUCF activities can lead to *eco-colonialism*, whereby developed countries can lock up forests as carbon sinks and restrict their use for development purposes, while deriving low-cost carbon credits for their sole benefit. Other concerns center around the lack of permanence of carbon sequestered in forests, the difficulties associated with quantifying the carbon stored, and the risk that including forestry activities could provide a subsidy to clear forested land for large commercial plantations. In contrast, LULUCF advocates maintain that investment in the forest sector is important to halt deforestation and to diversify the income-opportunities of local communities through reforestation activities. They also argue that forest carbon credits offer the only meaningful incentive for many developing countries to participate in international efforts to deal with climate change.

At the 7th Conference of Parties (COP7) in 2001, the eligibility of LULUCF activities was limited to Afforestation and Reforestation (AR) activities.⁶ To the disappointment of many developing countries, forest conservation (i.e. avoided deforestation) projects were excluded.⁷ Furthermore, AR activities were limited to a ceiling of 5% of a country's Certified Emission Reductions (CERs)⁸ over the five years of the first commitment period, or just 1% per year.

Development of the final rules for a carbon credit scheme for AR projects was concluded in December 2003 through negotiations at COP 9. An overriding focus of negotiators was establishment of procedures for accounting for changes in carbon stocks in LULUCF projects. This is critical since inclusion of such projects under the CDM has created a market mechanism whereby emissions are allowed in one area in exchange for establishing sinks in another area. Some of the important rules governing LULUCF activities under the CDM are provided in Box 1.

Forestry projects have been struggling to access carbon finance under the CDM in the four years since the rules for AR projects were adopted. While there are currently 1,000 registered CDM projects worldwide accounting for an estimated 1.25 *billion* certified emissions reductions (CERs), only one AR project has been registered. That project was initiated to establish 2,000 hectares (5,000 acres) of multiple-use forests in watershed areas along the Pearl River Basin in China. An additional 16 AR projects are in the validation stage,⁹ half of which are located in Asia - two in China, five in India, and one in the Philippines.¹⁰ The total amount of carbon that will be sequestered as a result of these Asia-based AR projects (if they are all validated) is estimated to be 483,124 metric tons of CO₂ equivalent per year, or 0.0005 Gt.¹¹ A quick review of the UNFCCC Project Search website reveals many *individual* landfill gas to energy projects estimate reductions higher than that amount.

⁶ Afforestation and Reforestation (AR) comprises human induced conversion of non-forest land through planting, seeding and/or human induced promotion of natural seed sources. Forests are defined as having a tree crown cover (or equivalent stocking level) greater than 10%. The activity is classified as afforestation if the land has not been forested for at least 50 years, whereas reforestation refers to land that did not contain forest before 1990. Established forests may be managed, harvested and used for a variety of purposes, including agro-forestry, bio-energy, or timber production. However, the forest land may not be temporarily unstocked as a result of human intervention such as harvesting, nor have the potential to revert to forest without human intervention.

⁷ Also excluded was consideration of carbon stored within harvested wood products, and in avoided carbon through replacement of high embodied energy (high quantities of total energy needed in production) products with low embodied energy products.

⁸ A CER is a unit of greenhouse gas emission reductions issued pursuant to the CDM and measured in metric tons of carbon dioxide equivalent.

⁹ Validation is the process of independent evaluation of a project activity by a designated operational entity against the requirements of the CDM on the basis of the project design document.

¹⁰ See UNFCCC website (<http://cdm.unfccc.int/Projects/projsearch.html>) for a list of these projects.

¹¹ Based on estimates provided by project participants in unvalidated project development documents.

The main reason for the relative lack of activity is that, the market for temporary credits from forestry is limited. One major obstacle for AR CDM is the European Union's decision to exclude forestry credits from the EU Emissions Trading Scheme (EU ETS), which currently comprises the majority of the global carbon market.¹² Since the trading scheme covers much of the European private sector, the EU policy will likely continue to keep forestry credits out of reach of one of the major demand groups. In 2006, European buyers dominated the primary CDM and Joint Initiative (JI) market, with an 86% market share (World Bank 2007b).

Even without the negative influence of EU policy, demand for temporary carbon credits has not been strong among potential buyers in the regulated markets. There are a number of reasons for this low interest (Boer 2006):

- AR CDM projects are not permanent and must be replaced after a certain period.
- The exacting and complicated rules for AR projects imply high transaction costs.¹³
- The 1%-cap of the Kyoto Protocol is likely to alienate some investors and credit buyers, although it is not currently acting as an obstacle.¹⁴
- AR projects face a number of unique risks, such as fire, pest and disease, and legal problems (e.g. land title, title to carbon, transfer of rights, implementation and management contracts).

Box 1: Rules for LULUCF activities under the Clean Development Mechanism

Additionality: As is the case with energy projects, LULUCF projects must meet additionality requirements, meaning that a project must lead to carbon benefits that are additional to a business-as-usual scenario. This requirement should restrict inclusion of large-scale commercial plantations, since most of them should be economically viable without carbon finance.

Leakage: Leakage occurs when forest sink projects have the effect of increasing deforestation outside the project area. If this occurs, the carbon released when deforestation activities are relocated to areas outside project boundaries can equal or even surpass the amount of carbon captured through the project. The final rules state that all projects must account for potential leakage and include measures to minimize it.

Non-permanence: In response to concerns that carbon sink credits would allow countries to offset permanent carbon releases from burning fossil fuels with temporary carbon sequestration offered by forests, negotiators stipulated that forestry projects could only result in so-called temporary Certified Emissions Reductions (tCERs), which expire after at most 10 years, or long-term CERs (ICERs), which are valid for the crediting period of the project or the project lifetime. These must be replaced by other credits in the future or if reversal of sequestration has occurred during the crediting period. Thus, sellers of carbon credits from reforestation projects have an incentive to ensure that the carbon stocks are retained. The crediting period was established at either 20 years - which may be renewed at most two times (up to 60 years) - or a maximum of 30 years. This means that the sale of a carbon credit incurs an ongoing obligation.

Impact assessment: After extensive negotiations, Parties agreed to include a general list of social and environmental areas that must be assessed as part of developing a CDM project. These areas include expected impacts on hydrology, soils, local communities, land tenure, local employment, and food production, among others. In addition, a project's preparation phase is subject to a 45 day comment period. The responsibility for undertaking these assessments will fall on project developers and other involved entities, under the watchful eye of interested non-governmental organizations.

Small-scale projects: Another feature of the rules is the inclusion of small-scale AR projects, which enable the participation of low income communities. To make these activities viable, simplified modalities and procedures were agreed on in COP 10 to reduce the high transaction costs associated with AR projects. Due to the potential transaction costs involved, only small-scale projects expected to result in net removals of less than 8 Kt CO₂eq/year are allowed.

¹² As a "tributary scheme" to the Kyoto Protocol, the EU ETS was launched on January 1, 2005 as a cornerstone of EU climate policy towards its Kyoto commitment. It has spawned a thriving market in the trade of allowances and for the import of project-based reductions. In its first phase from 2005 to 2007, the EU ETS regulated CO₂ emissions from energy-intensive installations representing some 40% of EU emissions.

¹³ The CDM project cycle required for project developers involves project design and development, validation, registration, monitoring, verification and certification, and the issuance of carbon credits. It also poses challenges in the development and use of methodologies to define baselines, monitoring and additionality.

¹⁴ So far, transactions cover only 6% of tradable credits under the allowable 1%-cap (World Bank 2007b).

Despite these competitive disadvantages for AR CDM, there will likely be increasing demand for these carbon credits due in part to their perceived community benefits. As 2012 approaches and companies in the West realize it's cheaper to buy credits than to clean up at home, purchases of credits from developing countries may increase. This may provide a boost to temporary credits from forestry projects.

A number of groups have offered greater access to information and capacity-building programs for activities that address the high transaction costs associated with AR. For instance, the International Tropical Timber Organization (ITTO) initiated a project to formulate and implement AR-CDM projects and to facilitate public-private partnerships that link host developing countries with potential investors.

To date, several million forestry credits have been put forward and purchased by the BioCarbon Fund, administered by the World Bank. Launched in November 2003, the Fund purchases carbon credits from CDM projects and finances demonstration projects for carbon sequestration and conservation in forest and agro-ecosystems outside the Kyoto market. The main contributors to this public/private partnership are governments, including Canada and Italy, and companies (e.g., Japanese power companies). Emissions Reduction Purchase Agreements (ERPAs) for more than a dozen projects are already signed and more await approval (Haupt and von Lüpke 2007). The price paid by the BioCarbon Fund may be taken as a first signal to estimate the value of temporary credits (tCERs) - around \$4 USD per ton CO₂.

Voluntary Markets

In addition to compliance markets like the Kyoto Protocol, there is a growing voluntary carbon segment that sells emission reductions to individuals and companies seeking to offset their own carbon emission footprints. Started well before the Protocol by conservation organizations looking to find new ways of financing their projects, voluntary carbon markets include all carbon offset trades that are not required by regulation. At the broadest level, the voluntary carbon markets can be divided into two main segments – the voluntary, but legally binding, cap-and-trade system that includes the Chicago Climate Exchange (CCX), and the broader, non-binding, over the counter (OTC) offset market (Hamilton 2007).

Started in 2004, CCX defines itself as “the world’s first and North America’s only active voluntary, legally binding integrated trading system to reduce emissions of all six major greenhouse gases with offset projects worldwide.” CCX is the first voluntary cap-and-trade system. Members voluntarily join CCX and agree to its legally-binding reductions policy. The CCX’s unit of trade is the Carbon Financial Instrument (CFI), which represents 100 tCO₂e. In 2005, the CCX also launched the European Climate Exchange (ECX), which has since become the major exchange for EU ETS allowances. Offsets from Indian, Chinese and New Zealand projects have also been listed on the exchange (World Bank 2007b).

Outside of CCX, a wide range of voluntary transactions make up a market that is not driven by an emissions cap. The project-based credits in this market are generally referred to as Verified Emissions Reductions (VERs) or simply as carbon offsets. Suppliers in the offset market include retailers selling offsets online, conservation organizations, developers of potential CDM projects, and project developers primarily interested in generating VERs. The buyer motivations vary. Some have an interest in managing their climate change impacts for philanthropy or public relations benefits, while others buy credits in preparation for federal regulations or to resell them for profit (Hamilton 2007).

Compared to their regulated cousins, voluntary markets can be more nimble and innovative. This is particularly true when it comes to forestry projects. While Kyoto negotiators are spending considerable time, energy, and money trying to determine how avoided deforestation might enter the CDM markets, voluntary markets are able to consider less complex and costly ways to manage risk. As a result, large classes of LULUCF assets that are still excluded from the CDM and other regulatory markets (e.g. soil sequestration, fire management and avoided deforestation) still offer attractive opportunities to promote sustainable development in natural resource-based economies (World Bank 2007b).

While voluntary markets are still relatively small compared to the Kyoto market, trading in voluntary carbon is increasing exponentially. For instance, the Chicago Climate Exchange (CCX) traded 22.9 million metric tons CO₂ in 2007, an increase of 123% over 2006, and this volume has already been eclipsed in the first quarter of 2008 (CCX 2007). The size of the voluntary OTC offset market is harder to estimate because of the decentralized nature and lack of comprehensive data. According to a study conducted by Ecosystem Marketplace, the volume of trades in the OTC market was 13.4 million tons of CO₂ in 2006 (Hamilton 2007). However, the study was quick to point out the impossibility of capturing all OTC transactions, particularly involving international projects (Asia and Latin America especially), so it is possible that the actual volumes being traded are larger than the volumes reported by CCX.

According to the Ecosystem Marketplace study and in stark contrast to the situation in the CDM market (in which forestry credits are negligible), forestry projects accounted for 36% of the transaction volume in the OTC voluntary market in 2006.¹⁵ The predominance of forestry credits in voluntary markets is perhaps not surprising. First, they face lower financing and bureaucratic hurdles than is the case in regulated markets. And second, while several projects have been criticized for negative social or environmental impacts, forestry credits are highly valued by many buyers for providing potential benefits to communities beyond carbon sequestration, including biodiversity (Hamilton 2007).

The popularity of forestry projects in the voluntary market has not translated into many projects in Asia. As shown in Table 1, the vast majority of forestry-based credits originated in North America (about 66% in 2006) due in large part to high value placed on forestry projects in US voluntary markets. For example, the first protocol approved for offsets by the California Climate Action Registry was the forestry protocol.¹⁶ Meanwhile, developing countries in Asia and the Pacific have typically been more reluctant than countries in other regions to pursue these opportunities. This is tied to the resistance of a number of developing countries in Asia to include forest-based projects in the CDM. One of the arguments is that developing countries should have a right to develop their natural resources and advance their national economies similar to how most developed countries fueled their own economic development. Some also view such projects as a form of eco-imperialism - a ploy whereby developed countries can control resources in developing countries. Such resistance has contributed to the limited number of voluntary projects proposed in the region. Many of the projects that have been initiated are supported by non-profit organizations such as Conservation International.

Table 1: Recorded OTC forestry transactions

Type of project	ktCO ₂ *						Total
	Asia	Africa	North America	South America	Europe & Russia	Australia / Other	
Afforestation/reforestation plantation	18	4	6	193	0	0	221
Afforestation/reforestation mixed native	1	308	2,337	157	128	26	2,957
Avoided deforestation	0+	16+	0	309	0	2	327
Total	19	328	2,343	659	128	28	3,505

Source: Hamilton, Katherine, Ricardo Bayon, Guy Turner, and Douglas Higgins. 2007. *State of the Voluntary Carbon Markets 2007: Picking Up Steam*. The Katoomba Group's Ecosystem Marketplace and New Carbon Finance. (July 18). (www.ecosystemmarketplace.com/documents/acrobat/StateoftheVoluntaryCarbonMarket17July.pdf)

* + sign means that respondent indicated transactions of this type, but did not provide volumes.

¹⁵ Renewables came in a close second at 33%. Industrial gas projects were third at 20% of projects.

¹⁶ The California Climate Action Registry is a private non-profit organization that provides GHG reporting standards and tools for member organizations to measure, monitor, third-party verify and reduce their GHG emissions.

Recent Developments Affecting the Future of Forest-based Carbon Projects in Asia

Since the United Nations Framework Convention on Climate Change came into force fourteen years ago, forest-based carbon projects have been surrounded by controversy. While such projects will continue to spark debate, recent events point to greater activity in forest-based carbon markets and a greater role for both Asia and the United States in these markets. This section describes four recent major developments.

Increased Government Support for Forest-based Projects in Asia

Forest-based projects are increasingly viewed by government officials in Asia as a way to meet national development and environmental priorities while contributing to economic, social, and institutional development. This is apparent by the inclusion of forest-based initiatives in the Sydney APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development, signed on September 9, 2007 (Box 2). While the overall pact was criticized for its failure to call for binding targets, the agreements made relating to forests represented an about-face from reluctance shown in the past.

Box 2: Excerpt from APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development

Forests can play a critical role in the carbon cycle. Ongoing action is required to encourage afforestation and reforestation and to reduce deforestation, forest degradation and forest fires, including by promoting sustainable forest management, combating illegal logging and addressing the underlying economic and social drivers. We therefore:

- agree to work to achieve a regional aspirational goal of increasing forest cover in the APEC region by at least 20 million hectares of all types of forests by 2020.
- welcome the Global Initiative on Forests and Climate launched in Sydney in July 2007.
- welcome the development of other instruments which may include continued work on a Legally Binding Instrument on Sustainable Forest Management for those economies interested in pursuing this option.
- agree to establish the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation to enhance capacity building and strengthen information sharing in the forestry sector. Collaboration between all regional initiatives on forests, including the Asia Forest Partnership, will be important.
- coordinate with relevant international institutions to develop forest program partnerships, including the proposed World Bank forest carbon partnership facility.

Source: http://www.apec.org/apec/leaders_declarations/2007/aelm_climatechange.html

Although regional commitments are a step in the right direction, real progress must come at the country-level. Important factors at the country-level include the state of forest resources, attention to relevant legal and legislative issues (e.g. land tenure), and advancement of forest management policies, including the promotion of AR CDM projects. Based on these criteria, China and India will likely offer the most promising sites in Asia for forest-based sequestration projects in the near future.

In both China and India, there are many regions where once-rich forests have been depleted of their timber wealth and where large areas of land are under the control of governments. In India, for instance, the National Remote Sensing Agency estimated the extent of wastelands to be 63.85 million ha, which is almost 20% of the total geographical area (UNFCCC). These lands could potentially provide forest-based industries with opportunities to establish CDM-supported industrial plantations to meet raw material needs as long as additionality and other project requirements are met. Such plantations could leverage the proactive efforts of governments and local communities. The Joint Forest Management (JFM) program in India, for example, has increased stability of tenure and participation of communities in land management decisions. In some areas of China, improved land tenure policies have stimulated farmers to develop collaborative institutions to capitalize on economies of scale in marketing timber (Smith 2002).

On the other hand, the potential for AR CDM projects may be limited in countries that are rich in forests, such as Indonesia and Malaysia. In these countries, land rights are often unclear and overlapping and there is a higher degree of conflict among stakeholders, such as the logging and plantation industries, local communities, and large scale farmers and ranchers (Smith 2002). If these problems can be overcome, many opportunities exist. Of Indonesia's 108 million ha of forestland, 12% is presently idle and unproductive and offers potential areas for carbon sequestration through forestation under the CDM. These lands could absorb 45–300 tons of carbon dioxide per hectare per year (ADB 2003).

Momentum Building for Forest Conservation under the CDM

As explained above, offsetting carbon emissions by conserving forests is not yet one of the UN's carbon trading mechanisms, so any projects starting now can only earn credits in the voluntary market. However, momentum has been building behind Reduced Emissions from Deforestation and Degradation (REDD) initiatives to extend regulated carbon markets to include "avoided deforestation" - activities that produce payments for preserving existing forests.

The Coalition for Rainforest Nations, a global lobbying group consisting of fifteen developing nations, put avoided deforestation on the post-Kyoto agenda at the 2005 Climate Change Conference in Montreal. Participating nations sought full credit for avoided deforestation and reforestation. Their cause received a significant boost when the *Stern Review on the Economics of Climate Change*, released in October 2006, identified avoided deforestation as one of the most cost-efficient strategies to mitigate climate change.

Bolstered by this growing momentum, the UN climate conference in Bali last December (COP 13) agreed to move forward on inclusion of REDD in global carbon market mechanisms in the second phase (from 2012) of the Kyoto Protocol. The four-page Bali Action Plan, while containing no binding commitments, called on Parties to step up international efforts to combat climate change and get to an agreed outcome in Copenhagen in 2009 (a process tentatively started in the most recent talks in Bangkok on March/April 2008). The Plan also called for greater action to develop "*Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.*"

It is unlikely that negotiations will lead to immediate approval of REDD projects, as there are still a number of contentious issues to be worked out. One problem is that if avoided deforestation is allowed into the CDM and reduction targets stay the same, the price of compliance allowances could fall significantly. The big losers of this crash would be local communities hoping to cash in on forestry. In addition, there is the ever-contentious issue of additionality. With avoided deforestation, some kind of system will need to be devised to prove that a saved forest is in danger of being cleared without a project intervention; this will require putting firm numbers on hypothetical future developments (Zwick 2007). Steps will also have to be taken to ensure that the benefits of such a global forest trading scheme will reach peoples living within the affected forests.

Despite these ongoing issues, significant steps are already being taken to develop this market. The Chicago Climate Exchange is currently working on protocols for "pure preservation" credits. It has allowed avoided deforestation protocols in its credits, albeit only when paired with reforestation and afforestation. In addition, the World Bank has stepped in to guide a market in REDD credits through its Forest Carbon Partnership Facility, launched at the UN climate change talks in Bali. The FCPF is designed to test the feasibility of different market-based approaches to avoided deforestation, with the ultimate goal of jump-starting a forest carbon market. Nine industrialized countries have already pledged US\$155 million to kick-start the 10-year initiative. A US\$100 million Readiness Fund will provide grants to help countries set up systems and processes to monitor and credibly govern their forests. Several

countries will also be able to sell emission reductions to a special US\$200 million Carbon Fund (World Bank 2007a). It will differ from the CDM by setting national-level reduction targets for a country's entire forest sector, instead of on a project-by-project basis. Pilot projects have already been proposed for Papua New Guinea, Costa Rica, Indonesia, Brazil, and the Democratic Republic of Congo.

Asian countries may become active partners in REDD initiatives. The government of Australia has already pledged 200 million Australian dollars toward preventing deforestation in the Asia Pacific region, a figure nearly twice the size of the entire voluntary carbon market in 2006 (Zwick 2007). As part of this pledge, the Australia-PNG Forest Carbon Partnership would see Australia pay to preserve Papuan rainforest and earn carbon credits for use in its own emissions trading scheme currently under development, or in other regional and global emissions trading schemes.

Asia is also home to a groundbreaking forest conservation project that may serve as a model for how carbon markets can be used to halt rapid rates of tropical deforestation and resulting carbon emissions. The project, located in the Ulu Masen forest in Aceh Province, Indonesia, is the first REDD project in the developing world to be accredited by the Climate, Community and Biodiversity Alliance (CCBA), which offers an offset accreditation standard in the voluntary market for forestry carbon. The project – backed by the Government of Aceh, Fauna & Flora International (FFI) and Carbon Conservation – will protect 750,000 ha of forest in the Ulu Masen Ecosystem and peripheral forest blocks located in Aceh Province. Proposed activities (e.g. land use planning and reclassification, increased monitoring and law enforcement, reforestation, restoration, and sustainable community logging) will reduce deforestation in the area by 85% and will help avoid 3,369,848 tons of CO₂ emissions each year (Aceh, 2007).

Improvements in Standards and Carbon Accounting

As the voluntary carbon market is getting more diverse and competitive with the addition of many more retailers, brokers, and project developers, the quality of forest-based carbon offsets is increasingly important for both buyers and sellers in the market. Quality issues will ultimately determine how (and how fast) the market for such offsets will grow. In response, various groups, from non-profits and industry associations to offset providers and government agencies, have been working to create more rigorous standards and certification programs to ensure confidence and quality in the global market.

One such program that has been developed to address this need is the Climate, Community, and Biodiversity (CCB) standard. The development of the CCB Standard was spearheaded by the Climate, Community and Biodiversity Alliance (CCBA), which is a partnership between a range of corporations (e.g. Intel Corp. and Weyerhaeuser) and research and non-governmental organizations (e.g. The Nature Conservancy, Rainforest Alliance, Sustainable Forestry Management). This standard promotes the development of climate change mitigation projects that incorporate biodiversity conservation and contribute to sustainable development.

The CCB Standard allows private-sector companies, multi-lateral funding organizations, and government agencies to screen land-based carbon projects. In 2007, the first two forestry projects, in Panama and in China, were independently certified to the CCB Standard. Since then, several dozen projects, both under the CDM and for the voluntary carbon market, are using the CCB Standard. Leading market players, including the World Bank and EcoSecurities, are now applying the CCB Standard to their project portfolios, and the Chinese Government has endorsed the Standard as a valuable tool for helping their country develop sustainable forestry initiatives (Sustainable Forestry Management 2007). The CCBA recently accredited the first REDD project in the developing world. The project, located in the Ulu Masen forest in Aceh Province, Indonesia, may serve as a model for how carbon markets can be used to halt rapid rates of tropical deforestation and resulting carbon emissions.

Meanwhile, advancements in carbon accounting are refining the measurement of tree growth and carbon storage in forests. In the Asian region, Australia is taking a lead in assisting developing countries in this effort. As part of a program with the Clinton Climate Initiative, Australian scientists will train foresters in neighboring APEC countries to use the Australian Greenhouse Office's National Carbon Accounting System (NCAS) to assess carbon sequestration in native and plantation forests. The NCAS uses a sophisticated system involving remote sensing, information from thousands of satellite images, greenhouse gas accounting methods, and modeling of environmental changes to monitor and account for emissions from land-based sectors (Australian Government 2008).

Potential New Markets for Forest-based Carbon Credits

Although a full-fledged carbon trading system based in Asia is unlikely in the near term, emissions trading has recently gained the attention of Asian governments. With China and India currently dominating the market for CDM project development, it is possible that Asia will emerge as a major carbon trading center.

The first entity to enter the Asian market was Asia Carbon, a private sector enterprise founded in 2003. After months of extensive research and development, Asia Carbon announced that they had finalized their trading platform for the Asian Carbon Trade Exchange (ACT) in September 2006. Volumes are low so far, at just 3.5 million credits from over 20 online transactions, but the group wants to align with an established exchange to achieve growth (Carbon Research Group 2008).

Also in 2006, the Chicago Climate Exchange signed a deal with an Asian environmental group – the Tata Energy and Resources Institute of India (TERI) – to make it possible for US companies to fund CDM projects (including AR projects) in South Asia. TERI will ensure that greenhouse gas-cutting projects in India, Sri Lanka, Pakistan, Nepal, Bhutan and the Maldives meet the standards of the CCX, while corporate members of the CSX will buy "the right" to pollute by buying credits that fund those projects. By linking with an environmental group on the ground, the CCX can help ensure that such projects are "cleaner" (Pasternack 2006).

The first half of 2008 has seen an explosion of carbon-related activity in Asia. In January, India's largest commodity exchange, Multi Commodity Exchange (MCX), entered into a strategic alliance with the Chicago Climate Exchange to initiate carbon trading in India and announced that it will offer European Climate Exchange (ECX)-based futures contracts, which will allow developers of local emissions reduction projects that generate credits under the CDM, to hedge against price risk, i.e. they can ensure there is no loss in credit revenues by purchasing European allowance futures contracts (Good 2008). This is just one of the recent developments that suggest that Asian may soon play a vital role in carbon trade. Other developments include:

- China and the United Nations are working to set up a carbon trading exchange in Beijing – a move that could establish the Chinese capital as an important center for the multibillion-dollar global trade in carbon credits (Dickie and Harvey 2007).
- The Hong Kong Stock Exchange has announced plans to partner with an international exchange in emissions trading.
- New Zealand already has a regulated scheme that mirrors the EU-ETS, and Australia expects to start trading in 2011.
- The Tokyo Stock Exchange and the Tokyo Commodity Exchange recently agreed to jointly study the possibility of creating a domestic carbon trading market (Good 2008).

The United States could play an important role in driving demand for forest-based credits, both in the short and long term. Perhaps the biggest change on the horizon is that the United States could soon join the regulated carbon market, as the likely presidential nominees in each party are backers of cap-and-trade

legislation. As key industries become regulated, the US could quickly surpass Europe in carbon trades. With the US seemingly more open to forest-based credits than Europe, this development could offer a huge boost in demand.

Exchange operators and banks are quickly seizing new opportunities amidst increasing pressure for negotiators to agree on a post-2012 successor agreement to the Kyoto Protocol. In March 2008, NYMEX Holdings, in partnership with several investment banks and brokers, launched a new “Green Exchange” in New York, representing the first real challenge to the Chicago Climate Exchange. Initial contracts will focus on United Nations-approved and voluntary carbon credits, while future offerings could include bio-fuel and reforestation credits. Such liquidity will allow even more investors to take a position in climate change-based markets. Also in March, California and Chinese provincial governments reached an agreement through the United Nations to share research, policy initiatives and technological innovations aimed at reducing greenhouse gas emissions with Chinese provincial governments.

In the voluntary markets, some recent developments in the US may spark increased demand for carbon offsets. Ten states in the Northeast and Mid-Atlantic region have agreed to a cap-and-trade program to control power generation emissions starting in 2009 under the Regional Greenhouse Gas Initiative (RGGI). The Chicago Climate Exchange also announced plans to launch the California Climate Exchange, which will support that state’s mandatory reductions under the California Global Warming Solutions Act, which calls for the establishment of a statewide cap on emissions. All of these developments could translate into demand for carbon offset credits in Asian markets.

The Bottom Line

There is growing interest in forest-based carbon sequestration projects as a strategy to mitigate climate change, and Asia and the United States are right in the middle of recent developments. Ongoing negotiations will determine the rules and modalities for LULUCF projects in the second phase of the Kyoto Protocol, including the possible inclusion of reduced emissions from deforestation and degradation (REDD) projects. While it is likely that REDD initiatives will undergo a pilot stage before probable full-scale introduction after 2012, there is already speculative project activity with the expectation that there will be some sort of compliance value in the future. Several U.S. banks are preparing for the future by buying up carbon credits to sell to industry and national governments later on.

It is important to keep in mind that many issues still need to be resolved to clearly define the role of forest-based carbon credits in global emissions trading. The state of carbon markets overall adds to the uncertainty – it is not certain that new and expanding markets will translate into a new source of significant near-term demand for CDM credits, much less forestry credits. For instance, the European Commission is looking to cut back on developing world credits used for Kyoto compliance so that more utilities and industrial firms will shift their practices at home. In addition, it is uncertain whether demand for credits in Asia will grow if countries in the region are not faced with emissions caps.

Despite this uncertainty, many Asian countries are seeking a greater role in addressing climate change and look at forestry projects as part of the solution. To more fully take advantage of the CDM and other markets, they must now follow the lead of countries like India in developing the institutional and legal arrangements. Along with improved standards and carbon accounting systems that are currently being tested and refined in the region (such as in the Ulu Masen Ecosystem), improved policies and mechanisms to identify, develop and approve forest-based projects can help improve market access, as well as opportunity costs of CO₂ emissions from deforestation.

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