

ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY II

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**ASSESSING THE PROTECTION OF FOREST-
BASED ENVIRONMENTAL SERVICES IN THE
GREATER MEKONG SUB-REGION**

by

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INFORMATION NOTE ON THE ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

The Asia-Pacific Forestry Sector Outlook Study (APFSOS) is a wide-ranging initiative to gather information on, and examine, the evolution of key forestry issues as well as to review important trends in forests and forestry. The main purpose of the study is to provide a better understanding of the changing relationships between society and forests and thus to facilitate timely policy reviews and reforms in national forest sectors. The specific objectives are to:

1. Identify emerging socio-economic changes impacting on forest and forestry
2. Analyze probable scenarios for forestry developments to 2020
3. Identify priorities and strategies to address emerging opportunities and challenges

The first APFSOS was completed in 1998, with an outlook horizon to 2010. During its twenty-first session, held in Dehradun, India, in April 2006, the Asia-Pacific Forestry Commission (APFC) resolved to update the outlook extending the horizon to 2020. The study commenced in October 2006 and is expected to be completed by September 2009.

The study has been coordinated by the Food and Agriculture Organization of the United Nations (FAO), through its regional office in Bangkok and its headquarters in Rome, and implemented in close partnership with APFC member countries with support from a number of international and regional agencies. The Asian Development Bank (ADB), the International Tropical Timber Organization (ITTO), and the United Kingdom's Department for International Development (DFID) provided substantial financial support to implement the study. Partnerships with the Asia-Pacific Association of Forest Research Institutes (APAFRI) and the Secretariat of the Pacific Community (SPC) supported the organizing and implementing of national focal points' workshops and other activities, which have been crucial to the success of this initiative. The contributions of many other individuals and institutions are gratefully acknowledged in the main APFSOS report.

Working papers have been contributed or commissioned on a wide range of topics. These fall under the following categories: country profiles, sub-regional studies and thematic studies. Working papers have been prepared by individual authors or groups of authors and represent their personal views and perspectives; therefore, opinions expressed do not necessarily reflect the views of their employers, the governments of the APFC member countries or of FAO. Material from these working papers has been extracted and combined with information from a wide range of additional sources to produce the main regional outlook report.

Working papers are moderately edited for style and clarity and are formatted to provide a measure of uniformity, but otherwise remain the work of the authors. Copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained from:

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ABSTRACT

Forests provide essential ecosystem services, such as biodiversity, watershed protection, carbon sequestration, and ecotourism. This paper aims to examine and analyze the various drivers that lead to deforestation and the loss of services, as well as the various policy and market mechanisms that may exist to protect forests in the Greater Mekong Sub-region (GMS). It is demonstrated that in most cases policy mechanisms play a greater role in forest protection and that payment for environmental services (PES) as a market mechanism is a relatively new method of protection that has yet to fully develop in the sub-region. Additionally, based on an analysis of drivers and conditions that allow for protection, three scenarios are presented that predict the ability of people to protect forest-based ecosystem services by 2020. These scenarios suggest that low middle income countries in the GMS will focus primarily on economic development and less on protecting services. Market mechanisms such as PES cannot be used, even though it is one of the key mechanisms to protect forest services. Middle income countries will show a more varied picture where there is willingness to protect forest services in some cases and inability to do so in others. Finally, high income countries are willing and able to protect services. It is anticipated that this paper will serve as a tool for policymaking on forest services in the GMS.

1. INTRODUCTION

Forests play a critical role in supporting life and livelihood activities by providing diverse ecological or environmental services. The Millennium Ecosystem Assessment (MA 2005) defines environmental services as benefits people receive from ecosystems to improve their wellbeing. These may include provisioning (i.e. food and water), regulating (i.e. ability of ecosystems to regulate floods, diseases, and land degradation), supporting (i.e. soil formation, nutrient cycling), and cultural (i.e. recreational, religious) services. Forests are one type of ecosystem that provides a range of such services. Considering that many people depend on forest services for their well being, what has been done to prioritize the protection of environmental services? More importantly, are people willing and able to sustain environmental services? These are the types of questions this paper will attempt to address.

This paper will provide an overview of the extent to which people in the Greater Mekong Sub-region (GMS) are able and willing to protect environmental services that forests offer through policies and market mechanisms. The GMS covers over 80 million acres and includes China (Yunnan Province), Myanmar, Viet Nam, Thailand, Lao PDR, and Cambodia (see Map 1). Although all countries in the GMS will be highlighted, the paper will mostly refer to Lower Mekong countries where most of the Mekong region lies. Lower Mekong countries include Lao PDR, Thailand, Viet Nam, and Cambodia.

Map 1. The Greater Mekong Sub-region



Source: WWF 2008b.

The GMS is a diverse area that is primarily covered by wet evergreen forests found in the Cardamom and Elephant Mountains of Cambodia and the Annamite Range in Viet Nam and semi-evergreen or dry evergreen forests in northern and central Thailand, Lao PDR, and Cambodia (MRC 2003). Table 1 provides the percentage of forest cover in the GMS.

Table 1. Forest cover in the GMS

Country	% forest cover
Lao PDR	69.9
Cambodia	59.2
Yunnan, China	50*
Myanmar	49
Viet Nam	36.5
Thailand	28.4

Source: FAO 2007a; *National EPA Reports 2005 cited in UNEP 2006.

The forests of the GMS play a significant role in providing ecosystem services. Services in the forests include biodiversity, maintenance of soil and water in watersheds, climate regulation, and ecotourism. An analysis of the policy and market conditions that do or do not allow people to protect these forest services will be presented. Case studies will also be provided to illustrate numerous conditions that influence whether people can take initiatives to protect environmental services in high, middle, and low income countries in the sub-region. In the context of the GMS, a high income country has a GDP per capita between US\$8,700 and US\$6,600; middle income countries between US\$6,600 and US\$3,000; and low income between US\$3,000 and US\$1,000. Additionally, this paper will suggest some possible scenarios that may occur by 2020 with regard to emerging provisions to protect forest-based environmental services. This will help to assess the future of protecting services in the GMS.

There are seven sections in this paper. Sections 2 to 5 will focus on examining the current state of forest-based environmental services that include biodiversity, maintenance of soil and water in watersheds, climate regulation, and ecotourism respectively. These sections will also identify the drivers that can alter services through human-led activities. These include both direct (land use change) and indirect (demographic, economic, socio-political) drivers that have diminished the state of ecosystem services. This paper does not address natural drivers, such as fires and invasive species. Although these services are highly interrelated, they will be examined separately in order to highlight the various specific issues involved in relation to a particular service. Based on a literature review, in each of these sections, progress on how protection mechanisms through policies and the market have evolved from the local to the global level will be traced and the conditions under which they were able or unable to evolve will be identified. The distribution of costs and benefits of these provisions will also be discussed with regard to trade offs in protecting services. This will help determine the willingness and ability of people to protect forest services. Special attention will be paid to assess the effectiveness of market-based mechanisms to protect forest services, especially since there is a growing trend to use payment for environmental services (PES) as a means to protect services. Section 6 will present various scenarios with regard to the extent to which people will be willing and able to protect environmental services by 2020 in the GMS.

Considering that the GMS region is diverse, it is beyond the scope of this paper to cover all the issues in all countries in the region in a detailed manner. This limitation is addressed by providing case studies and as much analysis as possible to highlight the various diverse issues and perspectives in the GMS with regard to protecting forest-based ecosystem services.

2. BIODIVERSITY CONSERVATION

Biodiversity or biological resources such as genes, population, species, and communities that make up ecosystems, is fundamental for the functioning of ecosystems. Biodiversity helps in nutrient and water cycling, soil formation and retention, and the production of food, fibre, and medicines. It also provides regulating services, such as pollination, pest and disease control, and seed dispersal. The diverse role that biodiversity plays demonstrates that it is essential. This section will provide a review of the extent of biodiversity in the GMS and the drivers that have affected biodiversity found in the sub-region. It will then discuss the scientific uncertainty that surrounds biodiversity conservation, which is tackled by the various policies and market mechanisms used to protect biodiversity.

Extent of biodiversity

Forests contain the highest levels of biodiversity. The GMS provides sanctuary to approximately 5.4% of the globally threatened wildlife species (UNEP 2006). In order to protect biodiversity, protected areas have been established. Table 2 shows the percentage of land under protected area management and the number of protected areas.

Table 2. Extent of terrestrial protected area in the GMS

Country	Land area (%) under protection*	Number of protected areas**
Cambodia	32% as of 2002	23
Thailand	18.2% as of 2004	250
Lao PDR	14.3% as of 2002	20
Yunnan, China	8.8% as of 2004	n/a
Myanmar	7.2% as of 2004	38
Viet Nam	6.2% as of 2004	95

Source: *UNEP 2006; **Conservation International 2007.

Some protected areas are viewed as ‘hotspots’.¹ Indo-Burma is a biodiversity hotspot in the GMS that covers more than 2 million km² of tropical Asia. In the last 12 years, many large mammals have been discovered, such as the large-antlered muntjac, the Annamite muntjac, the grey-shanked douc, the Annamite striped rabbit, the leaf deer, and the saola. There are also more than 1,300 bird species in Indo-Burma (Conservation International 2007).

Drivers of change

Despite the importance of biodiversity, it has been estimated that globally over the last few hundred years, the rate of extinction of species has increased by three orders of magnitude due to habitat loss (MA 2005) and forests have declined by 40% over the last three centuries (Chomitz 2007). A similar trend can also be seen in the GMS where only 5% of natural habitats remain pristine and 10% to 25% of the land is damaged (Conservation International 2007). The root cause of the loss of biodiversity, especially in the Indo-Burma biodiversity hotspot, is deforestation. Although forest growth has been limited to only some parts of China and Viet Nam, overall, the GMS has witnessed significant loss in forest areas that has led to loss of biological services (FAO 2007a).

There are several reasons that lead to the loss of forested areas. These drivers include:

¹ In order to earn hotspot status, a region must contain 1,500 or more endemic plant species, which are only found in the area and not anywhere else. It must also have lost at least 70% of its original habitat.

- *Agricultural expansion and demography:* The leading driver of deforestation in the GMS is conversion of forest land to agriculture. It has been predicted that croplands, pastures, and plantations will expand for the next 30–50 years. This can already be seen in the Lower Mekong Dry Forest area, which used to cover northeast Thailand, southern Lao PDR and Cambodia, and parts of Viet Nam. Mangrove forests in the area have also been converted for shrimp farming, which has significantly destroyed biodiversity habitats. There are various reasons why agriculture and aquaculture will expand and forest land will become limited. One reason is that although the population growth rate is falling, the number of people in the GMS will continue to rise over the next few years. As the population continues to grow, more food will be required to meet demands. This has primarily happened in Thailand and is now occurring in southern Lao PDR and Viet Nam
- *Markets:* Agriculture is also expanding due to market demands. China is a major trading partner with other countries in the GMS and it is tapping into the Lower Mekong region to source products such as palm oil, rubber, and wood pulp. Other countries in Asia and beyond are also demanding sugar, rice, coffee, rubber, cassava, and tropical fruits from the Lower Mekong region. Therefore, this sub-region is going through a major transformation from subsistence to a commercial agriculture
- *Logging and timber trade:* Commercial logging continues to grow in order to meet demands. China, Thailand and Viet Nam have become major importers of timber, which they acquire from Myanmar, Lao PDR and Cambodia. Additionally, the poor in the sub-region are still heavily reliant on fuelwood for energy. These demands can lead to clearing of forests to produce wood products, which also paves the way for agricultural expansion
- *Urbanization and infrastructure expansion:* Rapid urbanization is taking place in many countries. Urbanization includes expansion of roads and buildings that result in conversion of forest land. The growth of hydropower and building of dams are also critical issues in the GMS
- *Poor governance and conflict:* The inability to protect forest areas exists in all levels of governance. At the national level, policies may be ineffective since enforcement may be weak, opening avenues for illegal logging, especially in Lao PDR and Cambodia. Some countries such as Cambodia have also faced decades of civil strife that has led to poor policies and management of forest areas. The tight control of forest areas by the government of Myanmar does not allow for innovative policies to emerge due to the lack of democracy. The lack of finances and capacity may also prevent state officials from preventing deforestation. Regional or international policies may be ineffective due to financial constraints, and lack of cooperation and political will.

Table 3 demonstrates the extent to which biodiversity is threatened in the GMS due to a combination of the drivers mentioned above.

Table 3. Threatened wildlife species as percent of globally threatened species

Country	Mammals	Birds	Reptiles	Amphibians	Fish	Total
Yunnan, China	2.91	1.49	3.95	0.11	n/a	1.23
Cambodia	2.54	2.15	4.93	0.17	1.62	1.64
Lao PDR	3.09	2.06	3.95	0.23	.75	1.56
Myanmar	3.63	4.04	8.55	0.00	1.25	2.41
Thailand	3.45	4.13	7.24	0.17	4.74	2.91
Viet Nam	4.00	3.63	8.88	0.85	3.50	3.05
Average	3.27	2.92	6.25	0.26	-	2.13

Source: IUCN Red List 2004, cited in UNEP 2006.

Table 3 shows that Viet Nam has the highest loss in biodiversity. It is, however, important to note that these various drivers have impacted forests in GMS countries at differing stages in their economic development trajectories (Hirsch 200?). Emerging and middle economies, such as Viet Nam have also lost much of their forests due to rice cultivation, war (specifically Viet Nam), logging, and shrimp farming. However, Viet Nam's forest policy includes tree planting, and therefore, Viet Nam is seeing an increase in forest areas in its 'bare hill' areas, which could potentially bring back biodiversity. High income countries, such as Thailand have had the highest rate of deforestation in the sub-region. Thailand had lost half of its forest cover by the 1960s. Its forest biodiversity was further reduced due to logging, road construction, shrimp farming, and cultivation of cash crops. Because of the high deforestation rate, Thailand decided to ban logging and instead started importing timber from Myanmar, Lao PDR, and Cambodia (MRC 2003). Even though China has a high population, and therefore, high consumption rate, its loss of biodiversity is not as significant compared to other GMS countries. Its ban on logging and shift from a purely agrarian economy to a manufacturing one is starting to help protect biodiversity. On the contrary, low income countries, such as Lao PDR and Cambodia still have significant portions of their forests left. The forest that has been lost has been primarily due to logging, rice cultivation and refugee settlement since the Viet Nam War. Cambodia has for a long time been the only country in the GMS with the greatest forest cover. However, this is now being lost to a great extent due to logging and concessions being given to companies from Indonesia and exports to Thailand. It is likely that biodiversity loss will increase from source countries such as Myanmar, Cambodia, and Lao PDR as forest resources are used to boost economic development.

Uncertainties

Although it is quite clear that there is a list of drivers that changes the extent to which biodiversity is protected, significant uncertainties remain about biodiversity, which affects how it can be maintained through policies and market mechanisms. One uncertainty is in relation to selecting species or areas for protection. These choices can be biased and determined by what the public view as 'beautiful' plants or 'warm furry' animals. This may deter the prevention of protecting biologically important or keystone species that help maintain forest services (Damania and Hatch 2005).

In addition to the perception of what should be protected, there is also very little information on the type of biodiversity or the small but significant keystone species that exist due to the lack of data about forest areas. It is also unclear as to the extent of forest areas and annual increment. The lack of enough or appropriate data can lead to omitting important biological resources that require protection. Assuming or extrapolating ideas from the data that exist can lead to technical errors in protecting species since it is possible to believe a species is being protected when there is no actual proof (Langhammer et al. 2007). Therefore, insufficient data are a major technical challenge with regard to biodiversity protection.

The lack of similar terminology and definition to describe the state of protection is also problematic. This could lead to confusion and difficulties in designating a protected area, and implementing inappropriate policies and management mechanisms. The failure to include a certain part of the forest due to how a protected area is defined and the criteria used could lead to significant areas and biological resources being unprotected. Common agreed-upon indicators and methods to measure the level of biodiversity change also do not exist. Additionally, there may be forests that are well protected but not considered 'protected', which excludes them from the (political) status that protected forests receive (Dudley and Phillips 2006). Ambiguous technical elements are made problematic because it is unclear how biodiversity is itself defined: is it based on genetic diversity or number of species?

These technical challenges are part of the underlying causes why biodiversity conservation is made difficult. These technical barriers coupled with the various drivers make biodiversity

conservation extremely challenging as it decreases people's level of willingness and ability to protect biodiversity. Despite these uncertainties people have made attempts to both successfully and unsuccessfully protect biodiversity through policies and market mechanisms as the following sections will demonstrate.

Protection of biodiversity through local management

Although significant biodiversity has been lost in the GMS, active conservation of biodiversity has also taken place for generations. Through local knowledge on biodiversity, people at the grassroots level have found various ways to manage forest biodiversity through implementing informal policies at the local level (see Box 1).

Box 1. Local Resource Management Systems

Viet Nam – Thailand border

Thai minorities and the ethnic Hmong have been managing forest areas in Lai Chau and So La provinces along the Viet Nam and Thai border for generations. Sustainable use of natural resources has been maintained through local, common property management systems. The Nyom Pa system in Chieng Hac commune has been a way to protect forests areas. This system ensures that when trees become scarce, the remaining trees are protected by appointing a forest guard to prevent complete deforestation. The Nyom Pa system guides decisions regarding the location and length of rotation of upland fields, planting and felling of bamboo and timber, and the placement of forest fruit gardens to sustain forests and biodiversity for their ecosystem services. Furthermore, villages along the Thai and Viet Nam border have established sacred forests as people believe spirits that influence village life exist in them. Cemeteries are also found in forest areas, which help to protect forest sites.

Yunnan, China

The indigenous Hani (Akha) communities in southwest Yunnan differentiate forests and forest systems according to their function and products. Forests are divided by building materials or cash crops; forests that enhance the landscape; forests used for graveyards; and protected rattan forest. Collecting rattan in particular has been important as it is a vital resource for trading purposes with the lowland Dai ethnic group. In order to maintain its sustainability, chiefs of Hani villages have established informal rules that protect rattan forests, by allowing villagers to collect limited amounts of rattan for agricultural tools and housing construction. This same system of local forest protection system exists today, even though the rattan forests are now under state ownership.

Source: UNESCO 2003.

One way in which informal institutions have helped to protect biodiversity is through the establishment of common property management mechanisms. These include institutions that help decide rules of access, withdrawal, monitoring, and transferral of rights, which indicate where, when, and how much of a resource should be utilized and conserved. The creation and implementation of these grassroots institutions, however, are highly politicized and their effectiveness depends on various socio-economic positions based on gender, ethnicity, and the economic status of those who create and follow informal institutions (Ostrom 1990).

National biodiversity conservation initiatives

Governments have played an active role in conserving biodiversity through implementing formal policies. Table 4 shows that GMS countries have set various national level targets to increase forest cover.

Table 4. Forest cover trends and targets

Country	% of forest cover	Trend	Target
Cambodia	61	Signs of levelling after 30-year decline	Maintain 60% through 2015
Lao PDR	41.5	Down from 49.1% in 1982	70% by year 2020
Myanmar	52	Down from 61% in 1975	Not less than 35%
Thailand	33.2	Increased from a low of 25.8% in 1998	50% by year 2016
Viet Nam	36.5	Increased from a low of 28% in the mid 1990s	39% by 2005 and 44% by 2010
Yunnan, China	50	Substantial improvement from a low of 28% in 1960	48% by 2005

Source: SEFII, National EPA Reports 2005 cited in UNEP 2006.

In order to improve forest cover, protected areas have been established by governments that can be defined as ‘a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives’ (CBD 2008). Protected areas include game reserves and national parks. The formal establishment of national parks helped maintain both biodiversity levels by protecting flagship species. Government conservation programs in Indo-Burma cover a total of 236,000 km² of land area, which represents roughly 10% of the original extent of vegetation in the hotspot.

The establishment of parks was based on the idea that protected areas needed to be designated to prevent the ‘tragedy of the commons crisis’ from occurring where open access would destroy biodiversity (Adams 2001). These purely conservation oriented policies, however, came with a significant price. Top-down implementation of government policies, which prevented many people from gaining access to biological resources for their subsistence use, became highly unpopular. Although policies to create national parks were drivers that encouraged the protection of biological resources, the trade off was that many forest dependent people who lived on the outskirts of the protected areas, were not able to meet their basic needs. State managed parks did not lead to equitable governance since the establishment of parks in many cases led to resettlement and displacement of local people, impoverishment, erosion of customary practices, and social conflicts (Cernea and Schmidt-Soltau 2006).

Due to criticisms that purely conservation-oriented parks received, states started to share the power to manage with communities (see Box 2). It was assumed that sharing management responsibilities would lead to better protection of biodiversity because local people had intimate knowledge of biological resources and it would minimize conflict between local resource users and state officials. Creating a sense of ownership among local users was assumed to lead to greater efficiency and accountability in the management of biodiversity and decrease monitoring costs (Larson and Ribot 2004). This shift from eco-centric to somewhat anthropocentric policies started to evolve in the late 1970s and was mainstreamed by the 1990s. This change in policy is partly due to global conventions that called for recognizing local management systems.

Although state-led management of protected areas has greatly changed over the years, the question still remains if state-led protected areas are the best and legitimate ways to protect biodiversity when structural factors such as poverty and population pressure could prevent communities from engaging in biodiversity protection (see Box 2).

Box 2. Integrating Local and State-Led Protection in Yunnan

Prior to the establishment of the Xishuangbanna Nature Reserve in 1958 in southern Yunnan, the Dai ethnic group had relied on forests services for their subsistence for over 800 years. Their customary practices in governing forests were halted at the time of the Communist Revolution. Today, however, forest officials involve the Dai in making decisions about how to manage the Reserve and encourage forest stewardship as forest officials realize the importance of the Reserve to the Dai's economic well-being. Although this change in attitude has taken place within the Forestry Bureau, it is unclear whether participation of the Dai will actually protect threatened and endangered species, especially since forest encroachment by the Dai continues to be a critical issue as population pressures increase. Their poverty has led them to become involved in illegal trade of wildlife. The Dai are unwilling to trade off use of forest resources with protection of biodiversity. This suggests that there are various complex structural factors, such as population growth and poverty that can deter integrating state and local management of protected areas.

Source: Nepal (2000)

In some cases, devolution of management power to the local level may not work because of the lack of capacity to design, regulate, and enforce forest rules or because of the belief that communities are incapable of protecting biodiversity (see Box 3) (UNEP 2006). Additionally inadequate, overlapping, or confusing laws make it difficult to monitor and control the use of biodiversity.

Box 3. Local Level Management in Lao PDR and Thailand

The government of Lao PDR has taken several steps to decentralize forest management. According to the Department of Forestry's 'Vision 2020' policy, 2 million hectares are to be rehabilitated by shifting management to individuals and organizations. It is believed that local managers will be able to create a mosaic forest where various types of tree species are planted to reverse monoculture plantations. Three hectares of barren or degraded land will be transferred from the state to local managers for replanting and recreating forest areas. Credit and tax exemptions provide incentives to replant trees. The Land Law of 1997 also allows families to inherit such land for replanting, which provides future incentives to protect forests and biodiversity. Although commendable policies exist, the government has low capacity to design policies, and regulate their implementation. Similar to Lao PDR, the government of Thailand has been trying to devolve governance to local people under Article 46 of the Constitution. However, problems have risen between factions in the government that are hesitant to hand over forest rights to local managers and those who promote local participation due to the fear of losing power of distrust in communities to protect biodiversity. The belief that local communities are incapable of managing biodiversity and forests have prevented many community based natural resource management schemes.

Source: Mittelman 2001.

Because resource exploitation can sustain livelihoods, many people are instead willing to convert forest land to agricultural land or shrimp farming since they are a major sources of income (see Box 4). Furthermore, state-led policies on agriculture, mining, commercial logging, and aquaculture could also be more strongly implemented because these sectors have the potential to increase gross national products and alleviate poverty, which undermines the need to protect biodiversity.

Box 4. Mangrove Forests in Viet Nam

Mangrove forests offer a variety of ecosystem services. Not only do they offer biochemical services and a variety of biodiversity, but they are an important source of food and livelihood. Mangrove forests in the Mekong cover more than 250,000 hectares. In places such as Viet Nam (particularly Tra Vinh Province), mangrove forests have been destroyed by war, fuelwood collection, sedimentation, and population pressures. Since the 1990s, mangrove forests have been converted into shrimp farming sites, which have led to a significant loss in mangrove forests. There is, however, a complex relationship between mangrove forests and shrimp culture. Although mangrove forests thrive on shrimp culture as it provides nutrients, mangroves also absorb the waste from shrimp farming and provide food and nurseries for marine and brackish water animals. However, because shrimp farming is a lucrative business, there has been overexploitation of mangrove forests, leading to their loss and degradation. Although attempts have been made to replant mangroves, these efforts have resulted in just planting trees and not creating a forest. Short term exploitation to meet immediate economic needs and boost national economic development has come at the cost of loss of mangrove forests in Viet Nam.

Source: Thu and Populus 2007.

Sub-regional and global conservation efforts

Countries in the GMS are striving for sub-regional co-operation. Most of the co-operation in the sub-region has been based on trade and economic development, which have been especially promoted by the Mekong River Commission; United Nations Economic and Social Commission for Asia Pacific (ESCAP); the Association for South East Asian Nations (ASEAN); and the Asian Development Bank (ADB) (MRC 2003). Since it is beyond the scope of this paper to review all the major sub-regional institutions and the type of work these organizations conduct in the GMS, Table 5 provides a summary of this information and highlights some of the main issues these organizations are working on in the GMS.

Table 5. GMS programmes

Organization	Programmes
Association of South East Asian Nations (ASEAN)	ASEAN (does not include China) senior officials on the environment have 3 working groups that try to facilitate work on: nature conservation and biodiversity; coastal and marine environments; and multilateral agreements
Mekong River Commission (MRC)	Established in 1995 and comprising the Lower Mekong countries (China and Myanmar are 'dialogue partners'), the MRC provides coordinated approaches to carrying out strategic programs and provides policy and scientific advice. The MRC's Environment Program focuses on transboundary environmental monitoring, capacity building, and carrying out environmental impact assessments.
United Nations initiatives	The United Nations Environment Program (UNEP) co-implements projects with ADB. ESCAP is responsible for regional cooperation, strengthening national capacities, and promoting environmental and socio-economic planning.
Asian Development Bank (ADB)	ADB has been active in the GMS since 1992. It developed a GMS Strategic Framework in 2001 to guide cooperation for the next decade. One of the key components of this Framework addresses environmental issues. ADB has established a GMS Working Group on Environment; the GMS Flagship Program with 11 key areas, which include joint initiatives for the management of the subregion's shared environment and natural resources; the GMS Program on Environment for subregional cooperation; the GMS Core Environment Program; and the GMS Biodiversity Conservation Corridors Initiative.

Source: UNEP 2006.

Organizations, such as ADB, have initiated biodiversity conservation programmes through its Biodiversity Conservation Corridors Initiatives (BCCI) (see Box 5).

Box 5. The Biodiversity Conservation Corridors Initiative (BCCI)

In order to protect the environment from degradation that arises from economic development activities, the BCCI attempts to restore ecological connectivity and integrity within important biodiversity areas. ADB states that if natural resources are not protected, then the GMS will lose 50% of its land and water habitats over the next century. This will no doubt worsen poverty among forest dependent people, decrease economic growth, and increase vulnerability to floods and erosion. Therefore, one of the key goals of the BCCI is to restore biodiversity and forests, which have been highly fragmented, by establishing forest corridors that link protected areas by 2015. This initiative has 5 components: poverty alleviation through sustainable use of natural resources and development of livelihoods; clear definition of optimal land uses and harmonized land management regimes; restoration and maintenance of ecosystem connectivity; capacity building in local communities and government staff; and sustainable financing mechanisms and structures integrated with government planning and budgeting procedures.

Source: ADB 2008; UNEP 2006.

Corridors and parks can cross national boundaries, which calls for transboundary protected area (TBPA) management by countries in the GMS. TBPAs are beneficial for conservation if the aim is to protect the survival of endangered species with long life spans, such as tigers, that require large areas, or if the aim is to reduce animal-human conflicts. TBPAs can be successful mechanisms to promote conservation because they are usually politically supported by governments and have a high profile due to the international governance factor. Because TBPAs are large areas, they not only help to conserve a wide range of biodiversity, but they do not 'intrude' upon additional productive land and the costs of conservation are shared with another country. Since the opportunity cost of the TBPA is distributed between countries, a country can achieve more conservation while removing less land from production through TBPAs.

There are various challenges to managing a large, common area, such as TBPAs. Shortcomings include the lack of technical capacity, lack of information on biodiversity, and not enough political will to act together to protect biodiversity at a regional level (see Box 6) (Baddenoch 2002).

Box 6. TBPAs in the GMS

There are 11 TBPAs in the GMS. One of them is a transboundary limestone forest complex situated along the Viet Nam, Cambodia, and Lao PDR borders. It extends to 800,000 ha. It covers 332,500 ha of Virachey National Park in Cambodia's Ratnakiri Province, which is an important watershed that feeds into the Mekong River. Its effective management is critical to the socio-economic development of the north-east of the country. It also covers Chu Mom Ray National Park in Kon Tum Province of Viet Nam, which is one of the richest forest blocks in the country. In Lao PDR, the Nam Khong and Dong Amphan are included in this TBPA where species rich forest blocks exist that serve as northern extensions to the tri-border landscape. Although the management of this biodiversity-rich and important area has been largely successful, there are many issues that still need to be addressed. Participation of various stakeholders is still lacking and institutional mechanisms need to be clearly understood by all stakeholders across national boundaries. The political will needed to provide support to park management is also required. Information on biodiversity is inadequate and it has been difficult to develop databases at the national level due to the lack of capacity. This has led to low levels of biodiversity protection in forest areas. In general, it has been challenging for those involved in this TBPA to overcome cultural, historical, and political divide and focus on appropriate TBPA management and shared goals.

Source: ICEM 2003a

In relation to the conditions of successful TBPA's there are several potential difficulties that could hamper transboundary management. Management can become complicated if there are multiple legal structures, tenure arrangements, and various levels of capacity to manage TBPAs. This could make protection of biodiversity time-consuming and possibly more expensive (IUCN 2003). Furthermore, technical issues can be more challenging in transboundary cases as quality of monitoring biodiversity in the protected area may not be unified and identifying biodiversity that needs to be protected may not be agreed upon. Open borders can also lead to increased poaching and smuggling of endangered species. These issues could act as drivers to discourage willingness to invest in TBPAs and limit the protection of biodiversity.

The GMS in particular lacks the adequate legal mandate to develop and monitor compliance of a shared vision (UNEP 2006). This is further made difficult by the lack of legislative frameworks combined with weak capacity at the grassroots level, poverty, illiteracy and past experience of state suppression and civil strife. Furthermore, countries differ historically, economically, and socially, which makes it difficult to have a common vision on how to protect forest biodiversity. Some countries have differing development goals and history of conflict, which make cooperation to protect biodiversity difficult.

At a global level, the issue of protecting biodiversity came into the spotlight especially during the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, also known as the 'Earth Summit'. This conference called for integrating both conservation of natural resources and sustainable use of resources, which is reflected in multilateral environmental agreements that have been developed since the Earth Summit. One of the most significant agreements has been the Convention of Biological Diversity (CBD). The CBD was open for signature during the 'Earth Summit', which came into force in 1993. It has three components: conservation of biodiversity, sustainable use of components of biodiversity, and equitable sharing of economic benefits that derive from the commercial use of biodiversity. The Parties to the Convention decided in 2002 that there is a need to significantly reduce the loss of biodiversity by 2010 and 'effectively' conserve at least 10% of each of the world's ecological regions. It is the responsibility of CBD member countries to protect biodiversity. All countries in the GMS have ratified the CBD except for Lao PDR and Cambodia, two countries with high levels of biodiversity. Even though Lao PDR and Cambodia have only accessioned the CBD, they, like other nations in the GMS, have a National Biodiversity Strategy Action Plans (NBSAP), which provide strategies on how to integrate conservation and management of biodiversity (see Box 7).

Box 7. National Biodiversity Action Plans in the Lower Mekong

An analysis of the National Biodiversity Strategy Action Plan (NBSAP) in Lower Mekong countries reveals that low income countries, such as Cambodia, emphasize the need for poverty reduction and maintenance of livelihoods through the management of biodiversity. For instance, in the case of Cambodia, its NBSAP emphasizes managing biological resources in a way that they are preserved for human livelihoods and development; and ensuring that the benefits coming from the sustainable use of biological resources contribute to poverty reduction and improved quality of life for all Cambodians. Even though Cambodia has an NBSAP, it has not ratified the CBD, which suggests its low interest in biodiversity conservation and greater interest in economic development through forest use and conservation to alleviate poverty. It has also been noted that such countries do not want to ratify the CBD because it neither has the capacity nor the ability to do so when countries such as China continue to demand biodiversity, such as wildlife, from Cambodia.

In comparison to Cambodia, countries such as Thailand place a lesser emphasis on poverty alleviation and more on pure biodiversity conservation. Thailand's NBSAP does not emphasize poverty alleviation but stresses the need to enhance biodiversity awareness and knowledge; strengthen capacities; increase efficiency in conservation and sustainable use; control, regulate and reduce threats to biodiversity; provide incentives and encourage public participation; and promote international cooperation. Its goal is to conserve at least 30% of the total forest areas; monitor biodiversity in some protected areas; and establish a national network of biodiversity conservation and capacity building for local communities. Unlike lower income countries in the GMS, Thailand has clearly set quantifiable targets for biodiversity conservation.

The differences in NBSAP among Lower Mekong countries suggest that low income countries are not yet ready to comply with the CBD since poverty alleviation and economic development (through forest use) are priorities. Perhaps as Cambodia makes a transition to a middle income country, greater attention will be paid to conservation.

Source: CBD 2008; ICEM 2003a.

Similar to the setbacks that prevent TBPA's from being successful, implementation of the CBD also faces the same challenges. These include the lack of political will, especially when other policies take a more leading role. For instance, policies that promote agriculture and commercial logging could be leading factors that compete against and undermine the CBD. Considering that most countries in the GMS are either low income, such as Cambodia, Lao PDR, Myanmar, or middle income like Viet Nam, it is likely that their priorities will be economic development and not biodiversity conservation at the cost of alleviating poverty. Furthermore, the lack of finances allocated for biodiversity conservation also prevents collaboration and prioritization of biodiversity conservation. Therefore, the CBD is currently not as effective as its goals set out to be.

In addition to the CBD, multilateral agreements such as the Convention on International Trade of Endangered Species (CITES) also try to ensure that trade in species does not threaten their survival. CITES came into force in 1975 and all GMS countries are signatory to CITES. CITES encourages all import and export of species covered by the Convention to be authorized through a licensing system (CITES 2008). It also produces a list of species that are threatened, potentially threatened if trade is not regulated, and those that are not globally protected but protected through state initiatives. CITES is the only international convention controlling international trade in selected timber and non-wood forest species. Therefore, CITES has the potential to help protect forest services.

The extent to which CITES has been effective is questionable, however, because the illegal trade of CITES-listed species still continues in the GMS (see Box 8).

Box 8. Wildlife Trade in the GMS

Reptile trade in U Minh Thuong National Park, Viet Nam: Reptiles, namely snakes and turtles, in Viet Nam are highly prized for both food and traditional medicine. A study on the reptile trade demonstrates that 21 reptile species comprising 1,900 individual reptiles were captured within the U Minh Thuong National Park. This park is considered one of the most important in the Lower Mekong with regard to its high level of biodiversity. Reptiles are being traded by people who live in the vicinity of the Park. Some of these species have been listed as threatened or vulnerable. Nevertheless, reptiles are primarily bound for the Chinese market. Such a case demonstrates weak governance among park officials to prevent illegal trade of wildlife.

Source: Stuart 2004.

CITES is not well enforced because of the lack of inter-agency cooperation at national, regional, and international levels. CITES may not be a concern of high priority within nations since there may be other pressing issues, such as economic development or political stability. Because there may be other urgent issues, political will to curb illegal trade in wildlife and protect forest biodiversity may not be present. Box 9 lists other reasons why CITES is not well-enforced at various levels of governance.

Box 9. CITES Setbacks

There could be several reasons why implementation of CITES is challenging, especially in places such as the GMS. These challenges include:

National

- Inadequate enforcement of intelligence networks, caused by a lack of enforcement resources and impetus
- Lack of clarity in the roles and responsibilities of agencies within countries and sometimes unclear designation of the lead agency
- Paucity of information and barriers to sharing information between agencies
- Significant lack of awareness among enforcement agencies of wildlife laws

Regional

- Government agencies may not have the resources to be able to engage in regional co-operation protocols
- Complex geopolitical situations in regions generate barriers to co-operation
- Few effective formal or informal mechanisms for engagement at the regional level
- The driving force for change is lacking to push priority needs through to reality and action

International

- Lack of resources for networking and engagement to develop international co-operation
- Facilitation by international enforcement bodies is limited due to low priority
- Lack of clarity and awareness on the benefits of international co-ordination resulting in reluctance to become engaged
- Logistical issues (such as distance and time zones), political differences, and language barriers impede co-operation

Source: TRAFFIC and WWF 2004.

CITES at the local level in GMS countries is not acknowledged because even though provincial authorities try to regulate trade by establishing checkpoints domestically and along international borders, illegal trading still continues because people involved in the business

need the trade to maintain their livelihoods. There are also very few alternative sources of employment in places such as Cambodia and Lao PDR where the supply of wildlife trade in the GMS primarily originates from. The wildlife trade is viewed as a means to alleviate poverty and help meet subsistence needs among traders. CITES is also not given much attention because the demand for wildlife has increased due to the higher socio-economic status of people in China, Thailand, and Viet Nam who can afford exotic and expensive species sourced primarily from the forests of Cambodia and Lao PDR, as well as some from Viet Nam (Singh et al. 2006). China in particular is a major consumer of animals found in the GMS, such as turtles, snakes, and tigers. The volume of trade in species is as high as tens of millions of individual animals sold in the Chinese market (Conservation International 2007). Trade in wildlife is also facilitated by improving transportation networks and road conditions within and between GMS countries.

Market mechanisms to protect biodiversity

Complementing policy mechanisms to protect conservation of biodiversity, market mechanisms have also been developed to protect biodiversity. One of the theories behind using the market to protect biodiversity is that poverty leads to overexploitation of biological resources, paying resource managers to both sustainably use resources and protect them could be a means to conserving biodiversity.

Bioprospecting has been a means to use markets to conserve biodiversity, and particularly, medicinal plants that are biological resources that can be found in forests. Bioprospecting is a term used when private companies that produce pharmaceuticals, agrochemicals, cosmetics, flavouring, fragrances, and industrial enzymes, seek plant material to integrate into their commercial products. Bioprospecting is usually conducted by private companies who search for certain parts of plants ranging from barks to genetic material. Under the CBD private companies are encouraged to pay or compensate people to protect biological resource, such as medicinal plants in return for extracting some parts of the resource to integrate into marketable products. Bioprospecting is an industry that could be worth US\$500 million by 2050 (Bishop et al. 2008).

In order to protect people from unfair trade and sharing of profits so that those who govern biological services and possess knowledge associated with the resource are financially compensated for the medicinal plants they protect for the market, the CBD protects people from acts of biopiracy. Nations that have ratified the CBD may have legal and regulatory means to protect citizens who own plant material that is in demand through the Access and Benefit Sharing (ABS) mechanism developed from the CBD. The ABS aims to create economic incentives to conserve biodiversity and traditional knowledge while building equitable commercial partnerships between private companies and citizens who claim their rights over natural resources (Hughes 2002). However, the extent to which the ABS has been a successful market mechanism to protect biodiversity is questionable. Because bioprospecting is expensive, time consuming, and produces low or unpredictable value of resources, many private companies have not invested in bioprospecting or used the ABS (Bolsvert and Vivien 2005). Only if a biological resource becomes rare or almost extinct will profits and incentives to protect a biodiverse area rise as will the use of the ABS mechanism (Costello and Ward 2006).

Within the context of the GMS, no publication has been found that describes the effectiveness of the ABS, which also makes it difficult to assess in protecting biodiversity and finally compensating its stewards.

Based on the literature reviewed thus far, Table 6 presents the strengths and weaknesses of market mechanisms to protect biodiversity.

Table 6. Strengths and weaknesses of market mechanisms for biodiversity protection

Strengths	Weaknesses
Managers of biodiversity are recognized through financial payments and legally protected for their role in protecting biodiversity	Weak monitoring of trade could undermine protection
Rare or almost rare extinct species will be effectively protected	The ABS will not be used unless a biological resource is rare or almost extinct, which will fail to protect less threatened resources
	May be too costly and takes too much time to establish formal markets and legal structures
	Information on threatened species may not be accessible to prevent illegal trade

However, it can be assumed that the willingness and ability to adopt market mechanisms depends on the ability of countries to establish legal instruments to promote and effectively implement the ABS and compensate those who protect resources for the market. It also depends on whether market values of resources are high enough to create incentives to protect resources. Furthermore, willingness and ability depend on the time and money required to set up formal market structures. These structural difficulties discourage people's willingness to establish and use market structures to protect biodiversity.

Biodiversity protection outside protected areas

Protecting biodiversity outside of protected areas is challenging due to changes in land cover. The primary reason why forests and biodiversity are under threat today is because of conversion of forest land into agricultural land through permanent cultivation of crops, shifting cultivation, or slash and burn. It is expected that globally, cropland will grow by 3.8 million hectares per year over the next three decades (Chomitz 2007). Both poverty in rural areas and wealth in urban areas have been driving factors that have led to agricultural expansion. Because the rural poor depend on low-productivity agriculture to meet basic economic needs and the urban rich are increasingly demanding products such as beef, palm oil, coffee, soybeans, and chocolate, forests are being cleared to meet either the basic needs of the poor and/or the demands in urban areas or from global markets. These trends can be primarily seen in Lao PDR and Cambodia (see Box 10).

Box 10. Land Use Change in Lao PDR and Cambodia

Lao PDR and Cambodia are low income countries in the GMS. In order to alleviate poverty and boost economic growth, forests in these countries are being converted to agricultural land. Additionally, high consumption of fuelwood required for energy, commercial logging, mining and uncontrolled fires have also led to significant loss in forest areas. It has been estimated that 8.6% of forests in Lao PDR were lost between 1990 and 2005. Considering that Lao PDR was affected by the Viet Nam War, it is a country that has not been able to economically progress. Therefore, foreign investments to boost economic development through forest conversion are welcome. In comparison to Lao PDR, Cambodia has a high rate of deforestation. Its primary rainforest cover of 70% in 1990 has fell to 3.1% in 2005. A combination of illegal logging (started by warring factions during its civil war between 1970 and 1990), mining, rapid economic development, and population pressures has led to the loss of forest areas. Additionally, subsistence activities in Cambodia also lead to forest conversion. Similar to Lao PDR, high dependency on fuelwood and a largely agrarian economy have resulted in deforestation. Hunting wildlife for bushmeat has also affected levels of biodiversity. It is unlikely that countries such as Lao PDR and Cambodia will curb their deforestation rates any time soon when subsistence needs need to be met along with macro economic development.

Source: Mongabay 2006.

People in forest-agriculture mosaics may not want to trade off agriculture to protect forests when agriculture may be more lucrative. This is especially the case when the soil condition allows for greater crop production. Agriculture is also preferred when high prices are paid for agricultural goods. This can especially be seen in places where agribusiness is on the rise, such as Viet Nam (see Box 11). The value of agriculture also grows with access to roads and markets that allow products to be traded among a larger population. These drivers discourage the protection of forest biodiversity and make farmers unwilling to trade off the high revenues that agricultural products provide with protecting forests (Chomitz 2007).

Box 11. Rise of Agribusiness in Viet Nam

Viet Nam is a country that has experienced rapid and drastic transformation over the last few decades. By the end of the Viet Nam War, it was one of the most poverty-stricken countries in Asia. This was primarily because of low agricultural productivity, forced collectivization, and hyperinflation. However, dramatic changes took place between the mid-1980s and 1990s when poverty fell by half. One of the reasons why this occurred was because of the transition from a centrally planned to a market-based economy where incentives were provided to boost agricultural production. Conversion of forests to agricultural land for subsistence and cash crops has been one of the leading causes of deforestation in Viet Nam. Additional factors include population growth and demand, logging, fuelwood, and pulp and paper production. Viet Nam's engagement in producing perennial crops, such as rubber, tea, coffee, and cashew nuts for international markets, has significantly contributed to poverty alleviation. These crops account for half of Viet Nam's exports. Coffee production (Viet Nam is the 2nd largest exporter in the world) in particular has led to significant loss in forest cover, especially in the upland areas. Nevertheless, the government of Viet Nam is keen to keep producing such products to boost economic growth.

Source: Sunderlin and Ba 2005.

In addition to meeting subsistence needs and urban demands for certain commodities, it is also important to note the role of China in the GMS. High income countries in the GMS, such as China, are importing raw material from other middle and low income countries in the sub-region. The demand for commodities and products such as wood, rubber, timber, soya, pulses, rice and coffee from China due to increasing urbanization and rise in income levels is leading to a significant loss in biodiversity and forest areas due to logging and conversion of forests to agricultural land. China's demand for wood based products, in particular has grown rapidly in the last 10 years. For instance, between 1997 and 2005, the value of forest product imports rose from US\$6.4 billion to US\$16.4 billion (White et al. 2006 cited in Humphrey and Schmitz 2007). This increase is partly because consumption is increasing within China as incomes rise and also because of a logging ban within China after a devastating flood in the Yangtze River in 1998. China sources most of its timber from low income countries, such as Myanmar, where the timber trade is mostly conducted illegally (Humphrey and Schmitz 2007). Although in 2005 GMS countries (excluding Thailand) accounted for 1.5% of Chinese imports, it is likely that trade relations with China will continue to grow with low income GMS countries that are dependent on forests or converting them for economic growth. Similar trends will also arise within Thailand and Viet Nam who have also imposed logging bans within their own territories and will turn to low income countries for timber (UNEP 2006).

The ability to protect biodiversity outside of protected areas is, however, more likely in wealthier economies. People who are economically well-off and have alternative means of income that are not forest or agriculture based have a higher ability to protect biodiversity (see Box 12).

Box 12. Changes in Land Cover in Thailand

Thailand is considered a high income country in the GMS. With a high per capita income and relatively low population (63 million), Thailand has the second largest area of forest cover amounting to 14,520 ha. One of the reasons why Thailand has been able to maintain high levels of forest cover is partially due to agricultural expansion. For instance, areas such as the Nang Rong district in northeast Thailand have undergone major land use transformation. In the 1950s many people started in-migrating to forested areas. After settling in these areas, land was cleared to grow rice and cassava, which had high international demands. Between 1954 and 2000, forest cover declined from 54.8% to 13.3% as forests were converted to agricultural land. However, places such as Nang Rong are now seeing regrowth of forested areas after a time lag. Once people have expanded agricultural land up to a cost-effective point, forest land no longer becomes converted. In fact, villagers started to plant trees for shade and to utilize forest resources once enough forest land was converted to agricultural land. Furthermore, the building of roads has connected people to off-farm employment, decreasing pressure on forest fringes. This is reflected nationally as annual change in forest areas has fallen from -.07% between 1990 and 2000 to -.04% between 2000 and 2005. The shift from purely agrarian to labour intensive industries may have also led to protection of forest areas and biodiversity to a great extent.

Source: Entwisle et al. 2008; FAO 2007; UNDP 2007.

Discussion

This section has highlighted that people have been concerned with the loss of biodiversity, a significant forest-based environmental service for generations. Whether the protection of biodiversity is motivated by the economic service it provides or for its existence value, efforts to protect biodiversity can be seen at the local, national, and international levels. In each of these levels, there have been several non-market options that have been developed to provide provisions to protect biodiversity. These range from informal, common property institutions reinforced by cultural beliefs at the grassroots level to formal state-led management systems. Formal global policies through the CBD and CITES have also encouraged the protection of biodiversity. The wide range of policies has not been completely successful due to a variety of reasons. These include lack of finances, information, and capacity; participation of all stakeholders; lack of authority to act and responsibility; and language, political, and legal barriers.

Although there is potential to maintain biodiversity levels through the market mechanisms that the CBD advocates, the extent to which they will be effective is unclear. Because implementation of market mechanisms would require appropriate legal and formal market structures to be in place, it would be difficult for low income countries to use market mechanisms when trade in biodiversity takes place primarily at the informal level. This may especially be difficult for former socialist countries, such as Lao PDR and Cambodia to make a rapid transition to a formal market economy. Considering that there is no democracy in Myanmar, it would also be difficult to establish a free market economy. Poor governance structures do not allow for careful monitoring of trade. Even though room is being made for communities to participate and engage in management of biodiversity through markets, there is little incentive for people in low income countries to take advantage of the democratization process that is occurring in the region to help protect biodiversity when their priority is to meet subsistence needs.

Based on the case studies provided in this section, countries such as Cambodia, Lao PDR, and Myanmar will most likely continue to deforest areas since their priorities are economic development and poverty alleviation. Since most people in these countries are dependent on agriculture, agri-business, and logging, it is most likely that forest conversion will continue to grow at the cost of biodiversity protection regardless of the various policies that have been

formulated to prevent deforestation at the national and international level. The inability or unwillingness to ratify the CBD by Lao PDR and Cambodia clearly suggests that conservation is not high on their list of priorities. Therefore, in general, the willingness and ability of low income countries to protect biodiversity is low since the cost of foregoing economic development is too high. Maintaining forests in these regions will be a marginal issue.

High income countries, such Thailand and China, however, have the ability to conserve biodiversity now that they have moved away from agrarian to manufacturing based economy. They have the financial means and willingness to curb forest conversion. Viet Nam, a middle income country, is slowly following Thailand and China as it industrializes moves away from a purely agrarian economy. This is evident as all three countries have imposed a logging ban and no longer emphasize only poverty alleviation in their NBSAPs. Additionally, Table 4 clearly suggests that forests are expanding in these three countries as opposed to Lao PDR, Cambodia, and Myanmar. However, Viet Nam still shows a mixed picture where forests are growing due to the logging ban, but they are still being lost to shrimp farming and agribusiness. However, in general, it can be suggested that forest conservation activities in Viet Nam, Thailand, and China will ironically diminish the level of biodiversity found in other GMS countries as they source forest resources (i.e. wood, wildlife) from low income countries.

3. FORESTS AND WATERSHED MANAGEMENT

A watershed is a catchment area where water drains to a common point. Forests can play an important role in watershed maintenance and may offer a variety of services that help influence the amount of water available for use from groundwater, surface watercourses and water bodies; these services include the timing of water delivery; enhancing water quality; protecting water bodies and watercourses by trapping sediments and deleterious pollutants; and maintaining water temperature. Appropriate management and development of watersheds can lead to increase in agricultural and industrial productivity, availability of hydropower and essential drinking water, and maintenance of ecosystems.

This section begins by highlighting the key watershed areas in the GMS. It then discusses the complexities that surround the relationship between forests and water in watershed areas and the drivers that deteriorate watershed areas. This section will also discuss some of the ways in which people have attempted to protect watersheds, as well as the challenges of doing so. It particularly points out the policy and market mechanisms that people have used to enhance forest protection for watershed management.

Complexities and uncertainties linking forests and water

There are a few watershed areas that overlap GMS countries, in addition to the Mekong watershed, as listed in Table 7. Most watersheds in the GMS originate from China.

Table 7. Major watersheds in the GMS

Major watersheds in the sub-region	Watershed area (km ²)	Countries within the watershed	Percent of watershed that is:	
			Crop-land	Forest
Hong (Red River)	170,888	China, Viet Nam	36.3	43.2
Irrawaddy	413,710	Myanmar, China	30.5	56.2
Lackang/Mekong	805,604	China, Lao PDR, Viet Nam, Cambodia, Thailand	37.8	41.5
Salween	271,914	China, Myanmar	5.5	43.4
Xi Jiang (Pearl River)	409,480	China, Viet Nam	66.5	9.6

Source: World Resources Institute 2005a.

The extent to which forests and water are related is an issue that is unresolved. There is an assumption that forests are the best land cover to regulate water flows, maximize water, and ensure high water quality under any hydrological and ecological circumstance (Calder et al. 2007). This assumption itself is based on several other assumptions about the relationship between forests and water, which are described below.

- (a) Forests enhance soil quality and control erosion: It is difficult to relate deforestation to the loss of soil quality and erosion, which leads to sedimentation. The relationship between forests and soil depends on how the land is used after deforestation and the amount of leaf litter available to prevent loss of soil quality and erosion (Pattanayak 2004). Some trees actually increase erosion, such as teak, which may not be a suitable tree for reforestation purposes (Ong and Swallow 2003).
- (b) Forests increase water yield: Forests may actually use more water than agricultural crops and grasslands and may not increase flow of water during the dry season.

However, the infiltration and storage capacity of surface layers of forest soils can lead to high flows (FAO 2006; Pattanayak 2004).

- (c) Forests control sedimentation and flooding: Some studies have shown that forest protection in watersheds is not directly related to preventing floods, which can happen due to sedimentation in rivers. Forests do not necessarily act as ‘sponges’ that soak up excess water and sediments take a long time to reach downstream where flooding tends to occur. The reasons behind flooding are multiple (i.e. size of watershed, steepness, dams, discharge peaks of the large rivers, high runoff from hills adjacent to the water tables and spring tides, lateral river embankments and the disappearance of storage areas in the lowlands) and cannot just be associated with forest protection (Chomitz 2007; Hofer and Messereli 2006). Forests do not necessarily act as ‘sponges’ that soak up excess water. Evidence suggests, for instance, that the further the distance of rainfall to the watershed area, the less likely it is that deforestation is to blame for flooding (Calder et al. 2007). Reforestation may work to prevent flooding on a local scale of a few hundred hectares.

These complexities between forests and water in watershed areas indicate that although forest degradation is an issue, there is no clear science as to the extent to which loss of forests actually harms watersheds.

To add to the already complex role of forest services in watershed areas, there are many drivers that affect the quality of a watershed that people depend upon for both forest resources and availability of water. These leading drivers include:

- *Land use change:* Multiple land use activities such as agriculture, grazing, and logging can dramatically alter forest areas and reduce forest services in watershed areas. If a direct correlation is found between forests and water in a particular watershed, deforestation could lead to a significant loss of water availability both above and below ground. It could also lead to soil erosion that would negatively impact agriculture and grazing activities. Land use pressure could be exacerbated by population growth and demand for agricultural products to meet subsistence needs or market demands
- *Economic growth:* The demand for hydropower and irrigated agricultural land to boost economic growth is creating pressure on water sources in watersheds in the GMS. For instance, Viet Nam wishes to increase its irrigated land from 3.5 to 10-12 million hectares by 2010 to increase agricultural production. Viet Nam’s development strategy in combination with rapid population growth and rising incomes will most likely lead to increased demand and consumption of water. Lao PDR has the highest hydropower potential in the GMS and could be a key supplier to Thailand and Viet Nam. The Chinese in Yunnan are constructing numerous hydropower plants along the Lancang/Mekong River, which will provide 15,600 MW by 2025. The heavy diversion and usage of water could have negative impact on forests in upland/upstream areas
- *Poor governance:* Uncontrolled and intensive use of a certain watershed area due to the lack of appropriate institutions to monitor land use can also lead to deforestation, soil erosion, and loss of water supplies. This is worsened when there is a lack of information on quantity of surface and groundwater is difficult to assess over time

It is important to note that the extent to which these drivers alter a watershed is also dependent on the scale of the watershed. Watersheds can be divided into three scales: micro (less than 50 km²), meso (50 km² to 20,000 km²), and macro (greater than 20,000 km²). Together with scientific uncertainties and drivers of change, it can be difficult to decide the scale of a watershed to be protected. This decision can be influenced by the watershed’s strategic value, the existing demand for watershed services, the ecosystem situation, disaster

risks, local stakeholders' priorities, and the financial and technological resources that are available (FAO 2007b).

Although many questions still remain about the role of forests in watersheds, policy and market mechanisms have been developed that strongly promote the idea that forest protection is essential for watershed management. These mechanisms are discussed in the next section.

Policy initiatives to protect watersheds

Participatory or collaborative management of watersheds has started to become a policy trend. This has involved an integrated approach where all stakeholders are included in the process of planning and implementing forest protection plans to protect watersheds. Such informal management of watersheds offers flexibility in addressing uncertainties surrounding the relationship between forests and water and their impacts on people compared to formal, state-led institutions. Integrated management also provides a sense of ownership over watershed areas. Integrated management of watersheds is a new concept in the GMS (see Box 13).

Box 13. Integrated Approach to Improving Watershed Conditions in Lao PDR

Lao PDR is covered by 64 watersheds. Fifty-three of these, accounting for 91% of the country's land area, drain into the Mekong River. The other 11 watersheds drain into Viet Nam. Over the last 50 years, forests in these watersheds have decreased from 70% to 47% due to clearing of lowland forests for permanent agriculture, logging, reservoir construction, shifting cultivation, fires and the use of chemical defoliant during the Indochina war. However, the leading cause of deforestation has been conversion of land to agriculture. Most people in upland watershed areas are poor farmers who rely on extensive use of agricultural land due to low productivity to meet subsistence needs. The Ministry of Agriculture and Forestry is applying integrated watershed management as a means to address deforestation, agricultural expansion and poverty in the uplands of Lao PDR. By 2020, the government aims to make the transition from a subsistence to a market economy but through appropriate land use. Therefore, its plan for integrated watershed management includes 1) intensive lowland agriculture in the plains areas; 2) mixed agroforestry as the main production system in sloping areas; and 3) forest conservation and protection for upland steep areas while making sure that poverty reduction decreases as food security increases. Integrated watershed planning is, however, in its early stages in Lao PDR. Many staff, especially at the district level, have insufficient skills to communicate, deal with data and information, and plan. Training is underway at all levels of government to boost capacity and an information centre is being established to coordinate data collection for planning. Technical training on how to use tools for watershed planning, implementation, and monitoring and evaluation will also be provided.

Source: Pravongviengkham et al. 2005.

Considering that integrated watershed management is a new concept in most GMS countries, the extent to which collective action will be successful in managing forests in watershed areas in a participatory manner is yet to be seen. However, it is important to keep in mind that successful integrated watershed management depends on several factors. For instance, there are several transaction costs involved with regard to providing access, monitoring, and resolving conflicts. Grassroots level actors may find it very difficult to participate because they may have to trade off their income earning opportunity with leaving a watershed area to regenerate. Even if the costs of participation were low and people could still maintain their source of livelihood, there are high transaction costs in cooperation and uneven distribution of costs and benefits to protecting forests, especially in larger watershed areas. Because of vast distances between users, it is difficult to make unified decisions, especially when a diverse group of actors has varying interests. The effectiveness of institutional arrangements to manage watersheds in a participatory manner also depends on the biophysical characteristic of

the hydrological cycle in the watershed area (MA 2005). Regardless of the type of watershed that exists, there will be issues of power, hierarchy, and marginalization when it comes to making collective choices in collaborative management of watersheds. Therefore, deep rooted social norms and hierarchy could prevent many from participating and benefiting from participatory watershed management. Because the social costs of participation may be too high, this may prevent successful management of watersheds in an equitable manner.

Regional level watershed management is an important issue in the GMS since many watersheds cross international boundaries. One of the most notable watersheds is the Mekong. The management of this watershed is complex not only because 6 countries share this river, but also because the politics of managing a large watershed is challenging. Upstream-downstream power relations, geopolitics, and varying abilities of different countries to engage in regional management make management of the Mekong challenging (see Box 14).

Box 14. Mekong Watershed

Governance over the Mekong watershed in the last few years has demonstrated a tug-of-war between parties that want to promote economic development by generating hydropower through dams and those who are more concerned about the impact of dams on watersheds. Considering that there are many parties involved in the management of the Mekong watershed, governance at the regional level has been a complex issue. The Mekong River Commission (MRC) was the key regional governing body that helped to formulate the Mekong Agreement of 1995, which upholds international water laws. In addition to the MRC, various national governments also play an important role in regional governance. However, asymmetrical interests have plagued regional management of the Mekong watershed. Those countries upstream have not been keen on regulating resource use compared to those downstream. In such cases, the distribution of power is skewed where upstream users, such as China where the Mekong originates, have more authority over the management of the watershed compared to other countries. Cooperation among GMS countries has also been hampered by wars and conflicts, and differences in political ideologies (i.e. communism and centrally planned markets versus market economies). In relation to the differing political context, countries that make up the National Mekong Committees are positioned differently with varying structures. For example, Thailand has very different political structures compared to centrally planned states in the GMS. It also has greater financial resources and capacity to support regional governance compared to other Lower Mekong countries. How to share information about the watershed and river among the GMS countries are also unclear, even though the Mekong Agreement mandates that countries downstream have the right to information about developments in the Mekong watershed. Despite these challenges, addressing regional governance is unavoidable in GMS countries that are significantly interlinked through trade and a shared watershed crucial to livelihoods.

Source: Ojendal et al. 2002

It is only recently that Myanmar and China have become involved in regional governance, which suggests that watershed management and dialogue between upstream and downstream countries in the GMS is relatively new. It is, however, expected that China will be increasingly influential in upstream watershed management as it continues to source forest products from countries such as Myanmar (see Box 15).

Box 15. China's Impact on Salween and Irrawaddy Watersheds

After the devastating floods in 1998, a logging ban was imposed in China to protect trees in watersheds that could prevent future flooding. This ban, however, has led Chinese companies to source timber elsewhere. Logging concessions have been provided to the Chinese to deforest an area between the N'Mai Hku area in Myanmar and China's Yunnan. Building logging roads and bridges to transport logs from Myanmar to China has seriously threatened the state of Salween and Irrawaddy watersheds that border between China and Myanmar. Both legal and illegal logging between China and Myanmar has financially benefited Chinese logging companies and Myanmar's cash-deficient military government that relies on logging as a key financial source. However, such activities create vulnerability in Salween and Irrawaddy watersheds where loss of forests could lead to degradation of watersheds and flooding in Myanmar.

Source: Environmental News Service 2004

Furthermore, China's increasing demand for energy through hydropower could lead to deforestation and water being diverted from the Mekong to the Yangtze Kiang River basin, affecting downstream GMS countries. China has several dams within its territory that could affect the Mekong watershed, and thereby, the flow and ecology of the Mekong River. Even though China and Myanmar contribute only 18% of the water flow to the Mekong region compared to 35% by Lao PDR, downstream countries, such as Lao PDR, are not as economically powerful as China (Phillips et al. 2006). This would make it difficult for downstream countries to financially afford access to watershed ecosystem services that China could capture. Considering that China is not a member of the MRC, it has no obligation towards the MRC Agreement, making management and sharing of watershed services challenging.

Market mechanisms to protect forest and watersheds

Although it is difficult to put a price on 'quasi-public goods' such as services that forests in watersheds provide, especially when the science of how forests interact with water is unclear, market mechanisms to protect forests and watersheds are gaining popularity since markets have the potential of balancing demands for environmental services with their protection. Market-based mechanisms have several positive aspects (MA 2005).² These include:

- A way for upstream landowners to earn an income from the payment they receive to alter their land use practices and provide services to downstream users. This payment can help alleviate poverty among upland users, especially since they are generally poorer than lowland watershed users
- A direct approach to creating incentives to ensure regular flows of water, protection of water quality, and control of sedimentation
- Charging users for services on a regular basis to increase efficiency in management. This will encourage the preservation of scarce resources or services while encouraging less costly way to prevent damage to watersheds. This can prevent free-riding by those who use most of the services without being accountable for them

At present, public watershed payment schemes amount to US\$2 billion annually, worldwide. Private schemes amount to US\$5 million (FAO 2007a). There are several market mechanisms that can be used to maintain a healthy watershed (see Table 8). The type of mechanisms used

² Market mechanisms are not equivalent to privatization because in most cases, they involve both public and private sets of instruments to address variability and uncertainty of service provisioning (MA 2005a).

is dependent on the characteristics of the service, the scale of the ecosystem processes by which it is produced, and the socioeconomic and institutional context (Hamilton et al. 200?).

Table 8. Mechanisms for payment for watershed services

Transfer of payments	Tradable rights	Voluntary contractual agreements	Certification/labelling
Takes place at the national level	Requires strong planning and regulatory capacity	Relatively simple compared to other mechanisms	Landowners are rewarded for specified management practices
Covers large areas	Zones are identified where development is restricted or permitted	Negotiated among individual parties	Required intermediary organizations are needed to establish standards for labelling and to certify practices
Under heterogeneous conditions	Rules are strictly enforced over a period of time over common water sources		
Supported by taxes and not user fees because of broad social benefits provided			

Source: MA 2005.

The transfer of payment scheme has been most widely used, especially in large watershed areas at the national level. It is most likely a popular mechanism because it allows for informal rules and management under heterogeneous conditions compared to the other mechanisms. The other methods could also be more costly to use as they require more formal rules, enforcement, negotiations, and meeting standards. This paper will only focus on transfer of payment scheme as it is the most prevalent.

In the transfer of payment scheme, farmers are compensated for conservation measures (i.e. water quality, soil conservation). It could also be used to pay forest owners for the multiple services they protect either by cash and/or in kind. Countries in the GMS, such as Viet Nam and China (see Boxes 16 and 17) are leading the way in implementing market mechanisms to protect watersheds.

Box 16. Watershed Protection through Market Mechanisms in Viet Nam

The concept of paying for ecosystem services is a new mechanism to protect watersheds in Viet Nam. There are several policies and laws in place that facilitate this market mechanism. For instance, Article 130 of the Law on Environment Protection 2005 implements the polluter/user pays principle. Under Viet Nam's Civil Code 2005, individuals and organizations can also legally enter into contracts. It is, however, difficult for communities to enter into contracts unless they are legally established; have organizational structure; have assets independent of those of other organizations and individuals and can be responsible for those assets; and are able to participate in legal relations independently and in their own name. Since most communities cannot meet these conditions, it is difficult for them to engage in civil legal relationships. Nevertheless, three key documents (Decision No. 256/2003.QD.TTg, Politburo Resolution No.41/NQ-TW; Decree 175-CP, 1994) encourage and endorse the use of economic instruments to support environmental conservation. Under these current provisions, it is only the State that can set rates, fees and charges, and all income is treated as budgetary revenue belonging to the State. Even though Viet Namese policies and laws support market mechanisms to protect watersheds, it is unclear whether payments are to be based on direct taxes, fees or charges, or whether they can be based on market prices for a product or services. Additionally, the legal status of communities remains unclear, especially if individuals or households enter into joint agreements. Although these issues are yet to be addressed, Viet Nam is on its way to protecting watersheds through markets.

Source: Ha et al. 2008

Box 17. Transfer of Payments in China

Northwest Yunnan is an area covering 6,671,985 ha where the Salween and Mekong rivers flow at close distance. Forests in these two watersheds account for 60% of the land area. However, due to population pressure and agricultural expansion to meet increasing consumption, there has been significant deforestation on lower slopes. Furthermore, excessive timber extraction in upland areas has led to soil erosion where 52% and 38% of land areas of the Salween and Mekong watersheds respectively are subject to soil erosion. In order to prevent further forest loss in these watersheds, the Chinese government has placed a logging ban and implemented a program to prevent cultivation on all slopes over 25 degrees, even though it is unclear whether forest loss is the primary reason for soil erosion. Furthermore, China has been experimenting with transfer of payment schemes between the government and local resource managers. In an initiative that started in 2004 under the Forest Ecological Compensation Programme, financial assistance is provided to managers of forests that help prevent soil erosion and improve the quality of water in watersheds. In this program, called the Sloped Land Conversion Program, forest managers are paid 50 yuan/mu/yr (or US\$9/ha/yr) for seedlings and saplings. The number of years the compensation package is valid depends on the type of tree that is planted. Although the implementation of this plan has been rapid and extensive, instead of compensating upstream residents for their services and foregone land use, the money is to be spent on rangers, technical staff, managers, and administrators. Furthermore, the trees that are being planted to protect the Salween and Mekong watersheds are homogenous, which does not contribute to landscape diversity to protect biodiversity. Time constraints, task-based management, inability of government officials to listen to farmers' opinions, insufficient funds for planting stock and limited expertise and knowledge of alternative species have not contributed to effective regeneration of the watersheds in Yunnan. Although these challenges exist, China has made considerable strides in using transfer of payments to address loss of forests and watersheds.

Source: Porras and Neves 2006; Weyerhaeuser et al. 2005.

The success of payments for watershed management will be dependent on the confidence of stakeholders to receive the services forests offer for watershed protection when they pay for them (MA 2005). At the moment, there are several barriers that prevent confidence in market mechanisms in relation to watersheds. In many cases, markets for forest and watershed services have not developed because of the high transaction costs to establishing formal

markets. Establishing markets involves identifying potential trading partners, establishing collective institutions for buyers and sellers, negotiating to deliver a trade, monitoring and analysing service, documenting and record keeping, and administrating trade (Landell-Mills and Porras 2002). It also involves legal, financial, insurance and business management support and advisory services; credit provision; independent verification; inter-sectoral knowledge sharing and coordination; and effective and equitable public enforcement regimes (Richards and Jenkins 2007). These formal market and legal structures do not exist, in most of the GMS, although they are beginning to develop in middle and high income countries, such as Viet Nam and China respectively.

The success of PES in relation to watersheds also depends on the relationship between multiple stakeholder transactions between upstream and downstream users. It is questionable, for instance, whether the upstream poor would want to protect forest services for wealthy landowners downstream who require water to irrigate their farms when social relationships and networks may not exist between the two (Kerr 2002). It is also unlikely that the poor, especially upstream, would forego their need to use the land available for agriculture to maintain their source of livelihoods for payments from downstream users, when the PES is lower than what can be earned from agriculture and raising livestock.

Defining property rights and institutions is essential for markets to work. Poorly defined property rights would make it difficult for markets to function if it is unclear who is a buyer and seller of forest services. The knowledge is essential in formal and legal transactions, and the decision-making process. Without this clarification, distribution of benefits could be inequitable between people living in upstream and downstream areas, as well as between the rich and the poor within a specific area. Along with property rights, participation of buyers and sellers could be complicated if institutions do not set the 'rules of the game' (Hamilton et al 200?). Participation of a large number of landowners, complex negotiation processes, and conflict resolution could lead to high transaction costs. These issues could be further complicated without cost-effective intermediaries who bring buyers and seller together, and who have high technical, financial, and managerial skills to tackle conflicts over property rights.

Although market mechanisms offer much potential to equitably use and protect forest services in watershed areas, they may not necessarily help poorer members of society. For instance, payment for services through taxes can be especially difficult for the poor downstream since they also may not have enough influence and money to buy services from those upstream, which may exacerbate poverty without access to services. Their lack of management, leadership, and conflict management skills will most likely prevent them from joining formal markets. Therefore, market mechanisms may not promote equitable transactions unless mechanisms are specifically created to help the poor engage in the service trade with low transaction costs.

Table 9 summarizes the potentials and pitfalls of the market mechanisms to protect forests and watersheds discussed in this section.

Table 9. Strengths and weaknesses of market mechanisms for watershed protection

Strengths	Weaknesses
Beneficiaries or users are easy to identify and are often willing to pay for forestry interventions – even though there may be weak scientific evidence.	If buyers are unsure if they are getting what they are paying for or lack confidence in markets, sustainability of the transaction are at risk.
Investments in watershed management are cheaper than treatment or new water supplies.	Costly to develop capacity to establish and operate formal markets and use legal institutions for transactions, especially when there is a lack of scientific data that minimize uncertainties about watersheds
There is high win-win potential in developing countries since upper watershed farmers are usually poor and they are able to earn revenue.	Common equity constraints are insecure tenure, weak local institutions and inequitable public enforcement capacity and poor relationship between upland and lowland, and rich and poor buyers and sellers.
Watershed payment for environmental services works best when there is a scarcity of clean water, and water users have capacity to pay, e.g., urban citizens, companies.	Beneficiaries are often poor and/or unwilling to pay for a 'free good' or their basic right to water, and it is difficult to exclude beneficiaries who won't pay.
Markets create incentives to protect watersheds and can prevent free riding of forest services in watersheds.	
Once formal markets are established, transactions can take place efficiently and transparently.	

Sources: Bishop et al. (2006); Chomitz et al. (2006).

Market mechanisms used to protect forest services are still relatively new in the GMS. Although there are many benefits that could accrue from paying for watershed services, there are numerous difficulties with successfully marketing forest services.

Discussion

Protecting forests for watershed management has been a difficult task due to a wide variety of uncertainties associated with the science of forest hydrology. The lack of clarity regarding the relationship between forest and water makes it difficult to formulate policies and create market mechanisms to protect forests in watershed areas. This is worsened by the lack of scientific data on forest hydrology at a watershed scale. Despite these uncertainties, maintenance of forest areas is viewed as critical to the protection of watersheds.

Attempts are being made to promote collaborative and integrated management of forest in watershed areas whereby informal and flexible institutions are being introduced. Although it is possible to protect watersheds through forest restoration, such initiatives are determined by social relationships and the level of hierarchy that exists in a society, since how watersheds are to be maintained must be negotiated. The willingness to protect forests in especially low income countries will be difficult especially since forest conversion to agricultural land is continuing to grow in low income countries, such as Lao PDR, in order to meet subsistence

needs. Such continued land use change will make it difficult to set aside watersheds for protection and for people to be willing and able to protect forests.

Although attempts are being made to address regional management of watersheds in the GMS, issues of inequalities between upstream and downstream users, as well as between the rich and poor within one area will continue to make watershed management a challenge. High income, upstream countries such as China have significant potential to influence how watersheds are used that will affect the rest of the sub-region. It will be difficult for low income, downstream countries such as Lao PDR and Cambodia to negotiate access to watershed services, especially when China is increasingly facing water shortages and is in need of energy for its growing economy. The differences in economic status and political ideologies in the GMS will make watershed management at the regional level a difficult issue.

One of the most challenging issues with regard to protecting forests in watershed areas is establishing markets so that users pay for the forest services. In most cases, market mechanisms exist through the transfer of payment schemes where national or local governments pay service managers fees to maintain forest services in watersheds. This concept is, however, very new to countries in the GMS. Viet Nam is only beginning to use market mechanisms through supportive policies that encourage payment for watershed services. The only country where transfer of payments has been used is in China. In a country such as China, such mechanisms are most likely to grow since people are willing and able to forego using agricultural land because they have other employment opportunities in cities. Overall, however, because formal markets for ecosystem services have not been developed to a large extent in the sub-region due to the lack of market institutions and resources, payment for forest services in watersheds has yet to fully compensate service providers upstream. And yet again, uncertainties associated with the relationship between forests and water are likely to be one of the most critical factors in managing both buyer and seller expectations and maintaining their cooperation in the long run.

4. FORESTS AND CLIMATE CHANGE

Forests can play a critical role in mitigating climate change. On the one hand, forests provide climate regulating services whereby trees can absorb CO₂ in the atmosphere, the leading greenhouse gas (GHG) that contributes to climate change. Forests are able to act as carbon sinks for at least 1 billion tonnes of carbon dioxide. Pristine rainforests in particular can store around 500 tonnes of CO₂ per hectare (UNDP 2007). On the other hand, trees that are dying naturally or through land use change release carbon dioxide as forests are vast repositories of carbon. These land use change activities primarily revolve around the conversion of forests to agricultural land, which can be exacerbated by population pressures as discussed in the previous sections.

The release of carbon through loss of forested areas can significantly contribute to climate change. Annually, approximately 60 gigatons of carbon are taken up and released by terrestrial ecosystems, which include forests (MA 2005). After fossil fuels, deforestation is the leading cause of climate change. It is predicted that the loss in forests can contribute to climate change by emitting 3 billion tonnes of carbon dioxide every year. Roughly 20% of global carbon dioxide comes from deforestation activities (Chomitz 2007). It has been estimated that in 2004, the emission from deforestation was responsible for 7% to 16% of total GHGs (IGES 2008). Therefore, in order to combat climate change, it is crucial to limit deforestation to sustain the climate regulating services that forests offer, such as carbon sequestration.

This section examines the market mechanisms and policies behind the two ways in which climate change can be mitigated by absorbing emissions *above-ground* by trees:³ carbon sequestration and reduced deforestation and degradation (REDD) activities. This section will, however, primarily focus on REDD activities.

Land use, land use change, and forestry

The multilateral Kyoto Protocol acknowledges that land use, land use change, and forestry (LULUCF) activities can help meet the objectives of the Protocol, which is to reduce GHG emissions. LULUCF activities can occur in three stages: (a) sequestration through afforestation/reforestation (A/R), (b) conservation of existing carbon pools through REDD, and (c) substitutions for fossil fuels (MA 2005). In this section, sequestration and conservation will be focused upon. Specific attention will also be paid to the potentials and pitfalls of market mechanisms related to both sequestration and conservation activities in this section.

Sequestration activities

The Clean Development Mechanism (CDM) is a Kyoto Protocol program which encourages businesses in developed countries to offset their carbon emissions by funding clean energy projects in developing countries. CDM objectives are to: produce 'certified emissions reductions from project activities in developing countries; [and provide] a financial mechanism that funnels investments towards these emission reduction and sequestration activities' to help (Annex I) [industrialized] countries meet emissions limits' (Brown, p. 20). This could take the form of carbon sequestration through A/R projects where developed countries could earn carbon credits if they support planting trees to absorb their CO₂ emissions in developing countries.

³ This section will not examine the role of below ground resources such as soil and its relation to climate mitigation.

A/R projects have, however, been unpopular. Out of the 1,016 CDM projects, only one has been an approved afforestation project (see Box 18). One reason why there are very few A/R activities is because of the Marrakech Accords that limited the eligibility of LULUCF activities (i.e. conservation of standing trees) under the CDM in the first commitment period to A/R projects until 2012 and placed a 1% cap on sharing carbon credits that Annex I countries could acquire through A/R projects (UNDP 2007).

Box 18. CDM A/R Project in China

China is the second largest contributor to CO₂ emissions after the US. In an effort to mitigate climate change, China has made significant achievements in tree-planting and afforestation. China has been the only country that has received approval from the United Nations Framework on Climate Change on the CDM A/R project, 'Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin'. There are several objectives this project hopes to achieve through afforesting 4,000 hectares by creating plantations and multiple-use forests on degraded land. It aims to sequester CO₂ through forest restoration and it is expected that plantations could sequester around 0.34 million tons by 2012 and 0.46 million tons by 2017. In addition to contributing to mitigating climate change, it will connect fragmented forests to create biodiversity corridors, reduce soil erosion, improve hydrological flows, and reduce risks of flooding and droughts. Furthermore, it is anticipated that this project will create employment amounting to 5 million person-days, 40 long-term positions, and income for 5,000 households. Local forestry agencies will also help with monitoring and providing technical support. This project has been initiated by the Government of the Guangxi Zhuang Autonomous Region, family cooperatives, Kangan and Fuyuan forest farms, the Luhuan Forestry Development Company, and the World Bank BioCarbon Fund. Thus far, forest cover has increased from 13% of the country in 1986 to almost 17% today. This has led to approximately, a total of 3.06 billion tons of CO₂ absorption by afforestation, a total of 1.62 million tons of CO₂ absorption by forest management, and 430 million tons of CO₂ from deforestation were saved between 1980 and 2005.

Source: PRC 2007; World Bank 2008a.

It is, however, possible that more A/R projects could be approved in the near future as 100 more are in the preparation stage. Projects outside of CDM regarding A/R are also being developed by various carbon funding agencies to absorb emissions (see Box 19).

Box 19. Reducing Emissions through the Biodiversity Conservation Corridor Initiative

The Biodiversity Conservation Corridor Initiative (BCCI) established by the Asia Development Bank (ADB) in the GMS offers great potentials to reduce carbon emissions since it focuses on recreating and reconnecting forest areas. The Department of Forestry in Lao PDR, for instance, is making considerable effort to explore afforestation as an option to reduce deforestation while mitigating climate change. It has engaged with various stakeholders, such as the World Wildlife Fund and ADB to help the Department of Forestry prepare a proposal to mitigate climate change in places such as Champassak Province, where a BCCI already exists. Because this area has undergone extensive land-use planning and delineated areas of protection forest, it is a potentially good site for afforestation activities. Similarly, in Thailand, four income-generating village nurseries have been established to grow saplings for forest restoration in the Tenasserim Range. A review of land use change has also been conducted to assess how climate change activities can be developed in this part of Thailand. In Viet Nam, in order to create resilient ecosystems and livelihoods to protect against the negative aspects of climate change, WWF is running a pilot project in the Greater Annamite Ecoregion to create forest corridors. Currently, the area consists of much degraded and bare land. This initiative, with the support of the World Bank and ADB, will take a landscape approach to recreating forests as a way to create carbon sinks.

Source: ADB 2008; WWF 2008a; WWF 2008b.

Although A/R activities can help mitigate climate change to a certain extent, it is not a permanent solution as countries that have high A/R rates may also contribute significantly to GHG emissions. For instance, forested areas are growing in China due to the establishment of plantations through CDM A/R projects. At the same time, however, China is also one of the largest emitters of carbon dioxide.

REDD activities

While the Kyoto Protocol allows Annex I countries to gain credit from their financing of A/R and deforestation activities, the Protocol perversely does not provide any incentive for landowners in developing countries for reduced deforestation and degradation activities (UNDP 2007).⁴ Although Figure 1 shows that the largest contributor to emissions is deforestation and minimizing deforestation would help to substantially mitigate emissions, this fact has not been incorporated into the Kyoto Protocol or CDM.

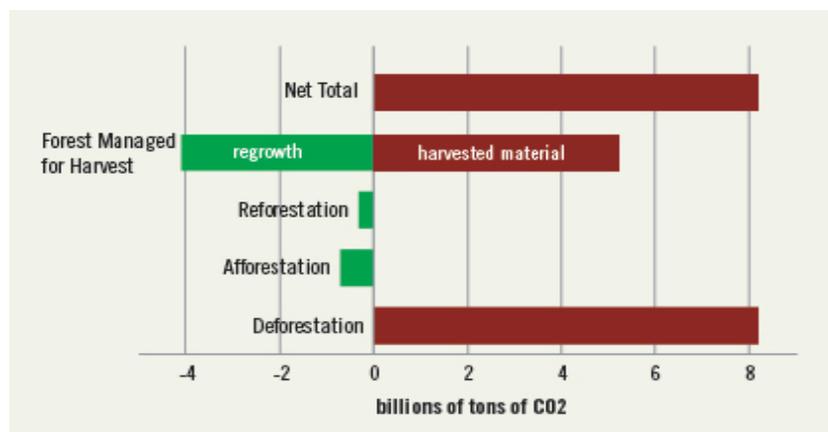


Figure 1. Emissions/absorptions of CO₂ from selected forestry

Source: Davis 2008; using data from Baumert et al. 2005.

The reason why the issue of deforestation has not been incorporated into the Protocol was probably because tackling deforestation and degradation poses too many challenges and uncertainties that may undermine the efforts of the Protocol. Many countries with high deforestation levels also felt their sovereignty over land use and right to develop would be threatened if deforestation is curbed (Davis 2008). Furthermore, tackling deforestation is maybe more costly than investing in energy efficient technologies to reduce dependency on fossil fuels. It is estimated that reducing deforestation could cost from US\$12 billion to US\$30 billion per year (Scholz and Schmidt 2008). In comparison, financing a wind energy project could be more cost effective than addressing deforestation and its 'deeply-entrenched social causes' (Raffensperger 2007).

Despite these arguments, many policy makers are now promoting REDD where developing countries could reduce their deforestation rate (based on a reference time period) and at the same time, receive financial compensation. This transfer of payment will be based on either foregone opportunity costs or on the value of carbon emissions saved (Scholz and Schmidt 2008). There are several economic assumptions that underpin REDD activities that make

⁴ REDD is sometimes interchanged with the term 'avoided deforestation'. In many cases REDD is used since 'avoided deforestation' could refer only to forest conservation (not land use management), and does not specifically identify deforestation and degradation as two of the most critical causes of climate change. Because REDD provides a more specific reference to causes of climate change, REDD will be used throughout this paper.

REDD an appealing option. Martin (2008) provides three economic assumptions behind REDD:

1. It is assumed that those who convert forest land to another land use do not realize any economic consequences since there is no economic value for the carbon they release during land conversion. Because there is no market for carbon, there is no incentive to conserve forests, which calls for CO₂ emissions to have an economic value.
2. There is an assumption that the atmospheric concentration of CO₂ is a public good and in order to maintain GHG levels at the required level advised by the scientific community, those who convert forest land should be compensated for protecting forests. Therefore, it is important to develop a market mechanism to pay forest stewards to 'motivate' them to conserve forest areas.
3. It is assumed that REDD activities will be more efficiently carried out through market mechanisms compared to government regulations.

Based on these assumptions, it is believed that reducing deforestation could be a low-cost method to reducing emissions. If governments are willing to spend US\$1 billion annually, this could prevent the emission of roughly half a billion tonnes of CO₂ per year for the next 25 years. This would prevent the loss of a tenth of the tropical forests around the world and would be a cheaper option in terms of reducing GHGs compared to what developed countries would pay to reduce emission through regulation of industry, transportation and energy sources (ENS 2008). And, in relation to curbing deforestation, it is also believed that forest degradation can also be reduced as reversing deforestation will help rebuild the carbon storage capacity needed to minimize degradation.

Countries believe in these economic assumptions and have proposed the idea of 'compensation reduction' where developing countries can earn carbon credits for reducing national deforestation rates below a baseline level. Emission reduction would be verified ex post through remote sensing and ground-truthing, and no credits would be generated if deforestation rates were not reduced below the baseline (Myers 2007). This could be a cost effective way of reducing emissions. For instance, if US\$10 is paid per tonne of carbon dioxide, annual revenues could amount to US\$12 billion, which is almost equivalent to 15% of official development assistance developing countries received in 2005 (Davis 2008). Compensation reduction introduces the possibility of rewarding a government at the national level where the entire national forest system is used as the unit of account. It also offers the possibility of rewarding REDD projects, at the local and micro level. This will also reduce costs since national level GHG inventories do not have to be conducted (IGES 2008). The important question is to what extent are people willing to invest in REDD activities to mitigate climate change and protect the climate regulation services that forests offer?

Carbon forestry is appealing because it requires limited physical infrastructure to gain access to markets and few intensive inputs and specialized skills (Peskett et al. 2006b). It also has the potential to provide a source of revenue that can fund development activities, especially in low income countries. However, in most cases, REDD activities have not developed since it is riddled with complexities and controversies. REDD activities call for setting aside land to regenerate forests that have been converted to other land use through logging, infrastructure development, and most importantly for agricultural land in the GMS. Although policies can promote REDD activities it will be challenging to find support among people, especially in low income countries where people rely on an agrarian economy to meet subsistence needs and as a source of income. Many people in the GMS are not involved in agribusiness but small-scale agriculture. Several barriers exist in order to be able to convince small-scale agriculturalists that forests should be protected and to become involved in the market trade. Agriculture is not only a critical source of income but it provides food security and insurance in times of crisis since it is a main source of financial capital. The level of engagement in

REDD and carbon markets will also depend on the degree food security is still maintained if land is not converted for agriculture; the time and amount of labour required (i.e. to switch from pastoralism to agroforestry); and size and timing of investment and returns. Current prices of agricultural products also exceed that of carbon, which does not create an incentive for people to protect forests (UNDP 2007). Furthermore, considering that many small-scale agriculturalists are poor, it will also be difficult for them to integrate into formal markets due to the lack of assets and endowments (Lipper and Cavatassi 2003). Therefore, carbon forest initiatives taken in places such as India are isolated cases since the opportunity cost of protecting forests for REDD are high. Furthermore, demands from richer segments of society for products such as beef, palm oil, soy beans, and chocolate will also lead to converting forests for agricultural products.

Regardless of these barriers, countries such as Cambodia are investigating how much financial return could be gained from REDD activities (see Box 20).

Box 20. Potential Revenue through Carbon Sequestration in Cambodia

A country such as Cambodia has the potential to conserve its large forest area and in turn earn revenue for protecting carbon sequestration services. Calculations have been made whereby Cambodia could earn between US\$85-875 million depending on the extent to which it can protect forests. It has been estimated that Cambodian deforestation releases on the order of 91-200 tonnes of carbon for each hectare of cleared or converted land for agriculture. Therefore, Cambodia's annual deforestation rate of 218,800 hectares may produce 20-44 million tonnes (megatons) of carbon emissions per year. Assuming a market rate of US\$4 per tonne of carbon dioxide (based on the trading price of CCX Carbon Financial Instrument contracts on the Chicago Climate Exchange), Cambodia could earn up to US\$175 million per year. This is a significant increase in national revenue for a country that earns US\$4.7 billion. Protecting forests could potentially increase GDP by 1.7% to 18.5%.

Source: Mongabay 2006a.

However, because the carbon market is not well-developed, the money earned from trading carbon through carbon forests may not be tangible to farmers. Since this financial reward is not directly or immediately tangible, farmers opt to convert forests for agribusiness to boost economic growth, and therefore, the transaction costs of implementing REDD to protect forests could be higher than continuing to be involved in producing agricultural products. Moreover, the amount received for a hectare of carbon forest is also unpredictable as it depends on the status of the US as major buyer, and when and how the Russian Federation will enter the market as a supplier. These two countries have the potential to decrease demand as in the case of the US and drive down market prices when the Russian Federation enters the market (Lipper and Cavatassi 2003). Therefore, in countries that are agrarian with high level of population and where land competition exists, such as Lao PDR and Cambodia, it is unlikely that forests will be protected as they will most likely be converted to agricultural land. Demands from richer segments of society for products such as beef, palm oil, soy beans, and chocolate will also lead to converting forests for agricultural products. Furthermore, current prices of agricultural products will exceed that of carbon, which does not create an incentive for people to protect forests (UNDP 2007). Therefore, there is no market incentive to demarcate land for carbon forestry, especially when the marginal cost of reducing carbon emissions will rise over time.

The relationship between those who want to buy forests to protect carbon sequestration services and those who want to sell forest land to participate in REDD activities can be problematic, leading to a deadlock. To begin with there are transaction costs with regard to completing a contract, which includes the costs for buyers and sellers to find each other, the costs associate with bargaining, and costs associated with monitoring and enforcing (Lipper

and Cavatassi 2003). If market structures do not exist to address these transaction costs, it may be difficult for buyers and sellers to establish carbon markets. Even if relationships between buyer and sellers were easy and a price at which to trade CO₂ were established, REDD activities may not actually decrease emissions among buyers in developed countries. Instead, REDD activities can be a form of transferring wealth to the developing world by protecting forests but not reducing actual emissions (Tollefson 2008).

There are also many risks associated with producers of carbon forests. In many cases, with the help of carbon funds, voluntary schemes pay producers up front to help cover start-up costs. Although this especially helps small producers with limited financial capital, this could lead to paying for emission reductions that have not yet occurred. Maintaining standards could help minimize this uncertainty but maintaining standards is also costly. Certifying carbon forests could increase overall project costs by between US\$4,000 to US\$8,000. Furthermore standards are also highly variable, which reduces comparability of credits generated leading to barriers in investment (Peskett et al. 2006,b).

Although REDD activities through voluntary markets are more popular than CDM projects because they are simpler and there is scope for flexible mechanisms for monitoring and verification, carbon forestry is still yet to take off due to the various market barriers discussed in this sub-section.

Policy barriers

In addition to the challenges of developing carbon markets to foster REDD activities, there are several policy barriers that also limit REDD potential, which will be discussed in this section.

Thus far, the Kyoto Protocol measures climate change with how much carbon has been added or removed from the atmosphere and does not address who has the right of ownership over carbon forests (Rosenbaum 2001). This is especially a tricky issue since ownership can be in various forms. A landowner can own forests but if carbon forests are considered public goods, then it is difficult to identify the owner. It also creates the problem of scale and targets. For instance, who should own carbon credits – an individual or a national government? To what extent should sequestration projects be administered through a command and control mechanism by the government or should communities and individuals decide on carbon trading targets? These questions remain largely unresolved and create constraints in formulating policies that promote forest protection for REDD. Answering these questions and determining ownership will depend on several factors such as existing formal and informal laws and legal traditions, and the extent to which they are well defined. There could be a tendency for customary or informal institutions to disappear if carbon forests are managed formally, which may not necessarily lead to better management.

Poor communities that manage forests may also be unaware of the policies and market mechanisms involved in carbon forestry and may become trapped into unfavorable contracts, legal obligations, and penalties (Luttrell et al. 2007). Furthermore, right to access forest resources does not mean ownership of the forest. In such cases, community members are only given rights over non-commercial resources where the state owns commercial resources. The ownership status of the state could prevent individuals, communities, and private companies from taking advantage of carbon markets. This may lead to questions of equity since community members are not being compensated for the overall management of forest areas and will miss the opportunity to financially benefit from carbon forests. If policies that promote REDD do not address rights over carbon credits, powerless groups will not benefit from REDD.

Furthermore, issues of sovereignty during negotiations between buying and selling countries also raises questions of property rights over carbon credits (see Box 21). These questions remain largely unresolved.

Box 21. Challenges of Developing Partnerships in Thailand

In an effort to promote REDD, a US company wanted to create plantations in Thailand to offset its carbon emissions. In exchange, the company would transfer US\$12.6 million comprising repayment of Thailand's debt into a 'Tropical Forest Conservation Fund' over a period of 28 years. However, this proposal was not successful due to pressure from civil society groups in Thailand because of several questionable issues such as who would own the rights to carbon credits and the type of access rights Thais would have to the plantations. This proposal could give US companies and researchers access to Thailand's biodiversity, in addition to carbon credits. Many felt that such a proposal impinged on Thai sovereignty whereby a foreign company would determine what can be done with the plantation on Thai soil, and thereby, ignore Thai law and regulations. Furthermore, many see such foreign potential partnership between industrialized countries, such as the US, and Thailand as a way for industrialized countries to avoid lowering emissions on their own soil and continue buying credits to pollute. Unless issues of rights over carbon credits and sovereignty are discussed at the international level, conflicts will continue to arise between buyers from industrialized countries and sellers from developing countries.

Source: World Rainforest Movement 2002.

In addition to ambiguous rights over carbon credits, weak institutions and governance mechanisms have not been able to effectively protect forested areas in the first place. Corruption, especially through illegal logging, especially in places such as Lao PDR and Cambodia, has led to lack of transparency and inequitable use of forest resources that do not encourage conservation of forested areas. Considering these policy ambiguities and poor governance, it is questionable if countries with high forest corruption rates will be able to protect carbon forests and equitably define property rights over them.

REDD offers several promises and potentials to compensate those who forgo converting forests to other land use systems. Through the use of market mechanisms, REDD offers to add value to carbon in order to create incentives to protect forests, which are considered a public good. Although limited physical infrastructure is required to establish carbon forests, most countries in the GMS have been unable to take the opportunities REDD provides and actually establish carbon forests because of several barriers.

Technical challenges and risks

In addition to market and policy barriers, there are several technical issues that limit REDD potentials. Among the most important technical issue is the level of accuracy in estimating carbon losses and gains from vegetation. Exact losses and gains are difficult to measure since they depend on the rates of deforestation and/or degradation, the carbon storage capacity of the forest in question, and the type of land use after forest degradation (Davis 2008). Since collecting such data is difficult to begin with, due to the lack of resources and expertise, especially in developing countries, it makes determining baseline levels for emissions, measurements and calculations difficult.

Since information on forest data and trends is imperfect, it is also difficult to quantify to what extent a forest area can be committed for REDD activities. The lack of clarity as to how much forests can be committed can lead to any rainforest to be a potential candidate for classification as a REDD site. This may lead to additionality where there would be a redundancy of carbon payments, especially if forests exist and carbon is being offset without

carbon payments. This is problematic if REDD activities are to be included in CDM in the future because without clear quantified limits of a carbon forest area, the sheer volume of CO₂ credits would swamp carbon markets leading to a collapse in market prices (UNDP 2007).

Another technical issue is leakage. This means that if a certain forested area is prevented from conversion to agricultural land or logging, another forested area could be used for logging and agriculture. In such a case, there would not be a significant decrease in CO₂ sequestration because conversion would take place elsewhere outside of designated carbon forests. Leakage is likely to take place if REDD activities are localized and do not take into consideration other forested areas (Chomitz 2007). Therefore, the question remains whether REDD initiatives should take place on a national level in order for forests to be treated collectively.

There is also the question of permanence of reduction. It is difficult to assess how long a forest can act as a sink, especially when exogenous factors such as forest fires, pests, and diseases can drastically alter forested areas. This lack of permanence also makes it difficult to calculate the price of forest and makes relationships between buyers and sellers problematic since the question of how much buyers should pay and how much sellers should receive remains in question. It may also take years for carbon to be sequestered and for forest stewards to receive financial rewards for forest protection, which may make it difficult for farmers to forego alternative use of their land. This will especially be the case among poor, small agriculturalists who must prioritize meeting immediate subsistence needs (Lipper and Cavatassi 2003).

When considering projects related to REDD, the lack of institutions and expertise to monitor forest areas under consideration can lead to technical loopholes. Although satellites could help to monitor, this may not be a cost effective measure for many developing countries. Monitoring degradation is more problematic compared to deforestation since changes may not be easily observable by imaging techniques. If REDD agreements are not carefully monitored, it is possible that countries may claim that forest areas would have been converted to agricultural use when in fact they were not in danger of being converted. The lack of monitoring systems could also slow down the process of developing GHG accounting systems and connecting payment systems to international markets (Peskett et al. 2006a).

The policy and technical barriers discussed in this section in relation to REDD are listed in Table 10.

Table 10. Strengths and weaknesses of REDD

Strengths/opportunities	Weaknesses/threats
Adding economic value to carbon can provide incentives to protect forests.	High transaction costs of establishing carbon forests could outweigh investments in clean and efficient energy technologies.
Markets can be more efficient than government regulations on emissions.	High demand for agricultural land (through forest conversion) could limit the amount of land allocated for carbon forestry.
REDD activities can be a source of revenue.	Income earned from carbon trading may not be directly or immediately tangible or as high as income from agriculture. Carbon prices are still unpredictable and depend on the role of the US and the Russian Federation.
It is easy to establish carbon forests due to limited physical infrastructure to gain access to markets, low intensive inputs and minimal specialized skills required.	Carbon trading markets are insecure creating weak relationships between buyers and sellers.
	Foregoing the use of agricultural land could reduce income, food security, and insurance, especially for poor small-scale agriculturalists.
	There are no standards established for carbon markets.
	There is no clarity in ownership of revenue from carbon trading.
	Market formalization could be economically and socially costly.
	There are several technical barriers: no accurate measurement of carbon gains and losses; additionality; leakage; permanence of reduction; and poor monitoring.

Discussion

Climate change is one of the most pressing contemporary environmental issues. There have been many innovative suggestions on how to tackle climate change by protecting forest areas since forests can act as contributors to climate change and the solution. As demonstrated in this section there are currently two LULUCF methods to maintain climate regulation, a critical forest ecosystem service. These are carbon sequestration and REDD. Considering the strict rules and regulations that CDM sequestration projects through A/R abide by, attention has been focused upon REDD even though it has not been mainstreamed into the Kyoto Protocol. Considering that the Bali Climate Change Conference (COP13) that took place in early 2008 highlighted the role of forests in mitigating climate change and the fact that deforestation is an issue that cannot be ignored, REDD is likely to be a major issue of discussion in the next round of climate negotiations. REDD provides the opportunity for developing countries to participate in carbon markets that can provide the funds to support REDD activities.

In the past international carbon schemes have focused on afforestation activities because they are simple to implement compared to REDD. Out of all the countries in the GMS, it is most likely that China is in the position to implement REDD activities. China already has considerable experience paying for ecosystem services as demonstrated by its initiatives to protect watersheds. Therefore, China has the capacity to begin to create formal markets and legal structures that would support carbon trading. China's economy is also shifting away from a purely agrarian based economy and to a more manufacturing based economy, that may leave forest lands untouched and to be used for REDD. However, most people in China still live in rural areas, and therefore, the speed at which the shift from an agrarian to a

manufacturing-based economy will be slow, especially due to a large population dependent on agriculture. Therefore, it is likely that adopting REDD activities in China will not be quick even though afforestation schemes through the CDM are underway. Thailand and Viet Nam are in a similar position as China where their economies are slowly shifting from an agrarian to a manufacturing economy. However, considering that Viet Nam and Thailand are increasingly involved in agribusiness their adoption of REDD activities will also be slow.

Unlike China and Thailand, a country such as Myanmar will mostly likely not initiate REDD activities in the near future because it is heavily dependent on logging and agriculture as the main source of revenue. In Myanmar, illegal logging and poor governance is the largest setback to protecting forests. Furthermore, as China sources its timber from Myanmar, China indirectly also contributes to creating disincentives that prevent REDD activities from potentially taking root in Myanmar. Myanmar's authoritarian government may also not distribute the financial benefits that REDD can provide.

Cambodia and Lao PDR are also still heavily dependent on agriculture, and therefore, it is likely that forests will continue to be converted to meet subsistence needs. Although revenue from carbon trading has already been calculated in places such as Cambodia, it is unlikely that REDD activities will be established soon when there is little incentive to protect forests. Considering that agricultural products provide higher, tangible incomes compared to carbon trading, small-scale farmers will choose to convert forest land in these agrarian economies as it provides them with income, food security, and insurance unlike new carbon economies. Market structures in such low income countries are also not fully formalized, which is essential in order to take advantage of REDD activities. Therefore, the costs associated with making low income countries REDD-ready are high and currently not feasible. Furthermore, as high income countries such as China source palm oil, rubber, wood pulp, sugar, rice, coffee, and tropical fruits from Cambodia and Lao PDR, demand from China will also indirectly prevent REDD activities from starting since such trade encourages conversion of forests into agricultural land. China, Thailand, and Viet Nam also source timber from Lao PDR and Cambodia, also creating disincentives to implement REDD activities as it brings significant revenue to such low income countries.

The issue of property rights and equity in relation to REDD activities is an ambiguous area from low to high income countries. Even though it may be feasible for a country such as China to initiate REDD activities, issues such as rights over carbon and distribution of benefits still need to be addressed, especially since China is still a centrally controlled economy. The extent to which local level users should also benefit from REDD is an unresolved issue and is worsened when property rights are not well defined. This situation can prevent marginalized groups from participating in REDD activities if they have no rights over forest areas, contributing to existing inequity in governing forests. Therefore, the lack of clarity over property rights may make marginalized forest users unwilling and unable to participate in REDD activities.

Regardless of the level of economic development among countries in the GMS, all countries need to address the various technical barriers and risks involved in conducting REDD activities. These include leakage, additionality, reduction of permanence and monitoring. Policies in the GMS have yet to reflect how these barriers are to be tackled; this suggests that inequity and distribution of benefits from REDD may not reach poor and powerless segments of society.

5. ECOTOURISM

Ecotourism provides a cultural service that not only satisfies socio-cultural purposes but can also help protect landscapes. It is an activity that is growing in popularity across the GMS. This section will first provide an overview of the state of the tourism industry in the GMS and then examine the extent to which ecotourism in particular is a viable market mechanism to protect forest based ecosystem services in the sub-region. Special attention will be given to community based ecotourism activities as a means to protect landscapes. It is important to note that this section differs from section 2 on biodiversity protection. Although there are overlaps since ecotourism involves protecting biodiversity found in forests within protected areas, this section on ecotourism examines forest ecosystems at a landscape level. The landscape may not have high levels of biodiversity, but yet there could be a demand to protect the landscape through protected areas because of the value associated with the scenic beauty the landscape provides.

Tourism in the GMS

The tourism industry is one of the largest in the world. It accounts for US\$3.6 trillion at a global level, providing jobs to 8% of people worldwide (Davis 2007). Another estimate states that the travel and tourism industry is responsible for over 230 million jobs and over 10% of the gross domestic product worldwide (IES 2006). Table 11 shows that in 2006, the tourism boom in the GMS had created a market in the sub-region worth at least US\$16.5 billion.

Table 11. Tourism in the Lower Mekong*

Major destinations	International tourist arrivals					International tourism receipts		
	(1000)		Change (%)		Share (%)	(US\$ million)		Share (%)
	2005	2006	05/04	06/07	2006	2005	2006	2006
Cambodia	1422	1700	34.7	19.6	1	840	963	0.6
Lao PDR	672	1210**	65.1			147	173**	
Thailand	11567	13882	-1.4	20	8.3	9591	12423	8.1
Viet Nam	3468	3583	18.4	3.3	2.1	1880	3200	2.1

Source: UNWTO 2007.

*It has been estimated that in the Upper Mekong areas of Yunnan Province, 200,000 foreign tourists arrived in 2003 that led to revenue of US\$100 million (Government of China 2006). In Myanmar, it has been estimated that 289,383 tourists arrived in 2005 (Government of Myanmar 2005). The revenue earned in Myanmar could not be found.

**These data are from Manivong and Sipaaseuth (2007) since they were not provided by UNWTO 2007.

Based on Table 11, Thailand is the most frequently visited country in the GMS. This is primarily because Thailand has been able to offer social, economic and political stability to attract tourists and has the financial means to develop tourist infrastructure. It is only recently that tourism has been booming in other GMS countries. Due to the Cold War and rule by socialist and communist parties in China, Lao PDR, Viet Nam and Cambodia, which imposed strict control over people and movement of foreigners, tourism did not significantly contribute to national development until recently. China recently introduced market-oriented reform, which has created a favorable environment for tourism. It has been predicted that by 2020, China will be the top tourist destination and it will be the fourth largest source of tourists in the world (UNESCAP 2001). This could mean that tourism in Yunnan Province could potentially be greater than that of Thailand. Although decentralization is helping countries such as Viet Nam, Lao PDR, and Cambodia to foster tourism, the impact of tourism on the economy is much lower compared to Thailand and China since it is a relatively new industry

(Khanal and Babar 2007). Myanmar, which faces international isolation, has the least developed tourist industry.

The number of tourists is also increasing because of the tourism policies that are being implemented in the GMS. With the support of ADB, GMS countries have identified tourism as one of the 11 flagship programs in the ten-year strategic framework of the GMS Economic Cooperation Programme. This Programme aims to use tourism to reduce poverty and contribute to the conservation of cultural and natural resources (Khanal and Babar 2007). The GMS Tourism Sector Strategy Study 2006-2015 by ADB aims to not only promote GMS as a single tourist destination, but to contribute to the Millennium Development Goals of alleviating poverty, improving gender equality and empowering women, and promoting sustainable development in the sub-region by 2015. The contribution of tourism to economic development is already noticeable as reflected in Table 12.

Table 12. Tourism as a percentage of GDP and total employment 2006

	Myanmar	Thailand	Cambodia	Viet Nam	China	Lao PDR
Tourism economy GDP (% of total GDP)	4.3	14.3	19.6	10.9	13.7	9.3
Tourism economy jobs (% of total employment)	4	10.7	15.4	8.7	10.2	7.3

Source: Khanal and Babar 2007.

Countries in the GMS have begun to cooperate in many ways to promote tourism and market the GMS as a single tourist destination. There have been two regional cooperation frameworks to boost inter-regional tourism. One framework is the 'Great Wonders of Suwannaphumi', which the ministries of Foreign Affairs of Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam are committed to. The other framework is the 'Mekong-Ganga Cooperation' which Foreign Affairs and Ministers of Tourism of India and Mekong countries (excluding China) are committed to. It is anticipated that these frameworks will promote products that combine tourist attractions and marketing of promotional links between countries. Membership of the Association for South East Asian Nations (ASEAN) is also facilitating tourism in the GMS as a single destination. Furthermore, cooperation also exists between countries. For instance, the Tourism Authority of Thailand has helped similar authorities in Lao PDR and Cambodia to study, plan, market, and build capacity within the tourism industry (Leksakundilok 2004).

Ecotourism as a market mechanism

Ecotourism is defined by the International Ecotourism Society (IES) as 'responsible travel to natural areas that conserves the environment and improves the well-being of local people' (Davis 2007). Ecotourism is a sub-sector of tourism, which is bound to outpace conventional tourism. In 2004, ecotourism tourism grew 3 times faster than the tourism industry as a whole. It is a sector already growing at 20% per year globally (IES 2006).

Even though there is no globally agreed upon criteria on how to define whether a tourist activity is indeed 'ecotourism' and its impact, there are two key components in 'ecotourism'. These are: poverty alleviation through participation in ecotourism planning and management; and environmental sustainability. Engaging in ecotourism can provide employment, which has the potential to indirectly improve people's wellbeing in terms of access to jobs, education, and health services that can help alleviate poverty. Establishment of ecotourism enterprises can also lead to improved infrastructure development (i.e. roads, communications,

electricity, water, waste water treatment and disposal, and medical services), especially in remote, rural areas (UNESCAP 2007). These direct and indirect benefits can help alleviate poverty and empower especially poor, rural communities who are primarily engaged in ecotourism through capacity building. With regard to protecting the landscape and environmental sustainability, the demand by tourists to explore pristine landscapes can create the pressure to protect the environment in order to cater to market demands. Because tourists are willing to pay for such ecosystem service, ecotourism has the potential to create incentives among local people to protect landscapes. Ecotourism is, therefore, a market mechanism that sells ecological and cultural tourism to tourists while protecting these resources at the same time.

In order to alleviate poverty and allow local resource managers to protect the environment, ecotourism as a market mechanism is being encouraged at the local, non-state level. Community-based ecotourism (CBET) schemes are being encouraged by donor communities as a means to allow local resource managers to participate and manage ecotourism ventures so that they are not only empowered, but can directly financially benefit from ecotourism activities. Ecotourism policies in countries, such as Lao PDR, strongly support CBET. Lao PDR's CBET policies have merged ecotourism with trade and tourism export strategies, which have resulted in strong ecotourism ventures (see Box 22).

Box 22. Lao PDR's Ecotourism Strategies

In Lao PDR, there are three key documents that mainstream ecotourism. These are the *National Tourism Development Strategy 2006-2020*, *National Ecotourism Strategy and Action Plan 2005-2008*, and *National Export Strategy for Lao PDR 2006-2008: Sectoral Strategy – Ecotourism*. The Ministry of Industry and Commerce has also recognized the importance of (eco)tourism and has highlighted it as a priority sector in the *National Export Strategy for Lao PDR 2006-2008*. These policy documents emphasize sustainable growth and poverty alleviation through marketing landscapes as a means to protect them along with cultural heritage. In particular, The *National Ecotourism Strategy and Action Plan 2005-2008* pinpoints four objectives for developing tourism in Lao PDR. These are:

1. To strengthen governance, planning and research;
2. To improve service quality, education and training;
3. To diversify products based on Lao PDR's unique natural attractions; and
4. To take into account equity considerations, including ways to spread the benefits to remote and minority communities.

The strength in Lao PDR's ecotourism policies lies in the fact that they have been mainstreamed and integrated into trade-related policies. They also emphasize capacity building and equity in governance for marginalized groups. These policies have been successful in many instances. Tourism in Lao PDR is now the top earner of foreign exchange and ecotourism in particular has become an important economic activity since 2002. This export income placed tourism earnings higher than the revenue from garments, electricity, wood products, coffee, agricultural products, and handicrafts. This is due to successful implementation of economic liberalization and integration policies, and the tourism development policies mentioned above. The government now projects 2 million visitors by 2010 and revenue of US\$290 million. More than half of the revenue earned from tourism will be from ecotourism activities.

Source: Khanal and Babar 2007; Manivong and Sipaaseuth 2007.

Although all countries in the GMS have addressed ecotourism, Thailand is the leader in ecotourism and CBET in the GMS (Box 23). With the increase in environmental awareness, the need for human development based on grassroots participation, and the demand of the tourism market for educational experiences related to the environment, Thailand has embarked on CBET ecotourism programmes since the mid-1990s (Leksakundilok 2004).

Additionally, since Thailand no longer relies on forests or agriculture to meet subsistence needs and boost national GDP, more forest land is potentially made available for ecotourism.

Box 23. Ecotourism in Thailand

Thailand offers a wide variety of tourism. In the last few years, the Tourism Authority of Thailand (TAT) has been shifting its focus to CBET. Between 2002 and 2006, TAT had budgeted 66 million Baht for ecotourism projects. TAT is now catering more towards tourists who seek environmental education and awareness. The goals of Thailand's Ecotourism Action Plan (2002-2007) have been to create a sustainable tourism industry by: ensuring that endemic natural resources and unique cultural resources, and their surrounding ecological system have an appropriate management system that emphasizes conservation, rehabilitation and ecosystem maintenance through assessing carrying capacity and instituting a proper zoning scheme; promoting people's awareness of how tourism can contribute to ecological sustainability; establishing a management system that facilitates cooperation among all related sectors through participatory management in tourism development; establishing tourism facilities and services that help protect the environment and are thus compatible with tourism resources; and attracting quality foreign eco-tourists to visit Thailand. TAT also aims to attract Thai tourists, particularly Thai youth to ecotourism activities to increase environmental awareness for the new generation.

Source: Thailand Ecotourism Information Centre 2001.

Although Lao PDR is not a high income country like Thailand, it has made great strides in using CBET as a means to protect the environment and alleviate poverty. CBET initiatives in Lao PDR have been in existence since 1999, primarily within National Biodiversity Conservation Areas and adjacent communities (see Box 24). Lao PDR has been able to promote CBET to a great extent because of strong, supportive government policies.

Box 24. Pro-Poor CBET in Lao PDR

Lao PDR has the largest forest cover among GMS countries and 20% of the land is comprised of protected areas. Lao PDR's first CBET project was the Nam Ha Ecotourism Project situated in the Nam Ha National Biodiversity Conservation Area in Luan Nam Tha. The aim of the project was to boost cultural- and ecotourism by minimizing the impact of tourism on the landscape. Nam Ha treks, for instance, use only existing forest trails and require that tourists consume only local food and products. Each tour generates less than one kilogram of non-biodegradable waste by using reusable water containers and solar electricity for overnight tours. Regulations are also in place limiting group size and departure frequency. All tourists who enter Nam Ha on treks or rafting tours are charged US\$1 per day as a user fee. A permit is also required for the overnight buffer zone treks. Since the permit system was introduced in October 2000, over US\$10,000 in fees have been collected. The revenue has been reinvested into conservation measures by raising environmental awareness and reducing poverty by producing local tourism products. In order to promote CBET, the project involved creating provincial and district tourism plans, monitoring and data collection, identification of potential villages, and gender and ethnic minority outreach. This project was a success because the project team worked closely with local communities and in a participatory manner to build capacity by providing them with operational training and technical assistance to develop CBET programs, such as ecotreks and river trips. Because wealthier families are better able to take advantage of such opportunities due to their good health and communication skills, the Project is specifically helping poorer groups to improve their capacity to take advantage of ecotourism. The private sector was also involved in fostering the ecotourism market. The CBET opportunity has significantly improved income levels for the Akha ethnic community in particular. They are earning 40% of the total income earned by the village from ecotourism, doubling their income levels. For its exemplary contribution to poverty alleviation, the Nam Ha Project Team was awarded the 2001 United Nations Development Award. The project was also recognized as Highly Commended in the 2002 British Airways Tourism for Tomorrow Awards in the National Parks and Protected Areas category.

Source: ICEM 2003b; Khanal and Babar 2007; Manivong and Sipaaseuth 2007; UNESCO 2004.

In countries other than Thailand and Lao PDR, CBET has not been mainstreamed (Leksakundilok 2004). Even though the Chinese Government in Yunnan Province is also committed to ecotourism as evidenced by the establishment of 5 ecotourism zones and 8 eco-cultural tourism routes, it is unclear the extent to which these ecotourism plans actually promote CBET. In Cambodia, ecotourism and CBET is under the responsibility of the Ministry of Environment. However, financial shortfalls in the Ministry, poor infrastructure and service developments, and lack of legal framework and institutional capacity building have slowed down the progress towards building ecotourism. In Viet Nam, even though the Tourism Master Plan includes specific guidelines for ecotourism, strategies for ensuring tourism benefits for local communities are not clear. Due to Myanmar's centralized planning, closed economy, and political instability, tourism has been deterred from making an impact on the lives and livelihoods of people (Khanal and Babar 2007).

In order to encourage CBET at a regional level, ADB is trying to promote it as an important means to alleviate poverty, as evident in its *Greater Mekong Sub-regional Tourism Sector Strategy 2005* (see Box 25).

Box 25. ADB and CBET

One of the main thrusts of ADB's *Greater Mekong Sub-regional Tourism Sector Strategy 2005* is to reduce poverty in the GMS through promoting CBET. ADB calls for broadening the impact of pro-poor tourism from the small scale, single village to the broader economy that includes towns and small cities. Part of its pro-poor tourism or CBET programme involves conducting pilot projects in all GMS countries where the main tasks will be to enhance access to tourism resources and potential markets; integrate national and provincial policies in planning, marketing, product development, and infrastructure directed at poverty reduction in designated areas; support the establishment of micro and small enterprises; increase human capacities and the role of women and ethnic communities; create "supplier support partnerships" between micro and small businesses and medium-to large-scale tourism service providers; and develop targets and indicators to measure impacts and assess and circulate lessons learned. The overall target is to alleviate poverty for 158,000 people by 2010, and up to 1.2 million people by 2015.

Source: ADB 2005.

Evaluating the impact of ecotourism on environmental protection and poverty alleviation

CBET is gaining popularity as a potentially effective tool to protect landscapes and alleviate poverty. However, to what extent are countries in the GMS willing and able to engage in ecotourism and CBET effectively? In the previous section, it has been suggested that Thailand and Lao PDR are the most willing and able countries to benefit from ecotourism in general and CBET in particular because of strong state policies and increasing awareness about environmental issues. This section will discuss the various reasons why it may be difficult to fully adopt and benefit from CBET, which could lead to some countries to be unwilling to invest in ecotourism.

One of the biggest setbacks against ecotourism and CBET is the lack of financial resources to monitor, evaluate, and minimize visitor impacts, which are all important to ensure that environmental sustainability is being achieved and landscapes are protected. In combination with the lack of finances, the lack of capacity among park managers to be economically, socially, and environmentally responsible when carrying out ecotourism activities has also made it difficult for especially low income countries who do not have the finances to invest in ecotourism capacity building. This is taking place in countries, such as Cambodia where tourism in general is a relatively new industry. Even though efforts are in place to boost

ecotourism in Cambodia, the lack of funding is among the critical issues why ecotourism is still in a fledgling state (see Box 26).

Box 26. Challenges of Ecotourism in Cambodia

Cambodia is one of the fastest growing destinations in the GMS. Cambodia has established the Cambodia Community-Based Ecotourism Network, a network comprised of organizations, travel agencies, educational institutions, and communities to promote CBET. The United Nations World Tourism Organization is also helping Cambodia formulate a long term plan for CBET. The government of Cambodia has established national parks specifically for ecotourism where conservation is combined with promoting Cambodian cultures. Because of the growth in the ecotourism sub-sector, Cambodia has the potential to develop such activities that can also help alleviate poverty and provide income to the rural poor. However, there are several setbacks that prevent Cambodia benefiting from CBET. One critical issue is the lack of funding, which has prevented development of recreational infrastructure and local capacity development. Another issue is the lack of legal framework and institutional capacity to protect parks against illegal logging and land encroachment, two of the major threats to landscape protection.

Source: Khanal and Babar 2007; Chamroeun 2000; People's Daily Online 2001.

Countries such as Viet Nam and China show a mixed picture as to how successful ecotourism has been. In Viet Nam, although tourism is contributing to the local economy, pollution has worsened due to uncontrolled tourism. The increase in tourists has also led to social ills (see Box 27). The lack of strict enforcement of pollution and social policies has undermined Viet Nam's effort to use ecotourism as a tool to protect landscapes and cultures.

Box 27. Ecotourism in Viet Nam

Compared to the other GMS countries, tourism is relatively new in Viet Nam. The Can Gio Mangrove Biosphere Reserve, which covers 40,000 ha of mangrove forests, has been recognized by MAN/UNESCO since 2000 as a key area for biodiversity conservation. Most of the forests were destroyed during the Viet Nam War and great efforts have been made to reconstruct mangrove forests. Due to its wide range of biodiversity, Can Gio is becoming an important tourist destination for those who live in Ho Chi Minh City. Can Gio district, together with city's Department of Tourism, is planning to increase tourist sites in Can Gio in both quantity and area to make tourism the leading economic sector of the district. At the moment, many people are financially benefiting from the Reserve including tour operators and family businesses. The most visible improvement has been infrastructure. Bridges, roads, and electricity have considerably improved the quality of life of residents who provide ecotourism activities in Can Gio. At the same time, however, pollution is increasing and hygiene conditions are falling due to uncontrolled tourism. The 2010 tourism development strategy is under implementation, which aims to improve the negative impacts of tourism such as pollution, intrusion of unhealthy culture, and social problems such as drug addiction, gambling, and prostitution.

Source: Khanal and Babar 2007; Hong et al. 2002.

In Yunnan, China, ecotourism has led to women's empowerment and improved standards of living. However, the poor have not been able to sustainably benefit from ecotourism because they do not have the resources or capacity to capture the market (see Box 28). In the case of Yunnan, private companies are primarily benefiting from ecotourism.

Box 28. Ecotourism in Yunnan, China

Due to its diverse forest landscapes and cultural diversity (the second largest ethnic minority population in China), Yunnan is a growing tourist destination. It is the 6th largest tourist destination in China. It was recorded that in 2000, it attracted 1 million foreign tourists and 38 million domestic tourists. Although Yunnan is ecologically and culturally rich, it is one of the poorest parts of China. The impact of ecotourism has been both positive and negative in Yunnan. On the one hand, ecotourism has had very positive impacts on women. It has led to women's economic empowerment, exposure to the 'outside world', and the ability to organize into collectives to engage in the tourism trade. The income earned by women has not only been reinvested to build schools and improve drinking water infrastructure, but it has also contributed to reducing pollution. Income earned by both men and women has also been reinvested into increasing education and health care, thus improving the quality of life. Cultural diversity has also been recognized since tourists prefer to see diversity rather than assimilation into dominant Chinese cultures. On the other hand, because tourism has brought in income earning opportunities, there have been cases where children are used to earn income for their families instead of staying in school. Prostitution has also significantly increased. One important aspect of ecotourism is allowing local people to participate in the management of tourism. However, in Yunnan, national tourism operators control most of the local tourism industry, especially since they are able to provide the finance for tourist infrastructure, such as five-star hotels that can cater to wealthier tourists that mostly visit Yunnan. This suggests that although incomes are rising among local people, ecotourism has not significantly reduced their level of poverty since they are not profiting from ecotourism to a large extent. Because the capacity to effectively negotiate and cater for tourists has not been developed among the local population involved in ecotourism ventures, they are unable to fully benefit from CBET.

Source: Donaldson 2007; Nyaupane et al. 2006.

The case study from China demonstrates that the extent to which revenues from ecotourism are reinvested into conservation and socio-economic development of a community depends upon the level of inequitable market control by tour operators (Landell-Mills and Porras 2002). Landowners and managers are often not paid for their contributions, such as the poor communities in Yunnan, creating a disincentive for them to join ecotourism ventures and protect the landscape. In situations where tour operators and land stewards do work together, their rent-sharing is still skewed towards agencies. The ability of land stewards to benefit from ecotourism and protect the landscape also depends on if they have tenure security. If they are land insecure or if land rights are unclear, they may not be able to have a strong bargaining position with tour agencies. Local people's lack of skills to bargain with tour operators, such as the ability to negotiate or to perform tasks to cater to tourists, may not be adequate enough for them to benefit from ecotourism.

Even though poor communities may not be able to achieve the full benefits of ecotourism, for the most part, ecotourism can reduce vulnerability. Even though many may still remain poor because profits are primarily captured by national tour operators or the private sector, poor communities are better off than not having the opportunity to engage in ecotourism activities (Ashley et al. 2001). Ecotourism provides people with regular employment and the potential to move out of poverty. Because ecotourism has the potential to protect landscapes and alleviate poverty, the governments of countries in the GMS are keen on collaborating to develop ecotourism areas, despite the various challenges of developing ecotourism. For instance, the Mekong World Tourism River Corridor, Emerald Triangle Area Tourism Zone, Heritage Necklace Circuit, Andaman Coast Tourism Zone and the Southern Tourism Corridor are all sub-regional level ecotourism proposals that are currently being discussed by the governments of the GMS (Khanal and Babar 2007).

Based on the literature reviewed in this section, Table 13 sums up the various strengths and weaknesses related to ecotourism activities as a market approach for landscape conservation.

Table 13. Strengths and weaknesses of ecotourism

<p style="text-align: center;"><u>Strengths</u></p> <ul style="list-style-type: none"> • Potential to help alleviate poverty through employment opportunities • Social development through capacity building • Ability to protect landscapes • Foreign exchange earner • Infrastructure development • Increases environmental, economic, and social responsibility 	<p style="text-align: center;"><u>Weaknesses</u></p> <ul style="list-style-type: none"> • Foreign-owned businesses provide little scope for revenues to trickle down • Infrastructure development could displace poor rural communities • Lack of clear definition/criteria to measure impact of ecotourism activities • Political instability can deter ecotourism activities • Greater emphasis on economic growth can overlook environmental responsibility • Unclear property rights could deter some local communities from engaging in ecotourism activities • Lack of funding required to protect ecosystem services (i.e. biodiversity, watersheds, carbon sequestration) at a landscape level can deter ecotourism ventures • Ecotourism ventures are usually small scale, which may not be able to address protection at a landscape level
<p style="text-align: center;"><u>Opportunities</u></p> <ul style="list-style-type: none"> • Increasing demand for ecotourism in the region • Many landscapes exist with high market value • Private companies and NGOs can lead ecotourism ventures • Local initiatives to capture ecotourism markets 	<p style="text-align: center;"><u>Threats</u></p> <ul style="list-style-type: none"> • Revenues may be captured by private companies and NGOs that will not be shared with local communities • Local communities may not have the skills to capture local ecotourism markets • Many landscapes may be inaccessible • Weak governance and corruption could fail to protect landscapes • Land use change resulting in conversion of forests to agricultural land or logging limit the landscape available for ecotourism

Table 13 suggests that although there are many positive aspects of ecotourism, there are many more opportunities that could be further explored as the ecotourism market matures. However, in the process of becoming a well-developed market, there are numerous issues that need to be addressed, as listed under weaknesses and threats, in order to fully promote poverty alleviation and environmental sustainability that ecotourism intends to do.

Discussion

Ecotourism has not been mainstreamed to any great extent in the GMS. Encouraging those in the tourism industry to formally protect landscapes by creating mechanisms that foster economic, social, and environmental accountability is still a new concept in most countries in the sub-region. However, with the rise in demand for ecotourism as a means to alleviate poverty and protect the environment, the public, private, and NGO sectors will increasingly play a role in promoting ecotourism. Organizations such as ADB and ASEAN have been very active in promoting ecotourism as an environment and economic development strategy at the sub-regional level.

There have, however, been several challenges in the GMS with regard to using ecotourism to protect environmental services that will have to be addressed by GMS countries. One difficulty stems from the lack of global criteria that define good ecotourism practices. Although many have been able to increase their level of income through ecotourism, many poor people are also not able to adopt ecotourism because of their lack of bargaining power with powerful national and private tour operators. This situation makes it difficult for the poor to be willing and able to lower their level of poverty and be empowered through ecotourism.

Additionally emphasis on tourism as a means to improve national economic welfare has come at the cost of turning ecotourism ventures to mass tourism, which has led to increased pollution and various social ills.

Considering that ecotourism is a new concept in most of the GMS, it is only possible to speculate the extent to which ecotourism will be successful and mainstreamed. It is likely that ecotourism will be mainstreamed in high income countries such as Thailand and low income countries such as Lao PDR. The success in Thailand can be explained since economic activities are no longer based in forested areas or agriculture. Because Thailand's economy is shifting to a manufacturing one, people are easily able to protect forest landscapes for ecotourism. Furthermore, greater environmental awareness, funding and Thailand's logging ban allows more forests to be protected and used for ecotourism. However, if there is strong government support for ecotourism, even low income countries are able to benefit from ecotourism. This is especially the case if tourism in general and ecotourism in particular are financially more rewarding than other sectors, as in the case of Lao PDR. People in Lao PDR may be more willing and able to invest in ecotourism since it is the largest revenue earner. However, if prices of agricultural products increase and China continues to source agricultural products from Lao PDR, those in the ecotourism industry who wish to protect forest landscapes may find it difficult when there is growing pressure to convert forests to agricultural land. Considering that illegal logging is a major issue in Lao PDR, it is also questionable to what extent ecotourism will be sustainable, especially if governance over forests is not improved.

Countries, such as China and Viet Nam, however, demonstrate a mixed picture. Although ecotourism is growing in popularity, more emphasis seems to be placed on using tourism to earn revenue with little environmental accountability and how state control of tourism impacts poor communities. It can be suggested that China and Viet Nam are currently more focused on boosting national economic growth, and therefore, those involved in ecotourism are less willing to emphasize environmental accountability in ecotourism activities. Perhaps as China maintains its logging ban and becomes less reliant on agriculture, greater attention will be paid to the environmental aspects of ecotourism. As ecotourism is more mainstreamed in countries, such as China, the rural poor who provide cultural resources and are stewards of the landscape may start benefiting, especially if there is investment in social development. On the contrary, considering that Viet Nam is still heavily investing in agribusiness, it may be difficult to set aside forest land for ecotourism purposes when agriculture is still a significant revenue earner. However, similar to China, its logging ban could also help encourage ecotourism prospects.

Among the GMS countries, Cambodia and Myanmar show the lowest prospects for ecotourism. Financial shortfalls in Cambodia are one of the main reasons why ecotourism has not taken off. Perhaps donor investment in ecotourism in Cambodia will change Cambodia's situation in the near future. However, if conversion of forests to agricultural land continues in Cambodia, ecotourism may not take off in such a low income country where most people depend on agriculture for both subsistence needs and as a major source of income. Demand from China for agricultural products could also hamper ecotourism efforts. Additionally, illegal logging in Cambodia continues to be a major issue that can also deter the establishment of ecotourism ventures. In the case of Myanmar, however, the political climate does not promote CBET, especially since it is a centrally planned state. Its closed economy and confinement of travel do not make it a tourist-friendly destination.

6. SCENARIO 2020

Scenario planning is a useful tool in order to assess alternative future paths and determine how today's actions' can impact future outcomes. It provides a systematic way to identify trade-offs and strengthen decision making (Ranganathan et al. 2008). In order to begin to develop scenarios that suggest the extent to which countries in the GMS will be able to protect forest-based ecosystem services, it is important to reemphasize the critical drivers of deforestation in the sub-region that have been reviewed in this paper. These include:

- Land use change: conversion of forest land for agriculture; aquaculture; logging
- Market demand for agricultural products
- Population pressures
- Urbanization and infrastructure expansion
- Weak policies and poor governance

These socioeconomic drivers are listed in Annex 1. Data were gathered on GMS countries in association with these drivers and an assessment was made as to where countries stand with regard to protecting ecosystem services. It is important to note that scenarios presented in this paper are not based on any quantitative calculations through the data acquired. Instead, the scenarios are built upon normative judgement on certain trends that emerge from the data. Furthermore, the literature reviewed in this paper is used to build and support the scenarios that foretell the capacity of countries in GMS to address the four different ecosystem services covered in this paper.

Through this analysis, three scenarios have been developed that broadly forecast the level of willingness and ability to protect forest services by 2020 based on the socioeconomic condition of a country. It is important to keep in mind that these scenarios provide a very general picture and there is great room for error, especially since unexpected events could occur that may move a country from one scenario to another. Considering that the GMS region is diverse, it is possible to suggest various types of scenarios based on the different direct and indirect drivers of change. For instance, scenarios could start off with assumptions about demographic change, socio-political status, or environmental conservation. It is, however, beyond the scope of this paper to suggest numerous alternative scenarios based on these various drivers. Therefore, this paper focuses primarily on economic drivers and assumes that future pathways will most likely follow the environmental Kuznets curve theory where initially low income countries face loss of natural resources but as income levels increase and countries reach a high income level, people are better able to protect services (Bhattarai and Hammig 2001). In the context of the GMS, a high income country has a GDP per capita of between US\$8,700 and US\$6,600; middle income countries between US\$6,600 and US\$3,000; and low income between US\$3,000 and US\$1,000. This is the most obvious trend that emerges from the literature reviewed. Based on this assumption, regulations, politics, demographic change, and science and technology will be reflected on to suggest the extent to which people in the GMS will be willing and able to protect ecosystem services by 2020.

Scenarios

Scenario 1: Growth first

Very few opportunities exist for countries in Scenario 1 to create appropriate institutions and market structures to protect forest services. Scenario 1 is likely to occur among countries that are low income with largely agrarian based economies. In such a situation, poverty alleviation is the ultimate development goal in economic policies, which can be achieved through

deforestation to create agricultural spaces. Since most people live in rural areas, a large segment of the population is dependent on agriculture to meet subsistence needs and as a source of employment, so forest areas will not be conserved (see Box 29).

Box 29. Scenario 1 in Cambodia and Lao PDR

The extent to which forest ecosystem services will be protected in Cambodia and Lao PDR will be very similar since the socioeconomic conditions are alike. Cambodia and Lao PDR both have the largest forested area (59.2% and 69.9% of land respectively) in the GMS as well as the highest deforestation rates (-1.30% and -.50% per year respectively). This similarity is a result of both countries being heavily dependent on agriculture to meet subsistence needs and to boost national economic growth. Forest conversion to agricultural land is extensive since a large number of people in poverty depend on agriculture; 60.3% and 85% of the people in Cambodia and Lao PDR respectively are involved in agriculture. Simultaneously, Cambodia and Lao PDR are meeting the demands for agricultural products from China, which leads to further deforestation. Additionally, logging is also extensive as both Cambodia and Lao PDR (illegally) supply timber to China, Thailand, and Viet Nam. Because agriculture aligned with forest conversion and logging is the largest revenue earner for Cambodia and Lao PDR, it is unlikely that these two countries will curb deforestation to any significant extent by 2020. Furthermore, considering that Cambodia and Lao PDR have not yet ratified the CBD, this suggests that these two countries are primarily focused on using forest resources to meet subsistence needs and alleviate poverty, instead of focusing on activities for purely conservation purposes. This is also evident by the fact that there has been minimal effort to use PES as a means to protect ecosystem services. For instance, no evidence has been found whereby biodiversity, watersheds, and carbon sequestration have been protected through market mechanisms. It is unlikely that market mechanisms will be used in these countries to protect watersheds and foster carbon sequestration, especially when a large population is still highly dependent on forest resources and agriculture for subsistence purposes. Developing markets to protect these services for the time being is costly and financial benefits may not be tangible for awhile. The only market mechanism that has the greatest potential in Cambodia, and especially Lao PDR, is ecotourism. Ecotourism not only significantly contributes to the GDP in both countries, but it is an activity that the rural poor can easily become involved with. Protecting forests and alleviating poverty in places such as Lao PDR are already beginning to take place and there is great scope for ecotourism to be further developed in Lao PDR. Although Cambodia is experiencing financial difficulties and lacks a legal mechanism to protect against illegal logging, it will still have potential for ecotourism in the future.

Market structures remain mostly informal, and therefore, it will take a considerable amount of time to develop markets for PES, which introduces new market and legal complexities. Although there is growing interest in agribusiness to produce products such as coffee, palm oil, and rubber for the global market, which demonstrate the existence of formal markets, it is unlikely that many formal markets will be created for PES when profits from PES are intangible to a large population in poverty. Although market mechanisms have the potential to protect ecosystem services, they will be overlooked in countries where forest loss is significant primarily because institutions have not been developed to adopt formal market mechanisms and economic development is prioritized.

As a development strategy, economies in scenario 1 will also focus on growth of national GDP and will encourage activities such as logging, which will also lead to deforestation and competition as to how to use forest land. The conflict and competition will revolve around the issue of whether to convert forest land to agriculture to meet subsistence needs or convert to logging areas to fuel the national economy. The high demand for fuelwood and biomass for energy will also add to competition over divergent needs and use of forest resources and services. Although urbanization is increasing as well as all-season roads to connect people to urban areas, the pace at which urbanization is growing is relatively slow.

Countries in Scenario 3 also have weak institutions and governing structures, which have been worsened by political strife. Although efforts have been made to decentralize forest governance that gives communities power to manage forest services, these efforts are undermined through high levels of corruption (i.e. in the form of illegal logging) and political instability. Due to poverty and poor enforcement of forest laws, forest resources and services are controlled by the privileged, such as the military and elites (see Box 30). Disparities in terms of access and political power over forest areas will make it difficult to create equitable institutions that encourage formal governance and/or well-defined property rights required for protection of forest services.

Box 30. Scenario 1 Myanmar

Although Myanmar has the highest forest cover in the GMS (49% of land area), it has the second highest deforestation rate (1.20%) in the sub-region. It also has the least amount of protected areas (7.2% of land area). One of the main reasons why Myanmar is not keen to protect forest ecosystem services is because of the high revenues it receives by supplying logs to China. Due to weak governance and corruption, much of the trade is illegal. The government of Myanmar, due to its economic and political isolation, is also highly dependent on the log trade with China since it is a key source of state revenue. It is unlikely that forest ecosystems will be protected if Myanmar continues to be an authoritarian state where economic growth is valued over environmental management. Considering that Myanmar is a relatively closed economy with little democracy that fosters participatory governance, it is unlikely that the use of PES schemes to protect biodiversity, watersheds, and carbon sequestration services will be developed and people will be able to financially benefit from them. It is also unlikely that ecotourism will be used to protect services and alleviate poverty. This is reflected in the fact that tourism contributes least to Myanmar's GDP compared to other GMS countries. Ecotourism will be difficult to use especially since Myanmar faces international isolation that does not encourage tourists to visit Myanmar. Therefore, the political situation in Myanmar is the key reason why it is the only country in the GMS with few prospects for protecting forest services.

Scenario 2: Mosaics

Scenario 2 offers a wide range of situations dependent on the various socioeconomic conditions of a country. In most cases, countries in Scenario 2 are yet to fully have the appropriate socioeconomic conditions that would allow them to effectively protect forest ecosystem services. On the one hand, middle income countries are rapidly industrializing, which suggests that there is more wealth to allow people to invest in conservation activities. More and more economies are moving towards a manufacturing-based economy or one fueled by agri-business. Population growth is falling and urbanization is on the rise, which suggests that deforestation will not take place at a fast pace. On the other hand, even though the population growth rate is falling, there is still a large population that directly depends upon forest services and agriculture for both subsistence and commercial purposes. On the whole, deforestation is still taking place as countries try to develop economically and increase investment in agribusiness through forest land conversion (see Box 31). Dependency on fuelwood and biomass for energy is also significant, which contributes to deforestation. These contrasting and opposing conditions will create tension and conflict when deciding the extent to which forest services should be conserved since some people still heavily rely on forests and agriculture as others are beginning to move away from forest dependency.

Box 31. Scenario 2 in Viet Nam

Although Viet Nam is slowly shifting to a manufacturing-based economy, it still heavily relies on agriculture to meet subsistence needs and as a means to increase its GDP. Because Viet Nam's development plan is to grow economically at a rapid pace, it is converting forests to cropland, for agribusiness (Viet Nam is the 2nd largest exporter of coffee), and shrimp farms. This is evident since Viet Nam has the lowest forest cover in the GMS (36.5% of the land) and the least amount of land under protection (6.2% of the land). Many people are also dependent on fuelwood for energy. Furthermore, wildlife trade is rampant in Viet Nam even in forest protected areas. Because Viet Nam is keen on developing economically, it pays little attention to protecting ecosystem services. Therefore, it is unlikely that ecotourism, which is a relatively new concept in Viet Nam as a market mechanism, will be able to protect forests. This is especially the case when significant portions of forests are being converted for agriculture. Although for the most part Viet Nam demonstrates a case where forest ecosystems will not be protected, there will be incidents where some effort will be made to protect services. The logging ban that is in place will to some extent help protect biodiversity. This is already evident in the high average annual change in forest area of 2.5%. Forests may also be protected through PES, which is already beginning to take place for watershed protection. Viet Nam already has many of the legal structures required for PES to protect forests.

However, in pockets where people are becoming less dependent on forests and agriculture, signs of formal markets to pay for ecosystem services are beginning to show a possible growing willingness to pay for services. It is anticipated that the relative political stability and increasing wealth will, in time, lead countries in scenario 2 to reach the socioeconomic conditions that exist in Scenario 3 (see next sub-section) and further protect forest ecosystem services.

Scenario 3: Nurturing protection

In order to protect forest services, a country must have a strong and stable economy that is no longer heavily dependent on agriculture to meet subsistence needs or alleviate poverty. Instead, such countries are moving from a purely agrarian to a manufacturing-based economy where deforestation and employment in the agriculture sector is minimal. Dependency on fuelwood and biomass for energy is also low. Therefore, there is greater scope to protect forest services.

In these countries consumption of forest and agricultural products remains high either because of a large population or high income levels that allow people to buy more goods. The demand for goods is met by importing from countries that still have large forest cover and are agrarian (see Box 32). Many people also live in urban areas, which do not directly affect forests.

Box 32. Scenario 3 in China

Based on the evidence gathered on the Yunnan region, it is likely that China is willing and able to protect forest services. Not only does Yunnan have the second highest forest cover in the GMS (50% of the land area), but it also has large afforestation projects. Additionally, it has banned logging, which further protects forest ecosystem services. The protection of forests will allow China to protect its own biodiversity. This trend is reflected in China's average annual change rate in forest area, which is 1.7%. Although most of its population is still rural, less than half is involved in agriculture (44.1% of the population). This suggests that forest areas are not being converted to agricultural land to a large extent and that there is a shift from a purely agrarian to a manufacturing-based economy. Even though forest conversion for agriculture is falling, high income levels still allow China to import food and forest products from GMS countries, such as Lao PDR, Cambodia, and Myanmar, to meet the consumption demands of a large population. China is also at the forefront of developing market mechanisms to protect services. This is especially evident in protecting watershed areas through transfer of payments. However, using markets through ecotourism and REDD initiatives is still in a fledgling state. Ecotourism is not currently benefiting the poor. However, considering that China will be the top tourist destination in the near future, it is likely that ecotourism will be more mainstreamed with regard to protecting forest and alleviating poverty, especially since tourists are demanding greater ecotourism options at the global level. It has already established 5 ecotourism zones in Yunnan, which suggests that this could be a key market mechanism to protect ecosystem services by 2020. It is unclear the extent to which REDD will benefit forest stewards if market transactions are state controlled.

It is also likely that since countries in this scenario are high income and moving towards a manufacturing-based economy, they have formal market structures that will help establish PES mechanisms, especially in the area of ecotourism (see Box 33). Political stability will allow institutions and market mechanisms to develop and advance to protect forests.

Box 33. Scenario 3 in Thailand

Although Thailand is a high income country in the GMS, it still has a low level of deforestation (-.6%) primarily due to forest encroachment. However, it also has the highest number of protected areas in the sub-region where 18.2% of the land is considered protected. This suggests that Thailand is willing and able to invest in protecting forested areas especially because there is more finance and capacity available in such a high income country. Similar to China, less than half of its population is involved in agriculture (44.4%), which also suggests that Thailand is no longer completely dependent on agriculture and forest conversion to meet its demands. It is moving towards a more manufacturing-based economy. Although Thailand still produces agricultural products, such as rice, for export it no longer does so by converting forest land since agriculture is intensive and not extensive. Extensive road networks have also provided off farm activities for many Thais, which help reduce pressure on forest conversion. Forests are protected as evidenced by the ban on logging. Because Thailand is a wealthy country, it can source its demand for timber from GMS countries such as Lao PDR and Cambodia. This helps Thailand to protect its own biodiversity and allows for market mechanisms, such as ecotourism to thrive. Because Thailand offers social, economic, and political stability, it is likely that ecotourism as a PES mechanism will expand and be even further mainstreamed by 2020, especially with high global demands for ecotourism. Because Thailand has experience with formal markets, finances, and the capability to utilize PES schemes through ecotourism, it is most likely that Thailand will also use REDD as a market mechanism to protect carbon sequestration and develop PES mechanisms for watershed areas.

The characteristics of the three scenarios presented in this section are presented in Table 14.

Table 14. Characteristics of Scenarios 1, 2, and 3

	Economic	Environment	Socio-political	Demographic	International Mechanisms	Science & Technology
S1	<ul style="list-style-type: none"> • Largely agrarian • Poverty alleviation is a key objective • PES unlikely 	<ul style="list-style-type: none"> • Agri-business, logging, and mining are key land use change activities • High demand for fuelwood 	<ul style="list-style-type: none"> • Conflict with competitive land use activities • Unclear property rights • Weak governance • High forest corruption undermines decentralized management 	<ul style="list-style-type: none"> • Mostly rural and dependent on agriculture 	<ul style="list-style-type: none"> • Formal governance mechanism will not be adhered to 	<ul style="list-style-type: none"> • Use of modern and traditional science is prevalent
S2	<ul style="list-style-type: none"> • Shift from agrarian to industrialized 	<ul style="list-style-type: none"> • Greater expenditure on conservation activities <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> • Increase in agribusiness • High dependency on fuelwood 	<ul style="list-style-type: none"> • High social inequalities • Forest corruption exists • Property rights not well defined • Political instability 	<ul style="list-style-type: none"> • Falling growth rate and increase in urbanization <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> • Large population still dependent on forest and agriculture 	<ul style="list-style-type: none"> • Will not follow formal policies 	<ul style="list-style-type: none"> • Greater investment in modern science and technology
S3	<ul style="list-style-type: none"> • Post-industrial, knowledge based • Stable economy • PES: <ul style="list-style-type: none"> (a) Automatic – no need for market mechanism or (b) PES established due to policy trend 	<ul style="list-style-type: none"> • No dependency on fuelwood • No strong reliance on forests and agriculture • Fall in conservation funding 	<ul style="list-style-type: none"> • Tenure is defined • Formal institutions • Political stability • Few social inequalities 	<ul style="list-style-type: none"> • High population but high levels of urbanization • Negative growth rate 	<ul style="list-style-type: none"> • Formal policies and conventions are followed • Cooperation on scientific research 	<ul style="list-style-type: none"> • Finances and capacity exist to invest

Conclusion

The scenarios presented in this section can be viewed as a continuum where countries lay somewhere in between Scenarios 1, 2 and 3. It is important to remember, however, that situations in the various countries in the GMS are extremely dynamic and the status of a country may rapidly change, moving its position from one scenario to the next. In addition to dynamic changes occurring in the region, the scenarios presented are not precise and there is room for error, especially since there are various assumptions, risks, and uncertainties that are present. Although the underlying assumption these scenarios present suggests that the state of ecosystem services will improve with economic growth, it is assumed that ecosystems services are robust. The risk is that they may not be robust and resilient, and ecological collapse could take place. The sections on biodiversity, watersheds, and combating desertification also suggest that there are many scientific uncertainties as to how forest services actually function, especially due to the lack of information on services. This lack of knowledge also makes the assumptions behind the Kuznets curve model, which these scenarios are based upon, weak. If we do not understand how services function, it is risky to assume that economic growth will automatically protect services in the future. Furthermore, the assumption that ecosystem services will eventually ‘automatically’ be protected could

lead to the risk of decreasing investment in understanding and monitoring both direct and indirect drivers of change in order to minimize their impact. These assumptions and risks suggest that economic growth may not be the ultimate way to sustainably use ecosystem services, which would undermine the scenarios presented. Therefore, the Kuznets curve the scenarios are based upon could provide a false sense of security for the future. These risks and uncertainties need to be accounted for when using these scenarios to visualize a possible general trend that is likely to emerge by 2020 in the GMS and used in policy formulation.

7. CONCLUSION

As this paper has demonstrated, forest based services are critical to people in the GMS. However, in many cases, deforestation is continuing, especially in low income countries and in some middle income countries. The drivers of deforestation are multiple and are primarily at work in low income countries in the sub-region. They include the expansion of agriculture to meet the subsistence needs of the poor, and international market demands for certain products. In some parts of the GMS, activities such as logging also contribute to deforestation. And last but not least, poor or weak governance has led to forest loss and illegal logging where regional or national policies to protect forests have not been implemented due to the lack of funds, capacity to regulate, and political will and cooperation.

The extent to which people are willing and able to protect forest services and minimize the impact of these drivers is highly dependent on two factors: uncertainties and socioeconomic conditions. In order to minimize the impact of drivers that lead to deforestation, people have attempted to implement formal and informal policies and market-based mechanisms to protect services. However, due to the uncertainties and lack of understanding of the science behind services, it has been challenging for most countries in the sub-region to curb the impact of the various drivers operating almost simultaneously. Due to the lack of shared terminology and definitions, how services are valued, and poor quality of data to assess loss of services, forest protection has been difficult.

In addition to scientific uncertainties, a country's socioeconomic status also influences the extent to which the impact of drivers can be minimized. Based on the analysis in this paper, it can be suggested that those in low income countries are not yet ready to prioritize protection of forest-based services over economic development, especially when the majority of people in low income countries are poor and rely on agriculture as the main source of income. However, environmental protection does still take place but at a smaller scale in these countries. Forest protection is primarily driven by policies and regulations in low income countries that are formulated at the national level, although decentralization is becoming a popular way of formulating and implementing policies to protect services. Indigenous or traditional ways of protecting services through culture and local technologies also co-exist with formal policies in various parts of the region, especially with regard to protecting or replanting forests.

Markets provide good opportunities to protect forest services through PES. It is assumed that they not only function more efficiently in terms of protecting services compared to regulations, but they can also create financial incentives to protect forests that can especially help the poor. This can be seen in places where farmers are being paid by the government to prevent loss of forests to protect watersheds and combat desertification. REDD activities have the potential to pay environmental stewards to protect forests and ecotourism is a growing industry that has the potential to alleviate both poverty and protect the environment by protecting landscapes for the tourist market. However the use of markets to protect services is still in its infancy in the GMS. The overlapping reasons that deter the use of PES that cut across all services include lack of formal market and legal structures, undefined property rights, inequitable distribution of benefits, and high transaction costs. Furthermore, the financial benefits from PES are currently not directly and immediately tangible or high enough for people to engage in this mechanism. This is especially true for farmers in low income countries who can gain more benefits from converting forests to farmland than protecting forests since agriculture remains a key source of income and security.

Conditions are, however, changing in middle and high income countries where more and more attention is paid to protecting forest services as dependency on agriculture reduces. However, the extent to which forest services are protected varies greatly since middle income

countries are willing to protect forests in some pockets but also deforest areas in order to increase economic growth. As middle income countries become high income, the potential to protect forest services will increase as more resources and capacity will be available to invest in environmental issues with growing awareness about environmental protection.

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9. ANNEX

Data on drivers

Drivers of deforestation	Greater Mekong Sub-region					
	Lao PDR	Myanmar	Cambodia	Viet Nam	Thailand	China
Economic development						
GDP per capita (PPP \$US)	2,039	1,027	2,727	3,071	8,677	6,757
Human development rank (within the sub-regional context)	Low	Low	Low	Medium	High	High
Percentage of people on less than \$1/day 1990-2005	27%		34.10%		<2%	9.90%
Land use change						
Total population 2005 (millions)	5.7	48	14	85	63	1313
Total population 2015 (millions)	6.7	52	16.6	96.5	66.8	1388.6
Annual growth rate (1975-2005, 2005-2015)	2.2, 1.7	1.6, .8	2.3, 1.8	1.9, 1.3	1.3, .6	1.2, .6
Percentage of total land area covered in forests 2005	69.90%	49%	59.20%	39.70%	28.40%	21.10%
Average annual change 1990-2005	-0.50%	-1.20%	-1.30%	2.50%	-0.60%	1.70%
Employment in agriculture 2002-2004	85% (1996-2005, HDR)	63% (1996-2005, HDR)	60.30%	59.90%	44.40%	44.10%
Technology intensive land use - mechanization (tractors per 1000 ha) 2001	1.1	1	0.5	18.4	11.4	7.2
Change in area of pasture land (thousand ha) 1990-2000	78	-45	-54	300	20	0

Percent of population dependent on fuelwood/biomass 2000	95%	>95%	>95%	>95%	72%	80%
Level of agribusiness (i.e. palm oil, coffee, cocoa, soybean)	Palm oil, rubber, sugar, rice, cassava, tropical fruits		Palm oil, rubber, sugar, rice, cassava, tropical fruits	Palm oil, rubber, sugar, rice, cassava, tropical fruits, coffee	Rubber	
Settlement patterns						
Proportion of people in rural areas 2003-2005	79.70%		80.90%	74%	67.90%	97%
Average annual percentage growth in rural area 1990-2005	1.80%		1.90%	1%	0.80%	
Proportion of people in urban areas 2005, 2015	20.6%, 24.9%	30.6%, 37.4%	19.7%, 26.1%	26.4%, 31.6%	32.3%, 36.2%	
Rural population access to all-season roads 1993-2004	64%		81%	84%		
Policies and institutions						
Strength of public policies on forestry	Poor governance, high levels of illegal logging	Poor governance, high levels of illegal logging	Poor governance, high levels of illegal logging	Moderate, forests are increasing in some areas but deforestation also occurs in places	Moderate, conservation is emphasized but deforestation still occurs	Strong, forests are increasing
Level of Illegal Logging (Corruption Perception Index, WRI) 2003		1.6		2.4	3.3	

Sources: Human Development Report 2007/2008; State of Food and Agriculture 2007; World Development Report 2008; World Resources Institute 2005.