

# Role of the Private Sector in Managing the Asian Environment: A Review<sup>1</sup>

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**ABSTRACT** *This paper identifies inadequate effort to use market-based and private sector-led approaches, among others, as a main reason for limited progress in arresting continuing environmental degradation in the Asia and Pacific region. Citing examples, the paper shows that markets can be created for ecosystem protection and provision of ecosystem services under innovative regulatory mechanisms and that the use of market-based approaches can reduce the dependence on unsustainable financing for environmental management. The paper also briefly discusses the role of governments, other stakeholders, and development assistance in creating the policy and institutional framework conducive for introducing private sector-led approaches to environmental management.*

## Introduction

Rapid economic growth in the Asia and Pacific region in recent years has been accompanied by concomitant changes such as increased demographic pressure, intensification of agricultural production, industrialization, and urbanization. These changes have brought about further stress on the region's natural resource base that underpins development (ADB, 2001, 2005). Despite the considerable efforts of governments, donor community, civil society, and other stakeholders, environmental degradation in the region has continued, except for some scattered improvements in a few sectors. At risk are people's health and livelihoods, survival of species, and ecosystem services that are the bases for long-term economic development. Sustaining economic growth and development would be increasingly constrained if the current trends in environmental degradation continue unchecked (ADB, 2001, 2002, 2005).

Environmental degradation is not only limited to the Asia and Pacific region. It has become a global phenomenon affecting both developed and developing countries. Global warming caused by anthropogenic increases in greenhouse gas (GHG) emissions is an alarming case, for example. The Stern Report (2006) warns that failure now to invest 1% of the global gross domestic product (GDP) to reduce global warming could risk a future reduction of up to 20% in world GDP. Asia, being the host of two growing giant

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economies and being the most dynamic region in the world in terms of economic expansion, has a vital role to play in assisting the efforts to address both global and regional environmental problems. According to a recent estimate cost of climate change in four Southeast Asian countries (Indonesia, Philippines, Thailand, and Vietnam) would be equivalent to 6.7% of their combined GDP by 2100, if climate change continues unabated (ADB, 2009).

There have been no shortages of initiatives to address environmental issues at the global, regional, national, sectoral, and project levels. Recent landmarks in the global community's efforts toward better environmental management in Asia include the Millennium Declaration<sup>2</sup> in September 2000 and the publication of the Asia-Pacific Environment Outlook 2 by the United Nations Environment Program, and the State of the Environment in the Asia-Pacific 2000 by the United Nations Economic and Social Commission for Asia and the Pacific.<sup>3</sup> Aside from these global and regional initiatives, the international development agencies have supported investments in environmental programmes and projects, helped through technical assistance to mainstream environmental objectives in national development planning and policy processes, introduced good practices, and developed safeguard<sup>4</sup> policies and procedures to assist developing countries. Regulatory systems have also been strengthened, including linkages with environmental institutions. However, these initiatives and efforts have shown only limited success in addressing environmental issues.

There are a host of reasons and contributing factors that account for the continuing environmental degradation in the region. Weak national and local institutions, overlooking the huge investment requirements for environmental programmes and/or projects in the face of more pressing needs to allocate government resources for employment generation and poverty reduction, coupled with limited environmental awareness, have contributed to environmental degradation. This paper looks beyond these conventional explanations of environmental problems and advances the thesis that the lack of concerted efforts to create markets and engage the private sector to provide environmental services in the region is one of the major shortcomings of previous efforts. The far-reaching trends in globalization and economic integration, the increasing role of the private sector and civil society, and rapid technological advances, taking place largely in private/corporate sectors, have been reshaping the contemporary world. The role of markets and associated incentives in environmental management cannot be overemphasized within this evolving context.

This paper argues that the public sector alone cannot supply ecosystem services efficiently and effectively for two reasons. First, the existing environmental problems are largely due to public sector or non-market failures. Second, environmental management should not depend solely on unsustainable donation-driven financing. Citing some examples mainly from developed countries, this paper demonstrates that market-based incentives can be aligned with self-interests of the private sector that could lead to the development of markets for environmental goods and services. Once such markets with appropriate incentives for the private sector are developed, the market exchange process could self-sustain and provide correct market signals for environmental protection. The paper discusses the potential for using market-based approaches for private sector participation in environmental management in the Asian region. It also highlights the need to create policy and institutional systems designed to facilitate the adoption of market-based approaches to environmental management.

## **Government and Non-Market Failures**

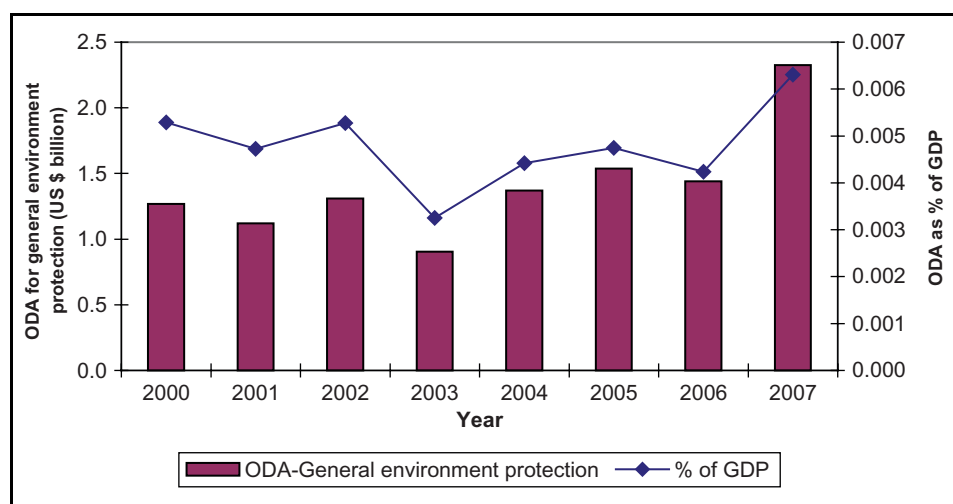
The world has been moving toward deregulation, private sector initiatives, and global and regional market integration in the last few decades. It is worthwhile in this context to revisit the belief that environmental management is solely the responsibility of the government. Despite the trend of placing more trust in the markets to allocate resources and improve society's welfare, the government has continued to remain as the custodian of the environment and the main supplier of ecosystem services. There are valid reasons for this situation. In many sectors of the economy, the incentives associated with private decisions are compatible with social objectives and these incentives enable the markets to maximize social welfare through its resource allocation mechanism. However, the market allocation of resources generally fails to protect the environment and results in under-supply of ecosystem services. 'Market failure'<sup>5</sup> occurs when the market mechanism fails to supply environmental services optimally.

Market failures provide a justification for the government to intervene in environmental management. However, the justification provided by the market failures for governments to intervene should be appraised against the potential non-market failures (i.e. public sector policy and institutional failures) in efficiently and effectively providing environmental goods and services. Population growth, poverty and affluence, the pace and path of technological advancements, and other driving forces that influence environmental change evolve within the context of international, national, and regional institutions and policies. A study concluded that environmental degradation in the Asia and Pacific region was above all a failure of policy and of institutions (ADB, 1997).

Most of the government interventions for environmental management in the Asia and Pacific region are essentially 'command and control' in nature. In a command and control regime, the government sets the rules, regulations, and standards and forces the business and other economic agents to comply with these regulations. Public sector efforts in environmental management in Asia are characterized by inadequate political will and commitment to environmental protection; limited financing for environmental improvement; continued dominance of sectoral approaches to policy-making; poor compliance; and weak enforcement (ADB, 2001). The command and control regimes tend to fail when they encounter constraints such as poor compliance and weak enforcement together with lack of political commitments. Responsible agencies for the environment in the region are usually understaffed and under funded.<sup>6</sup> Enforcing environmental regulations has proven to be difficult, especially where rent-seeking practices are less expensive than compliance. Because of the reasons mentioned above the public sector-led interventions in environmental protection and the provision of ecosystem services have not worked well in Asia.

One common feature of public sector-led environmental management in developing countries is its dependence on the grants- or donations-driven funding in the face of inadequate government fund allocations. As Figure 1 shows, the total amount of donor funding has shown some increase but environmental funds as a percentage of the GDP of donor countries have declined, except for 2007. On average, the Development Assistant Committees (DAC) countries have contributed only 0.0048% of their GDP for environmental protection in developing countries during 2000–7.

Although complete data on overall expenditure for environmental protection in Asia does not exist, available information at the global scale shows generalizable trends. Official development assistance for both sustainable forest management and protected areas



**Figure 1.** ODA for general environmental protection: DAC countries, 2000–7.

Source: ODA data from OECD Query Wizard for International Development Statistics online; GDP data from World Development Indicators online.

**Table 1.** Estimated financial flows for forest conservation (in million US dollars)

Sources of finance	Sustainable forest management		Protected areas system	
	(Early 1990s)	(Early 2000s)	(Early 1990s)	(Early 2000s)
Official development assistance	2000–2200	1000–1200	700–770	350–420
Public expenditure	N/A	1600	N/A	N/A
Philanthropy	85.60	150	N/A	N/A
Communities	365–730	1300–2600	N/A	N/A
Private companies	N/A	N/A	N/A	N/A

Notes: na = not available.

Source: Jenkins *et al.* (2004).

management was reduced by almost 50% during the last decade (Table 1). Under this programme, the philanthropic contributions for sustainable forest management have increased but such contributions provide only a fraction of the total requirements. An encouraging trend is that the overall community contributions, which include self-financing and in-kind contributions, have increased over time.

Development agencies, particularly multilateral agencies, have increased funds for the environmental sector in recent times. However, the amounts allocated by both governments and donors are not commensurate with the growing needs. In the Asia and Pacific region, expenditure on environmental programmes rarely exceeded 1–2% of GDP compared to defence budgets, with expenditures ranging from about 0.8–6% of GDP. According to some estimates, expenditures of at least 7% of GDP will be required to meet the environmental programme needs of the region (ADB, 2001). However, there is little evidence that such increases in environmental expenditures are being considered by policy-makers in the region (ADB, 2001).

### Environmental Degradation Costs and Profitability of Conservation

There is emerging evidence that environmental degradation is costly. The Stern Report (2006) estimates that climate costs in East Asia and Pacific could range from \$181 billion (5% of GDP) to about \$723 billion (20% of GDP) per year in current prices. In South Asia, the damage could be about \$57 billion to \$229 billion in current GDP.<sup>7</sup> In contrast, the costs of action—reducing GHG emissions to avoid the worst impacts of climate change—can be limited to around 1% of global GDP each year. Impacts of climate change are very likely to impose net annual costs that will increase over time as global temperatures increase. The social cost of carbon is estimated (in 1995 prices) to be \$18 per tonne of carbon dioxide, on average, but the range in the 322 estimates is large (Tol, 2009). This average estimate is obtained using 3% social discount rate and the social cost of carbon is much higher when lower discount rates are used. This large variation is due in large part to differences in assumptions regarding climate sensitivity, response lags, treatment of risk, inclusion of potentially catastrophic losses, and discount rates. Aggregate estimates of costs mask significant differences in impacts across sectors, regions, and populations and very likely underestimate costs of damages because they cannot include many non-quantifiable impacts.

World Bank estimates show that the economic cost of environmental degradation in developing countries is about 4–8% of GDP in these countries. For example, the economic cost of air and water pollution alone in Peoples Republic of China (PRC) is estimated to be 3–8% of its GDP (World Bank, 1997). Many research studies have shown that the cost of preventive measures is much less than the cost of environmental damages, and therefore, it is economically efficient to prevent environmental degradation. The challenge is to convert the avoided costs (or the benefits from environmental protection) to monetary terms (i.e. revenues) by allowing the self-interests of the private sector to capture the potential profits in a competitive setting. In the case of air pollution, for example, the necessary improvements in air quality can be successfully implemented with policy reforms, harnessing markets and investments in alternative energy sources, boosting availability of natural gas, and improving public transport. These activities would provide ample business opportunities to the private sector. Such measures would prevent an estimated 289 000 deaths a year in PRC if air pollution were reduced to comply with the government's standards.

The total economic value of 17 ecosystem services across 16 biomes has been estimated and the values have been extrapolated to the global scale. Findings from this work show that the aggregated annual value of nature's services (at year 2000 values) lies in the range of \$18–61 trillion.<sup>8</sup> These figures are of similar size to global gross national product (Costanza *et al.*, 1997). A group of researchers from the United States (US) and the United Kingdom (UK) asserts that conservation is highly profitable. Their estimates show that humanity loses \$250 billion through loss of habitats annually. They further show that benefits of conservation are much higher than those of conversion of many habitats for development purposes. Their analysis shows that conservation of certain habitats would provide a benefit–cost ratio of over 100.<sup>9</sup> These research studies have estimated that the goods and ecosystem services in the nature reserves of the globe are worth \$4400 billion more than the profits to be made after conversion (ENS, 2002).

The question is, why is the wilderness and related ecosystem gradually disappearing? The answer lies in the conceptual nature of the estimated benefits noted above. These numbers are not like the actual prices we observe in the market. The market prices, derived through the market exchange process, represent economic value and can be

converted to incomes. Such revenues provide incentives for economic agents to provide these goods and services. This paper argues that similar revenue streams can be generated through developing markets for ecosystems services. A few centuries ago, the environmental services were abundant such that scarcity was not sufficient to develop markets for them. Today, these are scarce, and they are important for human welfare. However, without private property rights these services cannot be exchanged in the market or markets will not be developed for them. If innovative mechanisms are developed to ensure the ownership for the ecosystem services, these values can be exchanged in the market.

### **Selected Market Mechanisms and Innovations**

The basic challenge in using markets for exchanging environmental services lies in converting basic conceptual values to real values like actual market prices. A large number of innovative methods for achieving this have been developed. Some of these selected innovations are discussed below.

#### *Biodiversity Conservation and Watershed Management*

Biodiversity conservation is largely a land allocation issue, as conservation often results in loss of development opportunities. The compensation for forgone development opportunities due to allocation of lands for conservation can be made through the purchase of high-value habitats, payments for access to species or habitat, payments for biodiversity conservation management, tradable rights under cap-and-trade regulations, and support for biodiversity business (Table 2). A team from McKinsey & Company, World Resources Institute, and Nature Conservancy estimated the annual international financing for conservation market (protecting land from development) to be \$2 billion. Buyers are predominantly development banks and foundations from US and Europe (Jenkins *et al.*, 2004).

Debt-for-nature swap is an agreement under which a proportion of a country's debt is written off in exchange for a commitment by the debtor country to undertake projects for environmental protection. Debt-for-environment swaps were set up by environmental groups in the 1980s in an attempt to reduce the debt problem of poor countries, while simultaneously promoting conservation. A debt swap involves purchasing foreign debt at a discount, converting the debt into local currency, and using the proceeds to finance local conservation activities.

Debt-for-nature swaps are designed to free up resources in debtor countries for much-needed conservation activities. There are different types of debt-for-nature swaps. In a bilateral debt-for-nature swap, the creditor government cancels the debt owed by a debtor government. In exchange, the debtor agrees to set aside a predetermined amount of local currency counterpart funds. While NGOs like the World Wildlife Fund (WWF) may play a role in establishing the counterpart fund and determining its use, the primary agreement is made between the two governments. On the other hand, under a commercial debt-for-nature swap model, an NGO such as the WWF solicits debt donations or purchases debt at a discount from face value from a creditor. The NGO then negotiates separately with the debtor government by offering to cancel the debt in exchange for conservation project funding.

Most debt-for-environment swaps have concentrated on setting aside areas of land, especially tropical rainforest, for protection and have involved private conservation

**Table 2.** Types of payments for biodiversity protection

Type	Mechanism
<b>Purchase of High-value Habitat</b>	
Private land acquisition	Purchase by private buyers or NGOs to be used explicitly for biodiversity conservation
Public land acquisition	Purchase by a government agency to be used explicitly for biodiversity conservation
<b>Payment for Access to Species or Habitat</b>	
Bio-prospecting rights	Rights to collect, test, and use genetic materials from a designated area
Research permits	Right to collect specimens, take measurements in area, etc.
Hunting, fishing, or gathering permits for wild species	Right to hunt, fish, and gather
<b>Ecotourism use</b>	
<b>Payment for Biodiversity-conserving Management</b>	
Conservation easements	Owner paid to use and manage defined piece of land only for conservation purposes; restrictions are usually in perpetuity and transferable upon sale of the land
Conservation land lease	Owner paid to use and manage defined piece of land only for conservation purposes for defined period of time
Conservation concession	Public forest agency is paid to maintain a defined area under conservation uses only; comparable to a forest logging concession
Community concession in public protected areas	Individuals or communities are allocated use rights to a defined area of forest or grassland in return for commitment to protect the area from practices that harm biodiversity
Management contracts for habitat or species conservation on private farms, forests, or grazing lands	Contract that details biodiversity management activities and payments linked to the achievement of specified objectives
<b>Tradable Rights under Cap-and-trade Regulations</b>	
Tradable wetland mitigation credits	Credits from wetland conservation or restoration that can be used to offset obligations of developers to maintain a minimum area of natural wetlands in a defined region
Tradable development rights	Rights allocated to develop only a limited total area of natural habitat within a defined region
Tradable biodiversity credits	Credits representing areas of biodiversity protection or enhancement that can be purchased by developers to ensure they meet a minimum standard of biodiversity protection
<b>Support Biodiversity-conserving Businesses</b>	
Biodiversity-friendly businesses	Business shares in enterprises that manage biodiversity conservation
Biodiversity-friendly products	Eco-labelling

Source: Scherr *et al.* (2003).

foundations. The first swap took place in 1987, when a US conservation group bought \$650 000 of Bolivia's national debt from a bank for US\$100 000, and persuaded the Bolivian government to set aside a large area of rainforest as a nature reserve in exchange for never having to pay back the money owed. The WWF was one of the pioneers of the debt-for-nature swap and successfully executed its first swap in Ecuador in 1987. Since

then, WWF has played an important role in the implementation of debt-for-nature swaps around the world. From its introduction until 2001, over 50 countries had taken part in some sort of debt-for-environment schemes.

Debt-for-nature swaps have made important contributions to conservation. They have done this directly, for example in the Philippines and Ecuador, where they have generated substantial funding for conservation and have helped catalyze new institutions; and indirectly, by providing valuable lessons for conservation funds and other stakeholders to prevent potential pitfalls in using innovative approaches for conservation. Debt-for-nature swaps have ushered in a new way of thinking about conservation and also initiated opportunities to involve institutions not previously engaged in conservation efforts. Proponents have successfully found new avenues and tailored the mechanism to their particular national circumstances. Now, there are emerging examples of harnessing similar creativity and strategic partnerships in order to tackle the greater challenge of attracting more private investment on terms that balance economic returns with conservation objectives over the long term (Resor, 1997). One drawback of the scheme is that the debtor country is expected to ensure that the area of land remains adequately protected, which in practice does not always happen.

Tapping profitability in the provision of ecosystem services is not a matter of conjecture in the minds of theoreticians anymore. There are many real-world examples of the profitable use of ecosystem services. This paper cites a few well-known examples. The first shows how the New York City (NYC) planners saved billions of dollars by preserving the watersheds, which provide clean water to NYC. The city's water supply does not depend on expensive filtration systems but on the quality of the 2000 square miles of watersheds. In the early 1980s, water quality started deteriorating due to development activities in the watersheds. The NYC administration had two options in its efforts to meet the water quality requirements of the US government. The first was to install a filtration system that would initially cost about \$4–6 billion and another \$250 million annually for maintenance. The second option was to invest in proper management of the Catskill watershed to provide high-quality water. NYC decided to invest in the watershed management programme and was able to save large sums of money by paying for the ecosystem services. The watershed programme cost only 1/8 of the total cost of the water filtration system. Land owners in the watershed received payments for the services they provided. Within five years after the watershed management programme was established, 93% of farmers had chosen to participate in this programme. This watershed programme resulted in additional environmental benefits. Furthermore, the water conservation programme of NYC, which reduced the per capita water consumption by about 20% at a cost of \$500 million, saved about \$3–5 billion of the potential cost of construction of new water supply works (Appleton, 2002).

A similar example in Costa Rica shows that the government pays the landowners who maintain forests in their lands for ecosystem services. The payments are based on the environmental services rendered, including carbon sequestration, water purification, and scenic beauty. Government finances this programme using funds from international agencies, tax on fuel, and support from a beer company. Under this programme, the government has already distributed about \$100 million among farmers who have become forest stewards (Chomitz *et al.*, 1998; Jenkins *et al.*, 2004). The above two examples are public payments for private landowners to enhance ecosystem services. There are several other types such as open trading under a regulatory ceiling, self-organized



private deals, and eco-labeling. Among these, the self-organized private deals are the closest to conventional market operations.

Another example of market exchange of ecosystem services is the wetland banking system in the US. Under this scheme, private companies purchase degraded wetlands and improve them to meet regulatory requirements. When construction companies meet compensatory wetland improvement requirements, they purchase those certified wetlands in the 'wetland banks'. One wetland banking company in California, Wildlands Inc., for example, purchased a degraded wetland and invested about \$2 million to improve it. The company has already earned about \$9 million by selling the improved wetlands to construction companies enabling the companies to comply with wetland compensation requirements.

One common feature of all the examples cited above is that environmental regulations play a key role in opening up business opportunities for the corporate sector and in promoting the conservation of ecosystems like wetlands, watersheds, forests, etc. The UK Department for International Development funded a four-year study that focused on 'payments for watershed services'—a way of compensating for the sound use of land and water upstream that bring benefits to water users downstream. The researchers found that while there is growing enthusiasm for using payments to encourage sound watershed management and to improve rural livelihoods, there is only patchy evidence of social and environmental benefits to date. Despite this preliminary finding, the researchers indicate that new payment schemes could make a difference if these are designed with specific watersheds and social contexts in mind and are led (and partially funded) by water users, particularly those in the private sector. The ecosystem service payments systems vary in scale from the one in Nicaragua that rewards just five families to a programme in China that aims to reach 15 million farmers by 2010. While the early payment schemes included small-scale farmers more by accident rather than by design, a new generation of schemes is specifically engaging poor upland communities as providers of watershed services. It is, however, too early to judge their success.

### *Green Industries*

Green industries provide goods and services used for measuring, preventing, limiting, or correcting environmental damage to water, air, and soil as well as problems related to waste, noise, human health and ecosystems. Some such industries have already been developed as profitable business ventures, mainly in developed countries. These also include eco-efficient technologies that reduce material inputs, energy consumption, emissions, waste disposal, and improved resource recovery.

The world market for outputs of green industries was valued at \$515 billion in 2004 and the forecasts show that it will grow up to \$688 billion in 2010. Green industries in the United Kingdom employed about 400 000 people in 17 000 companies with an annual turnover of £25 billion in 2005 (Mansfield & Thomas, 2005). A similar market (with a slightly different definition—Healthy Product-Healthy Planet Market) in the US generates economic activity worth \$40 billion per annum, which is about 4.2% of the US GDP. In 2003, this market grew at 6.3%, twice the growth rate of GDP in the US. The green industry market in industrializing Asia was \$19 billion in 1996 and is estimated to surpass \$50 billion in 2005. In 1999, the value of the organic foods market globally was \$14.2 billion and its value is estimated to grow to \$43.5 billion in 2007. In USA alone the value of

organic foods markets was \$5.3 billion in 2008. These numbers show how some of the green markets have expanded over time.

Cleaner production is an important subset of green industries. This involves continuous application of an integrated preventive environmental strategy to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment. Production processes should ensure conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes. Cleaner products should reduce negative impacts along the life cycle of a product, from raw materials extraction to its disposal of waste after consumption. The cleaner production sector (both software and hardware) in the Organization for Economic Co-operation and Development (OECD) produces \$184 billion<sup>10</sup> worth of goods and services.

While markets for green industries are largely confined to the developed countries, rapidly growing incomes provide ample business opportunities to introduce them in the Asian region. The corporate sector should be proactive to explore such possibilities in Asia and the Pacific region.

### *Clean Energy Investments*

The clean energy investment market is a fast growing \$100 billion a year global industry. The concerns on climate change present opportunities for business and private capital such as investments in clean energy and low carbon alternatives. Given the regional growth trajectories and the projected energy demand, Asia represents the largest growth opportunity for clean energy investment globally. Businesses need to adapt to the changing investment landscape that climate change ushers in.

Clean energy investment can be classified into three broad and distinct investment categories: (1) investments in technology or 'CleanTech', those ideas and intellectual property that may, with time testing, commercialization, and deployment, be adapted and incorporated in the energy supply infrastructure of the future; (2) investments in clean energy infrastructure, or those in 'bricks, mortar, and steel' that generate/produce energy and deliver energy to the consumer; and (3) energy efficiency, or those in products, applications, and technologies that reduce the energy consumed in a given process or operation.

There are multiple subcategories within each investment category. Each may have very different business profiles and drivers and therefore may appeal to various investor classes. 'CleanTech' tends to fall within the realm of the venture capitalists, while utilities, independent power producers, and infrastructure companies have been developed traditionally by energy supply infrastructure and energy efficiency initiatives. CleanTech, clean energy infrastructure, and energy efficiency investment will clearly require significant capital allocations to address the climate change challenges and achieve the long-term stabilization levels for green house gases. Table 3 illustrates how maturing CleanTech investment may lead to project opportunities for clean-energy infrastructure and energy efficiency.

### *Climate Change Mitigation's Flexibility Mechanisms*

Flexibility mechanisms refer to emissions trading, joint implementation (JI), and the clean development mechanism (CDM) that are intended to lower the overall costs of achieving emissions targets as defined under the Kyoto Protocol. These mechanisms enable 'Parties'

**Table 3.** Examples illustrating the difference between CleanTech and infrastructure project investments<sup>a</sup> BTL = biomass (cellulose)-to-liquids, CTL = coal-to-liquids, IP = intellectual property, and SVO = straight vegetable oil

CleanTech investment projects	Infrastructure and energy efficiency projects <sup>b</sup>
Biofuel technology	Biofuel plant – ethanol, biodiesel, SVO
GTL technology	Biogas
CTL technology	Electricity generation project – wind, solar, biomass, mini hydro (municipal), waste-to-energy, and geothermal
Second generation BTL technology	GTL plant
Energy intelligence technology	CTL plant
Distributed energy (Wind, solar) technologies	BTL plant
Batteries	Energy-efficiency project
Fuel cells	Carbon reduction, caption and storage or elimination project
Hybrid vehicles	Carbon sequestration project
Wave/tidal technologies	
Geothermal technology	
Carbon storage, reduction, or elimination technologies	



*Notes:* <sup>a</sup>Table 3 provides examples of CleanTech investment areas and clean energy infrastructure projects to illustrate the distinction between these different business models and investment opportunities. The table is not intended to be an exhaustive list of the investment opportunities in the clean energy sector; <sup>b</sup>“Infrastructure project” for the purposes hereof is intended to have a broader meaning than the meaning typically assigned to the term in that it is meant to include all investment made to commercialize/commission a clean-energy development but excludes investment in technology development.  
*Source:* Aequero (2007) in Carmody and Ritchie (2007).

to the Kyoto Protocol to achieve emissions reductions or to remove carbon from the atmosphere in a cost-effective manner. While the cost of limiting emissions varies considerably from region to region, the benefit for the atmosphere is, in principle, the same wherever the action is taken. Here we discuss mainly the CDM which is the most relevant flexibility mechanism for developing Asia.

The CDM is a financing instrument that allows industrialized countries with a GHG reduction commitment to invest in projects that reduce emissions in developing countries. CDM is considered as an alternative to more expensive emissions reductions in developed countries, which generate tradable emissions credits.

The objective of the CDM is to assist countries not included in the Annex 1 Parties<sup>11</sup> in achieving sustainable development, while at the same time allowing the countries included in Annex 1 Parties to achieve compliance with their emissions reductions commitments. Under a CDM project, a legal entity (presumably, but not necessarily, from an Annex 1 country) invests in a project that results in emissions reduction in a non-Annex 1 country. The investment decision would include an agreement between the countries on the allocation (instead of dispensation) of the emissions reduction resulting from the project. These emissions reductions have to be certified by an appropriate authority, and once this is done, the certified emissions reduction (CER) can be used to meet the Annex I commitments under the Kyoto Protocol (ADB, 2003). The CDM allows the net global GHG emissions to be reduced at a much lower global cost by financing emissions reduction projects in developing countries where costs are lower than in industrialized countries.

In recent years, domestic and international tradable emissions permit systems have received recognition as a means of lowering the costs of meeting climate-change targets. Creating carbon markets can help economies identify and realize economical ways to reduce GHG emissions and other energy-related pollutants or to improve efficiency of energy use. The cost of achieving the Kyoto Protocol targets in OECD countries could fall from 0.2% of GDP without trading to 0.1% as a result of introducing emissions trading in an international regime. CDM also entails long-term development aspects, since the projects must assist developing countries in achieving sustainable development.

The European Union Emissions Trading Scheme (EU ETS) has continued to dominate the market with transactions nearing \$25 billion up to 2007. The emissions trading schemes that are in operation in EU can be introduced in the middle-income and developed Asian nations. So far CDM has been the dominant emissions trading scheme effective in developing countries. Project-based transactions, primarily through the CDM, doubled in value over 2005, to about \$5 billion in 2007. Developing countries supplied nearly 450 million tonnes of carbon dioxide equivalents of CDM credits in 2006, with China leading at 61% of transacted volumes. About 920 million tonnes of emissions reduction credits were transacted under the CDM between 2002 and 2006, corresponding to a cumulative value of \$7.8 billion, leveraging<sup>12</sup> an estimated \$21.6 billion in investment (74% for clean energy-related projects) (World Bank, 2007). Further enhancing the local institutional capacity to undertake technical and paper work required by the CDM mechanism is necessary to realize its full potential in developing Asia.

### **Roles of Regulatory Framework, Institutions and Development Assistance**

Reliance solely on the public sector and donation-driven financing for environmental management so far has provided only limited results. As the incomes in the Asian region rapidly grow, the demand for environmental services will follow. Moreover, there is a large amount of private sector resources accumulating within the region. Mobilization of these private sector resources to manage the environment in the region is the way forward. This paper highlights some of the innovative market-based approaches for environmental management that engage the private sector. Many of these approaches are still in the pilot stages and largely applied in the developed countries. Introducing these approaches and up-scaling them as the main means to achieve environmental management objectives require proactive measures from the private sector and complementary efforts from the governments and the donors.

#### *Regulatory Framework and Institutions*

This paper argues that the traditional role of government as a custodian of the environment, together with its command and control approach, should be changed if measurable results in environmental management are to be achieved. This position, however, does not mean that government has no role to play in the new generation of environmental management policies. In fact, it will have a bigger, newly defined, and revitalized role to play.

The current state of environmental performance drivers varies widely within the region. A few countries, such as Japan and Singapore, have environmental regulatory institutions and infrastructure on par with that of OECD countries. But some countries lack even the rudiments of an operational national environmental regulatory framework, while many are in the middle of this continuum. Basic environmental laws are unevenly enforced, and the

main policy tools available are inadequate to accommodate the range of economic and environmental circumstances they need to address. In general, weak and under-resourced institutions generate inefficient policies that make achieving environmental goals very costly. Whatever the level of a country's environmental performance goals, when environmental policy is unevenly and inconsistently applied, unclear and uncertain messages concerning performance expectations result, causing higher levels of malfeasance and erosion of benefits for leading firms. An important first step in influencing basic economic decision-making, therefore, is a national environmental regulatory system that provides clear performance expectations that are consistently enforced (ADB, 2001).

Mature institutions with adequate capacities are preconditions for the introduction of innovative mechanisms that would utilize the strengths of the markets for environmental management. The donor community and the national governments have a major role to play in reforming policies and strengthening institutions to create conducive environment for the private sector to engage in environmental management in Asia. In addition to creating a conducive regulatory framework, there are a number of other functions they can perform. In some selected cases, creating the market may be achieved by directly paying for the services, as in the examples of Costa Rica and NYC. Government should establish property rights or put in place the regulations that will set the caps and govern the trading regimes in other cases. Moreover, the markets for environmental goods are characterized by high transaction costs between buyers and sellers. These markets also lack specialized market institutions. Creating such institutions and taking necessary actions to reduce transaction costs constitute another important role of the government. A variety of actual and perceived risks prevents the development of markets for ecosystem services. Government with the help of development assistance has a key role to play in reducing these risks and creating the market infrastructure for exchanging ecosystem services.

The harmonization of existing regulations is another important step since strict environmental regulation in one country in a particular region may put its business at a competitive disadvantage vis-à-vis its neighbours. An example is the greening process of tourism in Thailand, which requires hotels and other tourist establishments to meet more than 100 standards. If the transaction and compliance costs are significantly high, such regulation may drive up the prices of hotel rooms in Thailand and consequently lead to diversion of tourists to neighbouring countries. This will not only shift business from one country to another, but also shift pollution to the country that does not adopt similar strict regulations. Therefore, the harmonization of existing and new environmental regulations is imperative.

Having innovative regulations and harmonizing them across the region are only the only *necessary* conditions for better environmental management through market involvement. Effective enforcement of regulations is the *sufficient* condition. Also, there is a need to focus more attention on enforcement issues, because enforcement remains weak due to legal, institutional, and capacity limitations. Challenges in this area include, in particular, reducing overlapping authorities, decentralizing environmental functions, training core staff, raising awareness of the regulated communities, attracting and allocating necessary funds and, more importantly, reducing opportunities for corruption.

### *Development Assistance*

Much needs to be done to fully utilize the opportunities provided by market-based mechanisms for managing the Asian environment. All stakeholders have critical roles to play in

advancing the application of market-based approaches for environmental management. In the following section we focus on the potential roles of development assistance.

### *Correcting Information and Coordination Failures*

Attempts at environmental management in the region, using innovative market-based approaches appear to be disparate. While there are a few scattered examples of the use of market-based innovations, a systematic assessment has yet to be undertaken, especially one that would examine the potential for application of market-based approaches for environmental management. Development assistance could help alleviate such information problems through promotion of learning and knowledge sharing. This can be done by undertaking appropriate special studies and providing technical assistance and other grants that would explore the potential of these incentive-based approaches as an alternative to 'command-and-control' approaches. Assistance can be best geared toward tailoring these market-based approaches to suit the local needs and conditions of specific recipient countries. Technical assistance resources can be mobilized to generate and share knowledge such as scoping and reviewing current practices and technologies, risk mapping, promoting awareness, institution-building, and feasibility studies, among others.

Information and coordination failures often prevent development of new markets for environmental goods and services as in the other markets. In addition, recent literature points to another type of market failure due to what is called 'information externality' or the problem of 'cost discovery'. The problem of cost discovery could cause the under-provision of new and innovative products in the environmental sector. The idea is that if some products or services are new and innovative, an entrepreneur who invests in such products or services in that country faces many risks. If the effort fails, he or she would bear all the costs; but if the effort succeeds, many others would enter the market and share the benefits. It is argued that, due to such information externality, there would be inadequate efforts to introduce new and innovative products and services if left entirely to market forces (Rodrik, 2004). Creating markets for environmental goods and services can be hampered by information externalities and cost discoveries. The role of development assistance here is parallel to that in the financial market, i.e. help develop missing or underdeveloped markets through selected activities such as information sharing, catalytic investments, equity investments, non-sovereign credit, and risk guarantees.

### *Assistance in Policy Reforms and Institution Building*

Development assistance may play a significant role in strengthening the existing institutional framework in DMCs to effectively use market-based and private sector-led approaches for managing the environment. Donors' expertise is needed in setting up legislative and environmental policy frameworks for generating opportunities for businesses in the private sector for environmental protection. The imperative for strengthening institutions cannot be overemphasized as the developing world confronts environmental challenges. This underscores the importance of capacity building and the need for undertaking reforms within institutions to improve the incentive structure of public sector, which would coordinate with the corporate sector that invests and provide environmental goods and services.

### *Pilot Testing for Possible Scaling-up or Replication*

Donor agencies could provide support to small-scale projects that would pilot test the innovative market-based approaches in order to assess their feasibility and adaptability to the specific situations. Insights from this pilot testing would facilitate scaling-up or replication elsewhere, by reducing the perceived risk of such businesses and through catalytic and demonstration effects. A caveat for any scaling-up scheme is that Asian countries are in their various stages of economic development. Quality of governance, levels of income, and capacity and maturity of institutions differ from one country to another. Hence, the idea of 'one-size-fits-all' scaling-up efforts has limited relevance. What may be done is to apply market-based and private sector-led approaches selectively, based on how strong the institutions and capacity are in each respective country.

### **Concluding Remarks**

The Asia and Pacific region has a promising future if the current trends of growth continue for a reasonably long period. Environmental management, unfortunately, shows only limited success despite considerable efforts of various stakeholders. This paper recognizes the lack of concerted efforts to use market-based incentives and private sector engagement for environmental management as one of the main reasons for limited success in this area. It argues, citing examples, that markets can be created for ecosystem protection and provision of ecosystem services under innovative regulatory frameworks. Aligning ecosystem service provision with the interests of individuals who comprise the market will reduce the dependence on unsustainable donation-driven financing mechanisms.

Changing the existing command-and-control-oriented regulations to more flexible market-creating innovative regulations, enhancing institutions and capacities, and strengthening enforcement mechanisms are preconditions for market-driven environmental management systems. Some of the innovative mechanisms are nascent and still limited in scope even in the most advanced countries. Although they have a greater potential, considerable groundwork needs to be done before introducing them. However, the time is ripe for developing future vision and action plans that fully take into account the crucial role of markets and the corporate sector in environmental management. While the donor community and governments work toward this end, the corporate sector should adopt a proactive approach to capitalize on existing green market opportunities utilizing the existing regulatory framework.

Market-based innovative approaches could play a significant role in helping solve environmental problems in the region. Planners, however, should adopt a cautious approach in introducing them. As learned from past experiences, being overoptimistic and setting overambitious targets and overlooking the regulatory, institutional and capacity weaknesses in developing Asian countries should be avoided. Piloting should precede the scaling-up of market-based approaches. There is limited relevance in proposing a menu of these instruments given the need to examine the maturity and capacity of existing institutions. As such, this paper highlights some good examples, which would serve as springboards for further and more detailed research.

## Notes

1. An earlier version of this paper was published as an Economics and Research Department working paper at the Asian Development Bank (ADB). The opinions reflected in this paper do not represent the views or policies of the ADB.
2. The Millennium Declaration committed countries across the globe to meet eight Millennium Development Goals. Goal 7 aims to ensure 'environmental sustainability'.
3. Other initiatives include the Ministerial Conference on Environment and Development in Asia and the Pacific and the consequent Regional Action Program for Environmentally Sound Sustainable Development; the Kitakyushu Initiative for Clean Development; and the Regional Platform for Sustainable Development in Asia and the Pacific in Phnom Penh.
4. Safeguard policies are aimed at preventing, minimizing or mitigating the environmental impacts of development projects financed by the international development agencies.
5. Market failure refers to all the situations where private decisions result in outcomes that fail to maximize the welfare that society could derive from its resources. The conventional market failures that cause environmental problems include externalities, public goods, and lack of (or poorly-defined) property rights. The information failures and new-generation market failures such as cost discovery and coordination failures also contribute to environmental degradation.
6. For instance, Pakistan has relied mostly on command-and-control environmental policies but these have often failed, as pointed out by Faruqee (1997), because the regulatory institutions lack the resources to monitor compliance. General disenchantment with regulation and government intervention in the protection of the environment is not limited to Asia and the Pacific. Collier (1998) notes that the European Union's regulatory activity in this field and the effectiveness of command-and-control environmental measures have come under scrutiny and increasing criticism.
7. Regional GDP figures from the World Bank's World Development Indicators database, together with the Stern estimates of % GDP losses, were used to estimate the figures.
8. This research has been subjected to some criticism. Despite the shortcomings in the methodology, the figures are roughly indicative of the services provided by nature.
9. These numbers should be read with caution because the estimates were saddled with a large number of assumptions. Although the absolute values may change if they are further refined, the general policy directions suggested by these numbers will not change.
10. Cleaner production and environmental goods and services can be overlapping and the market size of these two should be viewed with caution.
11. Annex 1 Parties include the industrialized countries that were members of the OECD in 1992 plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.
12. CDM benefits sometimes make non-viable projects economically viable. This leads to attracting additional investment to implement these projects. Without CDM benefits, these investments would not be realized.

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