Towards a Sustainable Asia and the Pacific

Report of ECO ASIA Long-term Perspective Project Phase II

ECO ASIA

October 2001

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Foreword

This report represents the culmination of the two phases of ECO ASIA Long-term Perspective Project (LTPP). The first phase of the project was initiated in 1993 and presented its report in 1997. The second phase commenced in 1998. Both projects were launched under the framework of ECO ASIA to provide policy makers with scientific policy analysis on the environment and development in Asia and the Pacific region.

The key concepts for long-term sustainable development in the region developed by the LTPP are *Eco-Consciousness, Eco-Partnership, Eco-Technology/ Eco-Investment, and Eco-Policy Linkage.* The first phase of LTPP (1993-1997) focused on examining the 4 key concepts and the outcomes of this phase were published as "*A Long-term Perspective on Environment and Development in the Asia-Pacific Region: ECO ASIA Long-term Perspective Project Final Report*" (ECO ASIA, 1997). The second phase of LTPP (1998-2001) was conducted to further examine and promote the 4 key concepts and materialize the concepts with regard to critical environmental issues in the region, and its findings are included herein.

The first chapter presents the driving forces of environmental change in Asia and the Pacific region. The report goes on to discuss future perspectives on critical issues related to the environment and development in the region. Next, critical environmental issues in Asia and the Pacific are reviewed in detail. The studies examined the relevance and application of the four key concepts with respect to critical environmental issues. As several of the environmental problems identified are regional or global in nature, collaborative initiatives that have been being carried out in the various sub-regions of Asia and the Pacific are examined in the fourth chapter. Based on the analysis of the preceding chapters, the final chapter makes policy recommendations and explores future paths for developing innovative policies towards sustainable development in Asia and the Pacific region.

I would like to take this opportunity to express my sincere appreciation to everyone who contributed to the ECO ASIA Long-term Perspective Project, and have made possible advancement towards the goal of sustainable development in the region. Finalization of this report was made possible by the support and valuable contributions provided by a number of organizations and individuals, including the Ministry of the Environment, the Government of Japan, which has financially supported the project for last 9 years, Ministers and government officials of ECO ASIA participating countries and regions, delegates from international organizations, members of the LTPP steering committee, authors, reviewers, and those who provided logistical support. May I once again acknowledge the invaluable assistance provided by all concerned.

Finally, I hope this report serves as a valuable resource for those concerned with the future of sustainable development in Asia and the Pacific region, as well as for the preparatory process for the World Summit on Sustainable Development (WSSD).

Akio Morishima
Chair of the Board of Directors, President
Institute for Global Environmental Strategies

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Towards a Sustainable Asia and the Pacific: Report of ECO ASIA Long-term Perspective Project Phase II

Outline

This report is the final outcome of the two phases of ECO ASIA Long-term Perspective Project (LTPP). The first phase of the project was initiated in 1993 and presented its report in 1997[1]. The second phase started in 1998. Both projects were launched as forums for international collaboration in scientific research activities on the environment and development in Asia and the Pacific under the framework of ECO ASIA. The mission of the project is to provide the ECO ASIA with scientific background information in order to further discussions among its participants.

This report will review developments relating to environment and development within Asia and the Pacific at the start of the new millennium. It then examines, within this broad context, activities implemented under the framework of ECO ASIA LTPP and puts them in the perspective of the forthcoming World Summit on Sustainable Development.

The outline of the report is the followings:

Chapter I: The first chapter of the report makes a presentation of the driving forces of environmental change in Asia and the Pacific region. These driving forces revolve around social, economic and technological factors that affect the environment and verse-versa.

Chapter II: The second chapter discusses future perspectives on critical issues related to the environment and development in the region, such as energy consumption and GHG emission, based on the analysis provided by Asian-Pacific Integrated Model (AIM model).

Chapter III: In the third chapter, critical environmental issues in Asia and the Pacific are reviewed. The issues considered are climate change, urban environment, biodiversity, forest conservation, freshwater and environmental education. These area studies looked closely at the relevance and application of the four concepts of Eco-Consciousness, Eco-Partnership, Eco-Technology and Investment, and Eco-Policy Linkage with respect to the critical environmental issues.

Chapter IV: The fourth chapter discusses regional and sub-regional cooperative initiatives aimed at achieving sustainable development in the region. The paper reviews the current status of cooperative initiatives and looks at possible actions for the future.

Chapter V: The final chapter of the report draws on the analysis of socioeconomic conditions and critical environmental issues in the region (taking into consideration the four keys concepts developed during the first phase of the Eco-Asia Long-term Perspective Project) and makes recommendations for developing innovative policies towards sustainable development in Asia and the Pacific region.

[1] Environmental Congress for Asia and the Pacific (ECO ASIA). 1997. *A Long-term Perspective on Environment and Development in the Asia-Pacific Region: Final Report of ECO ASIA Long-term Perspective Project.* Tokyo: Environmental Congress for Asia and the Pacific, <http://www.ecoasia.org/main/about.htm>.

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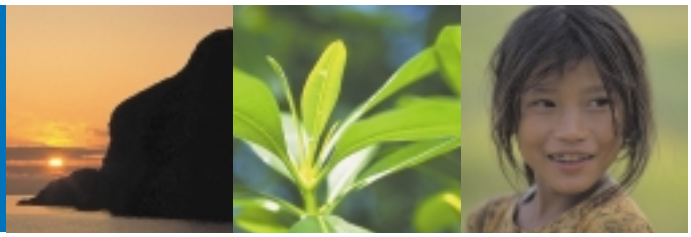
Summary for Policy-makers



INTRODUCTION

This report is the final outcome of the two phases of ECO ASIA Long-term Perspective Project (LTPP). The first phase of the project was initiated in 1993 and presented its report in 1997. The second phase started in 1998. Both projects were launched as forums for international collaboration in scientific research activities on the environment and development in Asia and the Pacific, under the framework of ECO ASIA. The mission of the project is to provide the ECO ASIA with scientific background information for discussions among its participants.

The key concepts for long-term sustainable development in the region developed by the LTPP are *Eco-Consciousness, Eco-Partnership, Eco-Technology/ Eco-Investment, and Eco-Policy Linkage*. The first phase of LTPP (1993-1997) focused on examining the 4 key concepts and the outcome was published as "*A Long-term Perspective on Environment and Development in the Asia-Pacific Region: ECO ASIA Long-term Perspective Project Final Report*" (ECO ASIA, 1997). The second phase of the LTPP (1998-2001) was conducted to further examine and promote the 4 key concepts and materialized the concepts regarding critical environmental issues in the region. Therefore, this report focuses on the findings concerning the applicability of the 4 key concepts in talking priority environmental issues in the region.

The first chapter of the report makes a presentation of the driving forces of environmental change in Asia and the Pacific region. These driving forces revolve around social, economic and technological factors that affect the environment and vice-versa. The second chapter discusses future perspectives on critical issues related to the environment and development in the region, such as energy consumption and GHG emission, based on analysis provided by the Asian-Pacific Integrated Model (AIM model). The third chapter reviews critical environmental issues in Asia and the Pacific. The issues considered are climate change, urban environment, biodiversity, forest conservation, freshwater and environmental education. These area studies looked closely at the relevance and application of the four concepts with respect to critical environmental issues. As several of the environmental problems identified are regional or global in nature, the fourth chapter examines collaborative initiatives that have been under way in the various sub-regions of Asia and the Pacific. The final chapter of the report draws on the analysis of socioeconomic conditions and critical environmental issues in the region (taking into consideration the four keys concepts developed during the first phase of the ECO ASIA Long-term Perspective Project), and makes recommendations developing innovative policies towards sustainable development in Asia and the Pacific region.

Why 4 Key Concepts

Eco-Consciousness is the first key concept identified as a fundamental basis for building a sustainable society. Eco-consciousness encompasses structures of environmental knowledge, beliefs, values and concepts that facilitate or motivate positive human behavior toward the environment. Promotion of Eco-Consciousness, i.e. to share common beliefs and values toward sustainable development among respective entities of societies, is considered to be essential for any policy addressing environmental problems within the government sector, private entities and the civil society.

Although all 4 key concepts are equally important, it is worth nothing that Eco-Consciousness has different characteristics to the others. It is considered as a conceptual tool to enable us to share local, regional and global environmental problems as common issues, while the others are concepts to guide actions toward building a sustainable society.

ECO ASIA is an informal information exchange forum to discuss possible regional cooperative actions, to share knowledge concerning the state of the environment, and to discuss effective measures to tackle critical environmental issues – all with the aim of attaining sustainable development in the region. Enhancement of partnerships among participating countries and regions, enabling them to tackle environment and development issues together will be one of the forum's fundamental outcomes. The

LTPP therefore identified the *Eco-Partnership* as one of its four key concepts.

Cooperative actions can be sought of, based on partnership among participating countries and regions. The LTPP identified *Eco-Technology/Eco-Investment* as another key concept to maximize the use of existing technological and financial resources in the region. It implies the transfer of environmentally friendly technologies to recipient countries where appropriate and the further development of innovative technologies.

Further to these concepts, the LTPP identified *Eco-Policy Linkage* as another key concept. Integrating approaches to simultaneously address local and global environmental issues (e.g. a simultaneous approach to local air pollution and global warming issues) is an important dimension of policy.

Eco-Consciousness

In past ECO ASIA deliberations on policy analyses, it has been emphasized that enhancing Eco-Consciousness is of the utmost importance in achieving sustainable development in the region. At the same time, the promotion of education to generate such awareness has been emphasized equally. This is because Eco-Consciousness is considered to be the basis for all other policy approaches as it influences fundamental ways of human thinking and behavior as well as decision-making aimed at achieving sustainable development.

The LTPP examined the nature of eco-consciousness in the region to understand the commonality and difference among diverse countries and regions. Through examination in the first research phase, it was suggested that wisdom concerning environmentally sound ways of thinking in natural resource management might often be found in traditional practices, modes of social conduct and rules for decision-making of rural indigenous communities. However, such practices are rapidly disappearing due to modernization. Therefore efforts should be made to identify, maintain, and encourage applications of such environmentally sound wisdom, which may be common or unique to the region, in order to further promote eco-consciousness.

The second phase of LTPP conducted further exploration of 'eco-consciousness' in two ways. One was to further develop the concept and summarize the key elements of Eco-Consciousness to be considered in the many levels of our daily activities, i.e. Circulation, Harmonious Coexistence, and Self-restraint. The other was the attempt to explore the nature of Eco-Consciousness in 4 countries and regions (Japan, Hong Kong, Vietnam, and Thailand) and learn policy implications from the findings.

Eco-Partnership

Eco-partnership aims at reinforcing cooperation and the exchange of experience among national governments, local authorities, the private sector, and NGOs. These actors are encouraged to promote partnerships amongst themselves crossing social, national and administrative boundaries. This will provide them with more learning opportunities, encouragement, and empowerment to tackle common issues. Such cooperative actions may also increase economic efficiency.

Among the various kinds of partnership, the partnership between the public and private sectors is particularly important for attaining sustainable development and building environmentally benign societies. A notable example of eco-partnership is private sector involvement in infrastructure development. One of the main causes of environmental problems, especially in Asian cities, is the lack of adequate infrastructure such as sewerage systems, waterworks and mass transportation systems. The World Bank estimates that total financial demand for infrastructure development in East Asia will amount to 1.3-1.5 trillion dollars between 1995-2004. Although infrastructure development has been considered to be the responsibility of the public sector, it has recently been recognized that participation of the private sector has a number of advantages. These include the enhanced mobility of private capital to meet the increasing demand for infrastructure accompanying economic growth and improved efficiency in building and operating infrastructure using the know-how of the private sector.

Eco-Technology/Eco-Investment

Eco-Technology and Eco-Investment are concepts to promote the development and transfer of environmentally sound technology and to promote investment that reconciles economic growth and environmental protection. The sustainable use of environmental resources such as energy, freshwater and forests is the key to realizing sustainable development in the region. To this end, suitable technologies need to be identified, promoted and transferred to minimize economic and environmental costs. At the same time, appropriate and strategic investment should be directed towards that purpose.

In the field of water resources management, applicable technologies may include diversified water supply systems and water treatment technologies, facilities for rainwater collection and storage, equipment for efficient water use, and knowledge of the management of water sources and reservoirs including the conservation of surrounding forests. In the field of sustainable energy in developing countries, suitable technologies should be promoted for the utilization of renewable energy sources such as biomass, wind and solar power. In particular, we should promote new and additional investment in energy conservation and efficiency improvement technologies, including the development of energy-efficient public transport.

Investment in environmental technologies will certainly contribute to increased environmental efficiency

and reduced environmental pollution. At the same time, the enhanced technology base achieved through such investment will also contribute to the improvement of productivity and competitiveness in the international market, which continues to demand higher environmental standards. In this sense, strategic environmental investments and infrastructure building will improve not only the local environment, but also the local economy. We can be richer by being greener.

Eco-Policy Linkage

The concept of Eco-Policy Linkage is to develop linkage between domestic, regional, and global environmental policies. To accomplish environmental improvement under financial and technological constraints, an integrated policy approach that simultaneously addresses local and global environmental issues is important. At the same time, it is important to link policies addressing environmental and non-environmental issues e.g. air pollution and urban planning (housing, public transportation, etc.).

Global environmental issues such as climate change are not given sufficient attention in most countries in the region. However, it should be recognized that measures to improve the local environment will often also have a positive impact on the global environment. For example, energy efficiency improvements that improve local air quality could reduce CO_2 emissions, one of the major greenhouse gases. A new approach to simultaneously address global and local environmental issues and local economic development should be sought by introducing effective environmental policy reforms and integration of policy objectives.

This Eco-Policy Linkage can provide many countries and regions in Asia and the Pacific with opportunities to improve policy efficiency and to generate new flows of funding and technology, which can be used to address local environmental issues. In order to move towards sustainable development in the region and the world, we need to seek out opportunities to create linkages between policies, e.g. the development and implementation of domestic/sub-regional/regional strategic action plans, and the careful designing of Clean Development Mechanism (CDM).

1. DRIVING FORCES OF ENVIRONMENTAL CHANGE

1.1. Population, Urbanization and Poverty

This chapter provides an overview of four socio-economic issues that comprise the driving forces of environmental changes in the Asia-Pacific region. The first is population and, in particular, the impact population growth, urbanization, and poverty has on the environment. The population in the region, which makes up approximately 60% of the world's population, has doubled in the past 40 years and such increase in population has caused environmental problems such as depletion of natural resources, over-consumption of energy and water shortage. Moreover, as a result of mass migration from rural to urban areas, population growth has centred on cities. Such urbanization has further negatively impacted the environment by causing deterioration of air and water quality, greater noise pollution, increase in waste, and sanitation problems. Furthermore, overpopulation in urban areas has also resulted in creation of slums in many cities of developing countries, contributing to health problems, seriously affecting the quality of life. Concentrations of wealth in urban areas have left rural areas poor and desolate, further affecting the environment. Approximately two-thirds of the world's poor live in Asia and the Pacific, concentrated primarily in South Asia, and approximately 80% of poor people in South Asia live in rural villages. Rural areas are vulnerable to exploitation not only by locals, but also by outsiders. Poverty negatively affects the environment in various ways, and these negative impacts further reinforce poverty.

1.2. Economic Trends

The second issue of relevance to the environment relates to economic trends. Globalisation and trade liberalization led to rapid economic growth in Asian countries and, together with industrialization, this resulted in increase in energy consumption. However, the financial crisis in 1997-98 slowed economic activities, which led to easing of air and water pollution as well as extraction of natural resources. In the aftermath of the economic crisis, public spending focused on economic recovery over environmental improvement.

Although the Asian economy recovered at a faster pace than had been expected, external debt in the region skyrocketed from 1985 to 1998. Heavy debt compelled these countries to increase production and productivity for extra earnings, thereby consuming energy and resources. Furthermore, heavy debt also accelerated the production of cash crops for foreign currency, causing negative effects on the environment such as clearing forests for expansion of farmlands and the excessive use of pesticide and chemical fertilizers.

Under such conditions, the region's economy became largely affected by external conditions, in particular massive inflows of foreign direct investment (FDI), involving both positive and negative effects. Positive impacts on the environment that FDI can have include the introduction of cleaner technology and transfer of efficient know-how in environmental management. However, in order to attract FDI, host countries may keep environmental and health standards low and make little provision for health compensation. This may have a negative impact on the environment. It is crucial for environmental safeguards to be incorporated into

economic reform in order to minimize their potentially adverse impacts on the environment.

1.3. Lifestyle Changes

The third socio-economic issue discussed is lifestyle changes. Population growth, combined with industrialization and economic development, has contributed to a worldwide shift in consumption patterns. This has resulted in increased production of goods and services and increased consumption of energy, food, water and other resources. In industrialized countries in particular, affluence is marked by possession of material goods and emphasis is increasingly placed on a lifestyle that focuses on mobility, convenience and product disposability. Such changes in lifestyle have negatively affected the environment in terms of air and water quality, land use, wildlife habitat, climate change, and waste generation and disposal. Furthermore, globalisation has resulted in the spread of environmentally wasteful and inefficient lifestyles to the rest of the world and there is growing concern regarding the added stress this will have on the environment when and if such mass consumption patterns become prevalent in rest of the world. In Asia and the Pacific region, many industrializing countries are already quickly catching up with such lifestyle trends.

Efforts are being made by various sectors of society to bring forth positive environmental changes by setting standards and regulations, introducing environmental taxes and eco-labels and increasing consumer awareness. In particular, public interest groups, in collaboration with public authorities, are making efforts to increase consumer awareness of the environment. Non-governmental organisations that work at the international, regional, and national levels have played a variety of roles in promoting better environmental governance by acting as problem solvers, advocates, visionaries, watchdogs, and service providers.

1.4. Technological Developments and Transfer of Technology

The final issue discussed in this chapter is technological development. Technological developments have been made, in the face of huge environmental challenges, that endeavour to change the structure of the economy to a more environmentally friendly one, spread more efficient and/or cleaner technologies and provide information to increase awareness of the impact such technological changes can have on the environment. Moreover, efforts are being made to transfer cleaner production technologies through development assistance. Development assistance and international cooperation have enhanced developing countries' abilities to deal with environmental issues. Such efforts are particularly important when considering that developing countries in Asia will be going through rapid industrialization in the future. By adopting cleaner production, it is possible to make industrial growth more competitive, as well as making improvements to the environment.

A technological development that has dramatically affected the world in recent years is the introduction of information and communication technologies (ICT). Many people view these as having the potential to provide a shift to more environmentally sustainable development. ICT can improve productivity, enable efficiency in terms of energy and resource consumption, reduce material consumption, and enable information exchange, communication and networking on a global scale much more cheaply and quickly than ever before. However, the prevalence of such technologies may also lead to increased consumption of energy and materials and increased waste. Moreover, there is a growing concern about the digital divide, that developing countries, which lack the resources to benefit economically from ICT, will be further marginalized by an information revolution taking place largely in industrialized countries. Efforts need to be made to tackle the widening disparities between rich and poor countries.

Rapid population growth, coupled with poverty, is firmly bonded to environmental degradation. Economic activities reinforced by globalisation and current trends of consumption patterns threaten the availability of resources in the near future. Under such conditions, technological developments have the potential to reverse negative environmental changes, though some concerns still remain. In order to achieve environmental improvement, it is important to take a holistic approach, rather than dealing with problems one by one. This overview demonstrates that policy formulation should focus on these socio-economic issues in order to combat environmental problems.

2. FUTURE PERSPECTIVES

2.1. Possible Scenarios

The IPCC SRES (2000) examined various kinds of greenhouse gas emission scenarios. Based on this analysis, AIM made estimates for energy consumption, CO_2 emissions, SO_2 emissions, land use change and water withdrawal and consumption in the Asia-Pacific region under four scenarios.

The scenarios adopted for the Eco-Asia project are labelled: *Conventional Development*, *Policy Reform*, *Fortress World* and *Great Transitions*. The Conventional Development scenario describes a future world of very rapid economic growth, global population that peaks mid-century and declines thereafter and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in region differences in per capita income. Policy Reform is a variation of Conventional Development that envisions a world in which these goals are achieved only with the active use of well-designed

policies, while still relying on the market to determine resource allocation and ensure an increase in prosperity. The Fortress World describes a very heterogeneous world, characterised by self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other scenarios. The Great Transitions scenario describes a world dominated by post-consumerist values and lifestyles and where the emphasis is on local solutions to economic, social and environmental sustainability. It is a world with continuously increasing global population at a rate lower than Fortress World, intermediate levels of economic development and less rapid and more diverse technological changes than in the Conventional Development World. These scenarios are alternative images of how the future might unfold and are an appropriate tool with which to analyse how different driving forces may influence future emission outcomes and to assess their associated uncertainties.

2.2. Basic Future Frameworks: Population and Economic Growth

The basic future frameworks on which scenarios are based consist of population, economic growth, and changes in economic structure. The population assumptions, in particular key components of the demographic driving forces such as population size and its rate of increase, population distribution, (particularly the extent of urbanization) and population structure have a significant influence on the future environment. An excessive population increase can be observed in big cities, in 2050. This increase might be a fundamental root cause of various environmental problems, such as water shortage, water pollution and air pollution, as well as exacerbating those environmental problems.

As for economic growth, the environmental impacts associated with resource consumption, such as energy-related emissions, are strongly influenced by GDP assumptions. The share of GDP in the Asia-Pacific region was about 25% in 1995 and it will increase to between 29% and 40% in 2030, depending on the scenario considered. Different assumptions on conditions and possibilities for development "catch-up" and for narrowing per capita income gaps in particular, explain the wide range in projected future GDP levels. The difference in the per capita GDP between the *Conventional Development* and the *Fortress World* is much larger, especially for China and South East Asia. The average per capita GDP will reach 5,000 dollars in 2025 in the *Conventional Development*, while it will be less than 2,500 dollars even in 2030 in the *Fortress World*.

Changes in the economic structure are expected to take place. A rise in per capita GDP tends to be accompanied by a decline in the agricultural sector's share of GDP and a rise in that of the service sector. The manufacturing sector's share of the GDP rises corresponding to the increase in per capita GDP at first and then declines in relation to the GDP increase in the service sector.

2.3. Future Perspectives

With respect to energy consumption, primary energy consumption in the Asia-Pacific region was 119 EJ (Exa Joule) in 1995 and 126 EJ in 2000. It is estimated to increase 2.4 times the 2000 level in the *Conventional Development* and 1.8 times in the *Policy Reform* scenario by 2032. Structural changes in the energy supply side demand become effective only in the longer term due to the inertia caused by long-lived capital stock and existing infrastructure.

In most scenarios, gas emissions (CO_2, SO_2 etc.) will increase to varying extents in the first half of the century and then start to decline in the second half of the century.

With rising incomes and the spread of affluent life styles, the volume of municipal waste to be treated will increase. Reduction of municipal waste has become a pressing policy issue in countries such as Japan and the Republic of Korea. In the developed countries, a re-examination of people's affluent life styles will be increasingly important not only for the reduction of waste, but also for ensuring the efficient use of natural resources. In this regard, we should further promote reuse and recycling of resources.

With regard to land use changes, forest area will slightly increase under the *Great Transitions* and the *Conventional Development* scenarios, while under that of the Fortress World, it will decrease. The biomass field will increase, especially under the *Policy Reform* scenario.

Water availability will change because of the expansion of regional activities and because of climate change. Water withdrawal in Pacific OECD countries will decrease except in the *Fortress World*, while all scenarios indicate the increase of water withdrawal in developing countries. Water withdrawal in the *Conventional Development* scenario indicates the steepest increase because of the increase of industrial water use. Water consumption in the Asia-Pacific is highest in the *Fortress World*, followed by the *Conventional Development* in 2030. The possibility of water shortages is high in the *Fortress World*. Climate change would have significant impacts on water resources. The average stream flow is expected to decrease after climate change in 2100.

2.4. Analyses of Eco-Policy Linkages

In order to move towards sustainable development, integrated assessment of policies is required. With regard to *global climate change and air pollution*, policies aimed at mitigating greenhouse gases can have positive and negative

side effects. One very important co-benefit of climate change is related to the public health effects of SO_2 emissions.

With regard to *forest management*, under the possibilities of cooperation between Annex I and non-Annex I countries of the Kyoto Protocol, joint afforestation activities between Japan and China, carried out in China rather than Japan, can increase the area available for afforestation threefold. This will mitigate the GDP loss that might otherwise result from the implementation of CO_2 reduction commitments by Japan.

Regarding *global climate change and recycling*, the AIM project team has been developing an economic model which evaluates the economic benefit of recycling activities in Japan given its severe constraint on the number quantities of final disposal sites. When paper recycling is introduced and low emission vehicles are put on the market, the GDP in 2010 will gain 729 billion yen compared with the situation where the environmental constraints of CO_2 and final disposal sites exist.

With respect to water resource management, the AIM model examined the relationship between national stock for flood control per capita and the ratio of flood disaster damage to GNP in Japan after World War II. The disaster damage is found to decrease according to the stock for flood control. While the situation may differ among countries, a similar tendency is still expected in most Asian countries. Considering the possibility to reduce flood disaster by assigning more capital to the construction of infrastructure, a simple optimising model was applied to estimate the damage potentially avoided thanks to appropriate investment in flood control infrastructure in China. Four scenarios combining climate change and investment on flood prevention infrastructure with their impacts on agricultural and non-agricultural GDP and consumption per capita were used for the simulation. The results indicate that appropriate investment in flood control infrastructure is a kind of robust no-regret policy, which seems efficient, whether or not climate change occurs.

3. REVIEW OF CRITICAL ENVIRONMENTAL ISSUES

3.1. Climate Change

The issue of climate change is the first serious difficulty that we face as humanity starts to move towards a sustainable development society. A stable climate is a prerequisite for all living things on earth. Procreation and living have been carried out in a relatively stable climate in the past. However, the expansion of human activity has now begun to destroy this stability.

Climate change is a term used to describe changes in the earth's climate caused by human activities. Scientists have predicted that the global mean temperature in 2100 might increase by 2° C (the most recent IPCC reports, which were endorsed in Bonn/COP6bis by all ECO ASIA countries suggest that temperatures are likely to rise by between 1.4 ° -5.8 ° C by 2100) compared to 1990. Many climate events such as more frequent storms, increased occurrence of drought, increased number of El-Nino and other adverse situations are attributed to global climate changes. In the absence of any efforts to prevent future changes, sea level rise and other adverse events can be expected to accelerate in the future.

In 1990, the Intergovernmental Panel on Climate Change (IPCC), which is composed of several thousand international scientists, compiled knowledge and analysis of the climate change issue in its first report. The report warned the world about the alarming possibility of global warming over the next 100 years and stated that the range of the effects will be extremely broad, affecting the whole eco-system, water resources, agriculture and the well being of people.

The Framework Convention on Climate Change was signed at the United Nations Conference on Environment and Development in 1992 and came into effect in 1994. The actual implementation of the provisions provided in the convention was to be decided in a protocol, and in December 1997, the Kyoto Protocol was adopted at the COP3 (the third Conference of the Parties). This represented a major step forward for the international community in terms of tackling global warming.

The most important issue in climate change policy is the development of domestic measures to achieve national reduction targets. This has a strong connection with the international framework. The participation of developing countries in the battle against global warming is indispensable. This has implications for the world trade order and policy for development assistance.

It is worthwhile to note that climate policy measures - such as carbon tax, emissions trading, command and control and voluntary agreements - have both advantages and disadvantages. It is commonly recognized that a combination of policy measures should be used to maximize these advantages and minimize disadvantages. In particular, great importance should be attached to the implementation of measures for the development and diffusion of technology as well as those for regulating emissions. The next topic to be discussed is how to find the optimum combination of policies when considering the characteristics of energy consumption in each sector.

Carbon taxes will not, in isolation, achieve emissions reductions unless practical energy-saving technologies are available. Economic measures will encourage technological development, but many of the proposals consisting of carbon tax or emissions trading have also included measures for the promotion of technological development through subsidies, regulations, etc.

Technological development needs to be combined with policies to restrict energy consumption and energy-intensive activities. This is because sufficient CO_2 reduction is unlikely to be achieved through technological

development alone. Economic instruments can be used to reduce energy consumption by raising energy prices. It commonly recognized that, in addition to technological development, a reduction of energy consumption and a change in underlying lifestyles is indispensable in order to achieve our Kyoto Protocol targets.

Some have made the argument that government revenues from policies such as carbon taxes should be returned to emission sources in some form, or should be used as subsidies for the development of energy conservation technologies. If revenues are given back to emission sources, the financial burden industry can be significantly relieved without impairing the environmental benefits of the incentives. In the long-tern, the greening of the taxation system in the long-term, to incorporate carbon tax revenues in the general budget while reducing conventional taxes such as income tax, will be necessary.

3.2. Urban Environment

The region covered by ECO-ASIA has a population close to 3 billion people. The area continues to experience simultaneous population growth and rapid urbanization. The Northeast Asia region including Japan, South Korea and the eastern coast of China has already undergone intensive urbanization, while South and Southeast Asia including ASEAN countries and India are rapidly urbanizing with greater potential for further growth.

Although the scale and speed of urbanization in Asia varies from one country to another, the total number of urban dwellers in Asia increased at an annual rate of 3.4% from 1950 to 2000, while the rate of increase in rural areas was only 1.4%. In 2000, nearly half of the world urban population lived in Asian cities; the proportion of urban dwellers in the total population is only 37% in Asia, much lower than other regions. If the current growth rate is maintained, however, the urban population will double in 20 years. Thus the urban population in Asia is expected to reach 2,605 million by 2030, exceeding twice the size of current Chinese population and accounting for 53% of the world's urban population.

Another aspect of urbanization in Asia is that this region has the largest number of mega-cities in the world. Out of nineteen mega-cities with a population of more than 10 million people, eleven are located in Asia. By 2015, three more Asian cities are expected to reach a population of 10 million people.

As a result of such urban growth, Asian cities are facing a number of peculiar environmental problems. A few mega-cities in the region are under heavy environmental pressures due to the overwhelming concentration of people and activities within limited areas. Yet in some of these large cities, the infrastructure necessary to sustain the functions of an expanding and advancing city and an ever-increasing population has not been fully established. In addition, many industrial cities, serving as a base for industrial production, face serious air and water pollution as a result of the policy priority given to industrial production over environmental protection. In many cases there is also a lack of financial and technical capability to solve environmental problems. Moreover, the compressed growth trajectory of the post-war Asian economy has resulted in severe deficits in the provision of infrastructure and institutional arrangements necessary for urban environmental management.

On the other hand, although Asian cities share, to some extent, similar urban environmental problems, the nature and characteristics of these problems vary from one city to another. Indeed, the evidence available so far on urban environments in East and Southeast Asian cities presents a rather mixed picture. The experiences drawn from Japan and Korea suggest that they are now encountering lifestyle-related environmental issues derived from high consumption, whereas many Chinese cities experience serious challenges due to rapid industrialization and urbanization. Southeast Asian cities show that existing urban environmental issues still remain poverty-related, such as poor access to safe water and a lack of sanitation facilities. As several studies on urban environmental change in Asia suggested, these types of environmental problems occur in sequence: poverty-associated issues - industrial pollution - consumption-related problems.

There are some aspects of the many urban environmental policy measures being used to mitigate environmental degradation in Asian cities that merit special attention in terms of effectiveness and relevance. Firstly, intense efforts from public and private sector are prerequisites for addressing urban environmental problems. A case study of Kitakyushu, a former industrial city, shows that the concerted actions of regulators (municipal government) and polluters (private firms) achieved environmental improvement. With strong commitment from business executives in favour of environmental protection, companies implemented comprehensive anti-pollution measures. As a result, they not only reduced the discharge of pollutants by changing fuels and adopting advanced technology (Cleaner Production: CP), but also saved energy by utilizing waste heat. The city government's response to environmental pollution was also quite effective and consistent. Key policies included conducting scientific studies, the strict enforcement of environmental regulations, the expansion of monitoring and inspection of polluters and dialogues among the municipal government, business and citizens. In the 1990s, the city embarked on a new challenge to develop a model of an "eco-industrial city", promoting environmental industries, especially in the fields of resource recycling and waste treatment.

Secondly, mixed approaches to environmental governance can be very instrumental in developing countries that are still undergoing socio-political transition. Historically, Asian countries have responded to urban environmental problems in two ways: bottom-up as experienced in Japan, and top-down as in China, South

Korea, Thailand, and the Philippines. The bottom-up approach, which mainly originates from the motivation, consensus, and efforts of all social actors, normally proves to be more effective in environmental governance. In contrast, the top-down approach, which only results from governmental initiatives and efforts as well as international concerns, faces difficulties such as conflicts in stakeholders' interests in growth and environment, non-compliance by regulated parties and low institutional capacities of regulators in environmental governance. Since the late 1980s and the 1990s in particular, however, citizens, NGOs, media, and civil society have increased their presence in environmental governance of East Asian developing countries and consequently a mix of top-down and bottom-up approach has emerged and gradually improved environmental performance.

Third, decentralization and deregulation, one of the newly emerging global phenomena, can provide a window of opportunity for realising sound environmental governance. Nowadays many Asian countries are experiencing political and economic movements. As a worldwide trend, globalisation (including market globalisation) and localization are common characteristics underlying these unique movements. These movements bring about, in turn, innovations in environmental governance such as deregulation and decentralization. A number of new ideas such as soft guidelines, market-based instruments, voluntary approaches and full involvement of all stakeholders have been advocated. Asian cities can benefit from these new experiences. In the case of Asia, however, care must be taken in simply replicating the European and American experiences of decentralization and deregulation, especially in the field environmental governance, as political and social conditions differ from those in Europe and North America.

The main challenges for Asian cities facing environmental degradation are as follows. Firstly, geographical balance. During central government environmental initiatives, much attention and resources is given to urban and capital regions, while rural and peripheries are largely neglected.

Secondly, local cities neighbouring large metropolitan regions tend to be a target area for industrial relocation. Facing public opposition and pressure and very limited available land for industrial relocation in large cities, governments often solve these problems by either pushing these industries outside city boundaries or relocating them to remote or less populated regions. Prior to the spurt of post-war industrialization in Asia, poorer regions had remained isolated from all pollutants caused by industrialization and urbanization. In fact, many local governments had once made great efforts to attract "smoke-stack industries" to their regions. Yet, it is increasingly seen that these regions are becoming the main sites for the relocation of polluting industries.

Thirdly, environmental problems are most severe where there is a lack of effective governance. Good governance is particularly critical for the cities, where municipal environmental management remains very poor. The lower degree of awareness of the environment in both government and the general public tends to compound environmental damage in these cities. In fact, the majority of local governments suffer adverse problems, such as severe fiscal deficits, a lack of professionals and experts, and insufficient transparency and accountability. Of the several problems that local governments face, the need for financial autonomy is greater than any other problem. In this regard, special effort should be made to secure the following conditions: revenue generation, expenditure assignments, local autonomy in budget and personnel and a transparent and rational system of grants. Along with the need for financial autonomy, local governments should address the following three common institutional obstacles: the lack of effective coordination between interested parties (government, private sector, and NGOs); the absence of sufficient incentives to induce private sector participation; and the absence of consistent political commitment to implementation.

In Asia's own experience, government has played a key role in leading environmental management, while the role of market forces has been largely neglected. However, neither governmental policies nor market forces can, on their own, achieve a sustainable urban environment or successfully address environment-related problems. Instead, the two should complement each other in alleviating growing environmental degradation in urban areas. As seen in several cases, the role of private entrepreneurs can be more profound in creating sustainable urban environments than that of any governmental policies. Moreover, private sector participation can be a reliable alternative for securing the provision of infrastructure and service delivery that the urban regions need.

3.3. Freshwater

Water is basic to human existence. Traditionally, water was considered as an infinite resource. It is only since the 1950s that policymakers have begun to espouse its economic and environmental values. A series of international meetings have addressed water issues since the 1970s, e.g. the UN Water Conference at Mar del Plata in 1977, the International Conference on Water and the Environment in Dublin and the Earth Summit in 1992. Through these conferences, policy-makers have come to recognize freshwater as a resource necessary to sustain life and ecological systems.

As a common umbrella to unite the disparate, fragmented, and ineffectual efforts on global water management, two organizations were established in 1996: the World Water Council (WWC), a think-tank responsible for the review of international policies concerning water, and the Global Water Partnership (GWP), a coordination body to promote linkage among

water-related organizations and effective international development assistance. These organizations presented papers entitled "World Water Vision for Life and Environment for the 21st Century" and "Towards Water Security: A Framework for Action" at the Second World Water Forum in The Hague, the Netherlands, 2000.

Status of Freshwater Issues

Despite concerted efforts made at global, regional, and national levels, the world water situation still has large room for improvement. In developing countries, around a quarter of the 4.8 billion people still do not have access to adequate sources of water, while half of them are without access to adequate sanitation services.

Freshwater resources in Asia and the Pacific region are under increasing pressure as a result of population growth, expansion of economic activities and improvements in the standard of living. Overexploitation of freshwater resources to meet increasing water demand has resulted in deterioration of freshwater and land resources. Salinization and aquifer depletion, both consequences of groundwater overexploitation, are becoming more serious in the intensively farmed area of Northern China, India, and Pakistan. In big cities such as Bangkok, Jakarta, and Manila, the overuse of groundwater also causes subsidence and saltwater intrusion, which result in further deterioration of groundwater quality. In the small islands in the Pacific, water scarcity, depletion of groundwater, and water pollution happen mostly because of lack of adequate techniques and management skills.

Climate change has also a great impact on water issues in all sub-regions. Sea-level rise will cause land erosion and expansion of flood plains and thus impact on people's lives, particularly in the coastal lowlands. Food security in the region is vulnerable because of rainfall variability that affects water and its management. Emergency preparation and effective land use management is necessary to cope with the problems.

The deterioration in water quality as a result of human activities is also one of the main factors that increases water stress by destroying freshwater resources and the aquatic ecosystem. Poor water quality also has a great impact on human health. In South East Asia, water pollution, particularly in the urban areas is one of the biggest water issues of the sub-region.

Asia has the lowest per capita availability of freshwater resources in the world. 1.1 billion people in the South East and East Asia were already under high water stress in 1995. The number is expected to increase to 2.4 billion by 2025. The central and South Asia sub-region has already experienced high water stress. In general, the poor are vulnerable to water shortage, pollution, and natural calamities such as floods and droughts. In the South Asian sub-region, in particular, water related services need to be improved for the poor who do not have access to sufficient water supply and sanitation systems. On the other hand, poor people, in order to subsists, often exploit natural resources such as soil and forestry, causing negative impacts on water resources, which in turn endangers freshwater resources and their own subsistence base.

Inter-basin water management is another aspect of water issues in the region, particularly in Central Asia. How to share water resources between the receiving basin and the area of origin of the water is a crucial issue. Cooperation for the sustainable use and management international rivers and lake basins should be promoted.

How to Cope with Freshwater Issues?

Current water stress is mostly caused by a lack of appropriate water management. Water policies have been formulated without consideration of the implications for all water users and without consultation across sectoral and institutional boundaries. The traditional sectoral and fragmented approach to water resource management hampers effective development and use of water resources. The lack of poverty alleviation programs also accelerates water resource degradation in Asia. As for technical cooperation, uncritical application of Western technologies often results in failure.

Water issues are very complex and diverse. To face these challenges, the following issues need to be addressed: 1) securing water for people, 2) securing water for food production, 3) protecting vital ecosystems, 4) dealing with water variability in time and space, 5) managing risks such as floods and droughts, 6) enhancing public awareness and understanding, 7) forging the political will to act, 8)ensuring collaboration across sectors and boundaries.

To tackle these eight challenges, a holistic and systematic water management approach should be introduced instead of the traditional fragmented one. The concept of Integrated Water Resource Management (IWRM), which was introduced in the Dublin and Rio Conferences in 1992, is the keyword for the new approach. GWP recently defined IWRM as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems". This definition illustrates a common framework of IWRM, but the implication of IWRM is not static. One of the most important things is to develop IWRM in the light of regional/national situation and put it into practice.

3.4. Forest Conservation

Forest Loss in the Asia–Pacific

The forest area in the Asia - Pacific region accounts for a quarter of the world's forest. In the region there are various types of forests ranging from tropical and temperate to boreal forests, all of which harbour rich forest resources and bio-diversity. The forests in the region are facing a serious crisis with accelerated forest loss (deforestation and the degradation of forest) since World

War II. Consequently the region has lost almost 95 percent of its frontier forests. Degradation of boreal forests has rapidly worsened. The proximate causes of recent forest loss in the region are logging, conversion, planting, direct destruction and a lack of adequate management. These have modified forests and led to the adoption of other land uses.

There are various domestic agents such as central and local governments, domestic logging companies and industry, military authority, and local people, all of whom are involved in activities leading to forest loss. "Economic / forest development policies with industrial emphasis" have been a leading cause of forest loss. Moreover "an insufficient political will and shortages of compliance" to stop destructive forest development was recognized as a key underlying cause of forest loss (UCFL).

Actions to Overcome Forest Loss

In order to stop such short-sighted forest resource use, all kinds of forest development should be planned, implemented and evaluated taking due account of the real value of forests. Forest loss in the region has been prompted, directly or indirectly, by top-down forest development ignoring the local people's rights and customary use of forests. Thus economic and forest policy should be reformed, placing special emphasis on participatory approaches, with a strong political will toward forest conservation. This action should be coupled with an effective legal and administrative base, involving concrete measures for the full participation of the local people in all kinds of forest management and development activities. Moreover, considering the significant impact of large-scale forest fires on forest loss both in tropical and boreal forest, the legal and administrative base for effective fire control, including proper resource allocation and regional cooperation should be urgently strengthened.

Constraints on the Participation of Local People

Enhancing the participation of local people should be a necessary component of policy reform. However a number of constraints still remain. In many cases, local people are confronted with obstacles originating in national policy and development projects. One important external constraint is inappropriate land tenure system. The land ownership of the local people is usually not approved by the government even though the people manage the forest sustainably in accordance with their customary law. Governments often grant land usage rights, without also conferring other rights such as logging or industrial plantation. Furthermore, centralized and paternalistic forest management, the so-called “forester's syndrome” is also an important external constraint. Top-down decision-making processes ignore the actual state of land utilization, which results in ineffective demarcation of forest land use and forest management plans as a result of neglecting local needs.

On the other hand, there are some "internal constraints", relating to the local communities. An alarming example of "internal technical constraints" is that TFRK (traditional forest-related knowledge) is going to fade out even in communities of indigenous people. A typical "internal economic constraint" is the lack of incentive for forest related activities compared to other activities. Indeed, conservation activities generate no monetary benefit. Even plantation forestry takes a long time to generate benefits.

"Internal social constraints" are disagreements among members of the local community and a weakening of the bonds of human relation, which hamper collective activities to manage forests. Moreover, some people hesitate to change their life-style, which is considered to be an "internal cultural constraint". Case studies conducted on some countries have revealed “external” and “internal” constraints. Such studies are useful in order to grasp the current situation and actual method of forest management on the ground. In this report, the results of field research in Indonesia, the Philippines, Vietnam and Lao P.D.R are shown as examples of these constraints.

Measures for Sustainable Forest Management and Participation of Local People

Sustainable forest management is a common goal of international society in achieving sustainable development. However, the current situation of local forest management is far from reaching this goal due to many obstacles. One of the major obstacles is a gap between the legal and administrative systems relating to forest management and the actual situation of forest and land use. In order to fill the gap, an appropriate legal and administrative mechanism, based on a flexible and decentralized approach and adapted to the actual situation of forest and land use, is essential.

Towards this aim, the following legal and administrative measures should be taken for the effective participation of local people, as a basis for realizing sustainable forest management. First of all, local participation in forest management should be set in legal terms. In addition, appropriate administrative measures should be taken by governments to ensure the effective participation of local people in the process of forest management such as the decision-making process, the management process of the protected area, the planning and implementation process of international aid programs, and the process of granting forest concessions. Developing an administrative program is another important measure. The program should be revised periodically and coordinated with other relevant programs. In addition, it should give opportunities for local people to express their views. These views should be taken account of seriously. In the process of formulating such a program, sufficient advice from experts should be provided. Moreover, national governments are required to support, instruct and encourage local government to take necessary measures to ensure participation of local people. With respect to

developing countries, international assistance is necessary for developing and implementing the program in a participatory approach.

In order to enhance the implementation of the legal and administrative system on forest management, training programs for such key actors as government officers, members of NGOs, journalists and local people should be organized with special emphasis on the values of the forest and the necessity of participation of local people. Ensuring the benefit of local people is also a key requisite for sustainable forest management under the participatory approach.

Legally authorized collective forest management by local people should be encouraged and supported and given priority over large-scale forest management by corporations. For that purpose, the necessary technical support should be provided. Where appropriate, the collective forest management bodies should be authorized by government to enforce the necessary regulations. In developing forestry plans, coordination among relevant ministries and authorities is necessary.

Secondly, individual-based forest management should be supported through legal assurances that guarantee the rights of the local people over the forest. A plan supporting tree plantation and benefit sharing should be established.

In order to secure the rights of local people, a "dispute settlement system" including independent informal mechanisms or an ombudsman should be established. The mechanism should include procedures for objection or appeal. For the purpose of efficiency, an option to choose/agree with a dispute settlement mechanism, through a legal forum or out of court should be ensured. Recourse to traditional conflict resolution mechanisms should be considered when deciding which mechanism is appropriate for the resolution. In addition, information disclosure and such support as necessary expert's advice and appropriate financial assistance can be essential for proper operation.

3.5. Biodiversity

The Asia-Pacific region is recognized as the richest of the global biodiversity regions, with the second largest rain forest complex, the world's highest mountain system (Himalayas), more than 50 percent of the world's coral reefs and a great number of small island systems. Seven of the world's 17 megadiversity countries (which hold 70 percent of the world's animal and plant species), are to be found in the Asia-Pacific region (Mittermeier *et al*., 1997).

However, the diversity of life in the region has been continuously damaged and lost over recent decades, as a result of human activities. Of the 640 species listed for protection under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 156 are found in China and approximately 15 to 20 percent of wildlife species of that country are endangered (UNEP, 1999).

Although the true extent of biodiversity loss in the region is yet to be understood due to inadequacy or lack of data, it is known that the major threats to biodiversity are *habitat degradation, overexploitation and species invasion. Habitat destruction* of vertebrate, invertebrate and plant species has come from the clearing and burning of forests, draining and filling of wetlands and urban development in coastal areas. Between 1948 and 1987, the estimated forest cover in the Philippines decreased from 50.5 percent to between 22.2 percent and 23.7 percent (DENR and UNDP, 1997). Ninety six percent of primary forest habitat has been lost in Bangladesh (WRI/UNEP/UNDP, 1994). The remaining mangrove forests in the Malaysian Peninsular have fallen from 113,348 ha in 1978 to only 88,731 hectares in 1994 (Latiff and Zakri, 1998). *Over-exploitation* has been observed as human populations have increased and their use of natural resources has escalated. *Species invasion* results from the intentional or accidental introduction by humans of wildlife or livestock species to new regions of the world and has caused huge environmental damage. The new species, being predators or competitors, cause negative impacts on native species. The major elements of the ecosystem in Asia and the Pacific region i.e. forests, grasslands, wetlands and freshwater systems, and coastal areas are all facing various sorts of threats.

The countermeasures taken to address threats to biodiversity have been conventional approaches based on three major instruments - *establishing protected areas, implementing conservation countermeasures outside protected areas, and restoring biological communities in degraded habitats.* The establishment of legally designated *protected areas* such as national parks, wildlife sanctuaries and other kinds of natural reserves is one of the most critical strategies for conservation of biodiversity. In the Asia-Pacific region, most countries have protected areas for biodiversity conservation. The region now has 209,476,000 hectares[1] of protected areas (UNDP/UNEP/WB/WRI, 2000). Despite this expanding endeavour, many of the listed important habitats are yet to be designated as protected areas. *Ex-situ* conservation is one other alternative for conserving biological resources. Manipulations through botanical gardens and zoos are one option for recovering populations that have been depleted. Methods available to recover declined populations include head starting and transplanting to augment existing populations or establish new ones. International networks among botanical gardens and zoological parks can facilitate cooperation in *ex-situ* conservation. However, *ex-situ* conservation remains a second best and might be ineffective if the original threats to habitats are not removed. Damaged or degraded ecosystems might be

[1] National areas of at least 1,000 hectares in five of the six management categories defined by the World Conservation Union (IUCN).

rebuilt to indigenous or historic ecosystems through the process of intentionally altering and duplicating the structure, function, diversity and dynamics of the ecosystems. Efforts to restore ecosystems have more focused on lakes, prairies, wetlands and forests, since these ecosystems are the most affected by human activities.

Due to limitations of conventional methods of protecting biodiversity, new trends have emerged, which are based on an integrated approach. As an alternative to the sector-by-sector approach, recent focus has been on the integrated area management approach, which applies a coherent set of resource management policies across sectors to particular ecologically important areas. When promoting an integrated approach to biodiversity conservation, two factors need to be given attention: participation and economic incentives. People in the communities around protected areas are often poor, and politically weak and lacking access to public services. When those people historically depend on natural resources within the protected area, they might perceive that the protected area further limits their livelihood and therefore might have no incentive to corporate with the park management. Unless local people receive economic benefits from a conservation policy or measure, that policy is unlikely to secure effective long-term biodiversity conservation. Thus, giving economic incentives to the local community is significant to sustainable development as well as the integration of local social issues into the policy making process. One of the options for economic benefits is the development of well-managed eco-tourism within or adjacent areas to the protected area, which generates income for both communities and government.

3.6. Education for Sustainability

The paper gives a brief summary of findings on the overall status of environmental education in the Asia-Pacific region. Results are based on 36 status reports and case studies of four key sectors (1) business and industry, (2) NGOs, (3) media, and (4) higher education.

Overall Status of Education

Data and information suggest that there is a high level of public awareness regarding the protection of the environment in the region. Countries are trying their best to integrate their environmental concerns into the formal curriculum as well as in educational programs; curricula are revised and teachers are trained. Nevertheless, the region is characterized by a great diversity in educational systems and philosophies, centrally controlled curricula, inadequate infrastructures, chalk-and-talk methods of teaching and an examination-oriented education system. At the same time, the region also harbours successful practices of indigenous knowledge, wisdom and practices. Common trends in education can be summarized as follows.

(i) There has been a progression towards greener curricula and educational programs. Composite courses, integrated courses and specialized courses are found respectively at primary, secondary and tertiary levels. Generally, cross-curriculum approaches have been adopted to integrate environmental concepts into the curricula.

(ii) Environmental education is seen as a new perspective to total education and deals with the issue in a holistic manner and takes into consideration the environment that surrounds and affects people.

(iii) Environmental concerns can now be found not only in courses related to natural science but also to social science.

(iv) Innovative co-curricular activities such as nature clubs, outdoor camp, street theatre, eco-farming, eco-harvesting and internships, are being practiced to provide students with first-hand knowledge and skills in school as well as out of school.

Successful Practices

A cursory review of 36 status reports leads us to conclude that the region is full of exceptionally successful educational examples, some of which include; (1) formation of an Inter-Ministerial Steering Committee for Environmental Education in Cambodia; (2) a successful story of a project “Hand in Hand in the Earth Village” in building two primary schools from the sale of recycled products in poverty-ridden Jiangxi Province in China; (3) a verdict of the Supreme Court of India to the University Grant Commission to include environmental courses in the universities and the establishment of two centers for excellence in environmental education and awareness; (4) joint initiatives of two ministries in establishing Environmental Study Centers responsible for education and training, research and community service in the living environment in Indonesia; (5) establishment of junior eco-club, a nationwide “green” club activity in Japanese schools; (6) designation of conservation model school and honour schools in Korea to promote conservation education at school, home and community, (7) joint partnership between the Department of Wildlife and National Parks and the Ministry of Education in Malaysia to organize camping and nature education courses for school children on holidays, (8) mandatory requirement for students to plant three trees in the rainy season in Myanmar's schools, (9) greening of religious and opinion leaders in Pakistan, (10) a comprehensive plant project for primary school students in Tonga and (11) a nation wide network of educational institutions in the Philippines.

Case Studies

Brief summaries of the findings of four case studies are presented below.

(i) The case studies on business and industry indicated that environmental educational activities are still in the evolutionary process. Still many exemplary and outstanding examples of eco-businesses are found in

the region, especially in developed countries. The study also suggests that business and industry sectors needs to concentrate on developing in-house capacity building of the company, promoting green consumerism and developing symbiotic partnerships with others.

(ii) Two case studies from Japan and Indonesia indicate that environmental NGOs are actively involved in environmental education activities. In Indonesia, a national environmental NGO network JPL (*Jaringan Pendidikan Lingkungan*) established with financial contributions from Japan-US Common Agenda for Roundtable has been successful in improving social learning, sharing of resources, etc. The study also emphasized the need for international assistance for promoting environmental education activities in both countries.

(iii) Data from research work on the media indicates that the mass media are active in, and responsible for, promoting environmental education, training and public awareness in the region. The study suggests the need for more funds for the development of environmentally friendly information technology, for supporting environmental literacy programs and for tailoring information technology to specific countries' needs.

(iv) The case study on higher education suggests that environmental education began with a concern to improve industrial pollution. However, nowadays, environmental concerns have been incorporated in natural as well as in social science courses. Still, more focus is given on natural resource management in developing countries. The study suggests the use of an open education approach in promoting environmental education. Other suggestions emphasize policy setting, external collaboration and more training facilities at the tertiary level.

Major Issues and Problems

The major barriers to the implementation of environmental education in the region can be summarized as follows.

(i) Lack of national policy and guidelines
(ii) Bias of curriculum and education programs towards natural science
(iii) Lack of whole-government commitment
(iv) Inadequacy in trained manpower and facilities
(v) Centrally controlled curricula and conventional teaching methods
(vi) Inadequate school infrastructure
(vii) Unavailability of, and inaccessibility to, data and information

Mechanism of Regional Cooperation

With a view to establishing a regional mechanism of cooperation in environmental education, the Project has formulated a document, *Regional Strategy on Environmental Education in the Asia-Pacific Region.* The document is the outcome of a series of participatory exercises with stakeholders, together with an analysis of 36 status reports. It is intended to foster eco-consciousness in relation to a sustainable society in the Asia and Pacific. It has a mission statement aiming "*To provide leadership in promoting, inspiring and fostering citizens to work towards achieving a sustainable future*". The intended users of the document are agencies, organizations and educational institutions. Other beneficiaries include those who are concerned with environmental education in the region. The document has suggested a framework of four actions, which are as follows.

(i) Strengthen the capacity of stakeholders.
(ii) Develop partnership for collaborative works.
(iii) Review curriculum and program development.
(iv) Facilitate the improved governance for environmental education.
(v) Mobilize external assistance for educational activities.

Conclusions

The study on education for sustainability indicates that people of the region are aware of, and responsive to, the need for environmental education to improve the quality of human life. They have shown interest by incorporating environmental concerns into formal as well as non-formal education programs. Many pioneering activities have been initiated and an enthusiastic leadership appears to be emerging regardless of great resource constraints, persistent poverty, rising population, conflicts in resource use, inequity and faulty development projects. Taking all these points into consideration, it is suggested that a whole-government approach of education should be adopted to address the issue of environmental education in the region.

4. INSTITUTIONS FOR REGIONAL/ SUB-REGIONAL COOPERATION ON SUSTAINABLE DEVELOPMENT

4.1. Current Status

Most global and regional environmental problems are rooted in human activities taking place at the local and national levels. Appropriate local policies are therefore a crucial part of solving regional and global environmental problems. Nevertheless, as clearly stated in Agenda 21, no nation can achieve the aims on its own, but only in close collaboration and good partnership with the United Nations, other international, regional and sub-regional organizations, local governments, and with broad public participation. Regional and sub-regional programmes on environmental cooperation have, since around the time of UNCED, started to gather pace in Asia and the Pacific. The UN/ ESCAP has hosted a Ministerial Meeting on Environment and Development for every five years since 1985, leading to the adoption of Regional Action Programmes (RAPs).

In the Asia-Pacific region, which includes more than

forty geographically, economically and politically diverse countries, collaboration at the (smaller-scaled) sub-regional level has been emphasized by many international and regional organizations. This has resulted in the activation of existing sub-regional environmental programs and plans such as the ASEAN Strategic Plan of Action on Environment, the South Pacific Regional Environment Programme (SPREP) and the South Asian Cooperative Environment Programme (SACEP). The 1990s also witnessed the emergence of a multitude of new initiatives such as the Northeast Asian Sub-regional Programme on Environmental Cooperation (NEASPEC) and ECO ASIA.

The emergence of such initiatives alone, however, does not ensure institutional effectiveness. In fact, in several cases, organizations for environmental cooperation have not yet been fully and satisfactorily developed. There are still gaps between the planning and the implementation stages. Insufficient capacity in terms of technical, personnel and financial resources are among the major obstacles for many developing countries in implementing environmental governance programs and plans. Also, the effectiveness of the linkages between actors within a state and actors operating internationally has been strongly influenced by domestic politics. In many cases, the outlook for accomplishing their tasks is unclear.

4.2. Towards Further Promotion of Cooperation

To address this problem, this paper considers three specific cases of sub-regional cooperation in Northeast Asia, Southeast Asia and South Asia, together with cross-sub-regional initiatives. This is followed by a comparative analysis of the mechanisms and institutions for sub-regional environmental cooperation. The analysis indicates that mechanisms of environmental cooperation vary from one sub-region to another.

In Northeast Asia, several institutions for environmental cooperation have been established through different channels, which require further coordination. The status of participating states differs from one institution to another, depending on diplomatic relations between countries and on the international membership of the host organization. In the absence of regional organizations, which can administer regional environmental plans and programs, each of them must start negotiations from scratch. Some have stagnated in terms of institutional and financial development. This sub-region, therefore, needs to create a mechanism for systematic coordination between all the existing initiatives. In the long-term, a comprehensive and strategic environmental action plan should be developed for medium and long-term objectives. Enhancing coordination between Japan and the Republic of Korea, which have commenced several initiatives independently, would contribute to building a common framework for cooperation in the sub-region.

Southeast Asia, unlike Northeast Asia, is characterized by well-established institutional structures. A number of environmental action plans and programs have been initiated by ASEAN, which has expertise in administering regional cooperation in various fields. ASEAN's well-designed organizational structure has been applied to the environmental field, and there are strong affiliations between each component of the organizational structure. Accordingly, there has been little redundancy between environmental cooperation activities within ASEAN. ASEAN is, however, not strong financially, and has mostly relied on external financial support for implementing its environmental activities, which have been provided mostly on a project-by-project basis. This has led to a failure in executing several project proposals which did not attract donors' attention.

Recent talks regarding the issue of forest fire and transboundary haze led to the process of developing and negotiating the ASEAN Agreement on Transboundary Haze. The development of a legally binding treaty is, however, not the only solution. It is more important to create mechanisms for bringing countries to comply with international commitments. To this end, policymakers in the Sub-region will need to coordinate their activities with technical and financial assistance mechanisms.

Finally, with regard to South Asia, two regional organizations, SACEP and SAARC have pursued regional cooperation on environmental issues. South Asia has difficulties in mobilizing sufficient financial resources for environmental protection. Funding comes from international organizations and bilateral donors, but according to the donor's preference. The amount of funding within South Asia and other sources is insufficient to carry out all the planned environmental activities.

In order to handle this difficult situation, both SACEP and SAARC need to strengthen regional environmental cooperation by working together on projects and activities. Environmental cooperation based on the SACEP has become more active. SACEP therefore needs to advance the strategic goals of regional environmental cooperation, which will benefit both sustainable development and the fostering of mutual trust and peace in the region.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

The four concepts of Eco-consciousness, Eco-partnership, Eco-technology/ Eco-investment and Eco-policy linkage underlie broad strategies for tackling critical environmental problems facing countries in the Asia-Pacific region. The study of critical environmental issues indicates that the potential of the four concepts has not been exhausted, suggesting that greater efforts can be undertaken for their implementation. In the following part, these cases are reviewed, and lessons learned from their experience drawn to further promote the implementation of the concepts.

5.1. Eco-Consciousness

Eco consciousness is the fundamental basis for building a sustainable society. It can be regarded as the cornerstone of any policies addressing environmental problems within the government sector, private entities or civil society.

Climate Change

Technological development will be a major, but not sufficient element in order to face the challenge of climate change and to reach the objectives of the Kyoto Protocol. In addition to technological innovation, a reduction in energy consumption and a change in underlying lifestyles are indispensable. These require a greater environmental consciousness among people and business, implying a change in lifestyles.

We envisage that a change in lifestyle will require emission reductions in the industrial, residential and transportation sectors. One of the instruments that might raise environmental consciousness and induce reduction in emissions from the transportation and residential sectors is the use of "downstream" regulation and/or taxation, which directly places additional costs on energy consumers, thus having a greater effect.

Urban Environment

With respect to urbanization and urban environmental management, eco-consciousness has been rising in many Asian countries. This is reflected in the increase in the number of environmental NGOs in Korea and the Philippines, environment-related social activism in Thailand, and national environmental programs, actions and campaigns in China, to name a few examples.

In order to further promote environmental consciousness and greater public participation in urban environmental management, further efforts should be directed at:

(i) Creating specific institutions for representatives of the public to be involved in environmental policymaking. Environment councils under the Japanese national government and local governments, the National Environmental Board in Thailand, the Citizens' Committee for a Green Seoul, and The Philippine Council for Sustainable Development all provide good institutional models for other Asian countries.

(ii) Establishing formal and informal institutional mechanisms for the public to monitor the environmental performance of government and business.

(iii) Improvement environmental dispute and compensation mechanisms. Experiences in Japan and Korea prove that this can foster public participation in environmental protection.

(iv) Ensuring public disclosure of environment-related information covering not only environmental quality data but also information regarding policymaking and the environmental performance of government and business. In China, the release of weekly reports on environmental quality has been significant in educating citizens and fostering interest in environmental protection.

Freshwater

The limited per capita availability of freshwater resources puts water at the forefront of environmental challenges for the Asia-Pacific region. Despite efforts to identify additional sources of freshwater, growing population will continually decrease the availability of water. Public awareness and education are crucial in promoting the most efficient use of the limited water resources available.

Public awareness and community education programs are particularly important among women, youth and farmer groups. We suggest that education programs that help communities understand the linkages between water, sanitation, health, and productivity be encouraged.

In raising environmental consciousness with respect to water conservation, two fundamental issues need to be addressed:

(i) First, recognizing the social, environmental and economic value of water in all its competing uses;

(ii) Second, changing the perception of water as an infinite bounty.

Addressing these issues will require new policy measures including the introduction of water fees/charges and a clear allocation of rights and responsibilities pertaining to water use and discharges.

Forest Conservation

With respect to forest conservation, a greater interest has been noticed in most Asia-Pacific countries. However, there still remains an overly simplistic and stereotyped conception of the causes of forest loss. In raising public consciousness, emphasis should be put on the fact that the loss of forest is not only due to shifting cultivation but also many other proximate and underlying causes.

The strong demand for natural resources both from forests and forest-converted land has been identified as one of the underlying causes of unsustainable forestry practices in the Asia-Pacific region. The gap between supply and demand will continue to put great pressure on forest sustainability. It is therefore urgent to initiate measures that limit the demand for forest products to an extent that will allow sustainability. Such measures should target consumers - individuals and countries - and encourage a sustainable use of forest resources and recycling. In doing so, mechanisms through which consumers are informed of the environmental soundness of forest products and processes can play a crucial role. Mechanisms such as forest certification schemes can ensure that consumers get the right information concerning the legality of products they acquire and thus act as safeguards in the marketplace. In order to develop acceptable forest certification schemes,

it is recommended that priority be given to:

(i) Setting standard evaluation criteria and indicators among certifying institutions;
(ii) Developing domestic criteria and indicators based on those of the Forest Stewardship Council[2] and;
(iii) Establishing Asian certifying institutions.

Biodiversity

Two sets of policies are crucial to the conservation of biodiversity:

(i) Setting regulatory controls over access to and exploitation of resources under serious threat of complete loss;
(ii) Establishing legally designated protected areas, such as national parks, wildlife sanctuaries and other kinds of natural reserves. Such a strategy is already in place in several countries in the Asia-Pacific region. In total, the protected area in this region is 209,476,000 hectares.

Rising environmental consciousness has contributed a lot to the understanding, already widespread among scientists, policy makers and the general public, of the importance of biological diversity. Policy makers have also started to accord greater consideration to knowledge based on cultural and traditional values. This has prompted further research and monitoring aimed at achieving a better understanding of the current situation of the biodiversity in each country. The Global Taxonomy Initiative (GTI)[3], which has been launched under the framework of the Convention on Biodiversity, is one such example. Environmental awareness has also increased regarding the fact that often, environmental damage related to biodiversity is irreversible (i.e. the complete loss of biological resources), has also increased.

Education for Sustainability

Environmental education has been a major tool for promoting environmental consciousness. A study that reviewed the experience of 36 countries across the Asia-Pacific reveals a range of institutional changes, changes in curriculum, and educational programs to promote education for sustainability. The "Hand in Hand in the Earth Village" project run by primary school students in China, the establishment of Environmental Study Centers in all state universities in Indonesia, Junior Eco-Club in Japan, the Philippine Association of Tertiary Level Education Institutions in Environmental Protection and Management (PATLEPAM) are but a few of the many initiatives towards education for sustainability in the Asia Pacific region.

In order to further promote environmental consciousness, the following measures should be considered:

(i) Improving coordination between ministries, with the ministry of education assuming a leading role in the conception and implementation of programs promoting environmental consciousness, would strengthen the institutional structure for environmental education;
(ii) Moving the focus of environmental courses from physical and natural sciences into social sciences. Social sciences are more likely to provide the kind of intellectual understanding and awareness able to change human behavior in more environmentally sustainable ways;
(iii) Integrating the various levels of the educational system from primary to tertiary levels of education;
(iv) Increasing the among of trained manpower available for environmental education, especially educators and facilitators.

5.2. Eco-Partnership

All segments of society, from government to business and citizens share responsibility for human-induced environmental problems. Consequently, all should be all actively involved as partners in finding solutions to these problems. Eco-partnership aims at responding to this need.

Climate Change

Because of the global nature of climate change, policy responses need to involve the greatest possible participation across society and countries. Based on the UNFCCC, a number of mechanisms for cooperation were introduced by the Kyoto Protocol to enable eco-partnership involving governments, business sectors, and non-profit organizations. In particular, mechanisms for joint implementation, emission trading, and the Clean Development Mechanism have great potential, which already has started to be explored. Under the UNFCCC, joint activities have already initiated in a few countries in Asia and the Pacific.

One of the most important realizations of eco-partnership in the Asia-Pacific region is the ALGAS (Asia Least-cost Greenhouse Gas Abatement Strategy) Project, a technical assistance project being executed by the Asian Development Bank. The ALGAS project reviews the national GHGs emissions and the projections of GHGs emissions of 12 Asian countries, and analyses mitigation options under different economic strategies.

[2] The Forest Stewardship Council (FSC) is an international non-profit organization founded in 1993 to support environmentally appropriate, socially beneficial, and economically viable management of the world's forests. The FSC accredits organizations with an international labelling scheme for forest products, which provides a credible guarantee that the product comes from a well-managed forest.

[3] The Global Taxonomy Initiative (GTI) has been established by Conference of the Parties to the Convention on Biological Diversity. The purpose of the GTI is to remove or reduce the taxonomic impediment – that is the knowledge gaps in our taxonomic system (including those associated with genetic systems), the shortage of trained taxonomists and curators, and the impact these deficiencies have on our ability to conserve, use and share the benefits of biological diversity.

Other regional frameworks for partnership include the Tripartite Environment Ministers Meeting (TEMM) among China, Japan and Korea, the South Pacific Regional Environmental Programme (SPREP), the South Asia Co-operative Environmental Programme (SACEP), the South Asian Association for Regional Co-operation (SAARC) and a number of co-operation programmes among member countries of the Association of Southeast Asian Nations (ASEAN).

In order to enhance regional partnership in the Asia-Pacific region, future action should aim towards:

(i) Strengthening cooperation mechanisms, with possible institutional arrangements in East Asia.
(ii) Reinforcing the financial capability of Southeast Asia to support the already well-developed framework for co-operation in that sub-region.
(iii) Finding ways of coordination between the parallel institutions existing in South-Asia.

Urban Environment

Significant institutional changes have enhanced interactions between public and private sectors and NGOs and reduced the centralization of functions in government. In this context, voluntary actions can supplement command-and-control methods and form the basis of more effective environmental management.

Inter-regional and inter-sectoral partnerships should be developed in areas such as urban water resource management because urban water management cannot be carried out within a single city, but rather requires a comprehensive approach including natural hydrological cycles and socio-economic aspects. Three areas require particular attention for enhancing eco-partnership with regard to water issues in urban environment:

(i) Water pollution control;
(ii) Water resource management and;
(iii) Inter-city and inter-regional co-operation for water resource allocation.

Some of the major achievements made in this regard include inter-city co-operative initiatives in urban environmental management such as the "Kitakyushu Initiative for a Clean Environment". Such forms of partnership can be further extended into academic co-operation at regional and international levels.

Freshwater

Freshwater offers one of the most promising areas of eco-partnership - public-private partnership in water delivery and water related-infrastructure. There are already several cases of water-related public-private partnerships across the Asia-Pacific region. This kind of partnership can greatly contribute to improving performance and efficiency and should be encouraged further. Based on such experiences, greater private participation should be encouraged in such ways as:

(i) Combining public responsibility and ownership with private management in water service delivery;
(ii) Involving the private sector in water supply and wastewater treatment services in urban areas, based on agreed performance parameters.

Forest Conservation

Cooperation among local people, private corporations, local authorities, national authorities and non-governmental organizations is necessary for sustainable management of the forests. In order to enhance eco-partnership between the various stakeholders, attention should be paid to following factors:

(i) Changing the attitude of foresters (both corporations and government) - the so-called "foresters syndrome" or paternalistic professionalism that overly emphasizes the value of forests without integrating the concerns of people living in the forest areas. Eco-partnership should take place under socially acceptable and environmentally sustainable forest management.
(ii) Introducing "social forestry" that involves local people in forestry activity for the purpose of rural development, as a long-term alternative to "industrial forestry".
(iii) Establishing conflict resolution mechanisms through the channel of courts and also informal settings to ensure an adequate framework for partnerships that protect the rights of the local people.
(iv) Providing economic incentives for communities to be involved in forest conservation to offset the fact that compared to other activities, forest related activities generate no monetary benefit or take a long time to yield benefit, such as in the case of plantation forestry. This reality has constrained effective local involvement in forest conservation activities.

Biodiversity

The establishment of protected areas is one of the most effective means of biodiversity conservation. However, it has been observed that the establishment of protected areas might further limit the livelihood of people living around and historically depending on the resources within such areas. It is therefore important to develop mechanisms for partnership that ensure a sustainable use of biological resources while enabling local communities to make use of such resources for their living. The involvement of the local community provides not only a more effective mechanism for biodiversity conservation but also provides access to the traditional knowledge and resource management practices of such indigenous people. The San Salvador Islands Marine Park in the Philippines is a successful case of a protected area being established in partnership with the local community.

At the international level, there have been initiatives towards sharing experiences and information amongst countries with the aim of biodiversity conservation. The "Asia Pacific Migratory Waterbird Conservation Strategy" initiated in 1996 is one such example. Under that strategy, three different programmes on shorebirds, cranes and

Anatidae of the region were planned and implemented jointly by governmental and non-governmental organizations.

Future policy initiatives should aim at:

(i) Initiating policies aimed at making it profitable for local communities to conserve their resources rather than exploit them. Such policies could include eco-tourism programs that generate revenues for the local community and the country and ensure an environmentally and socially acceptable management of biological resources.

(ii) Strengthening the biodiversity-related activities of regional cooperation mechanisms such as ASEAN, SACEP and SPREP.

Education for Sustainability

Sharing knowledge and exchanging experiences is particularly important in promoting environmental education. To that purpose, a network of environmental educators and facilitators from different backgrounds has been established across 36 countries of the Asia-Pacific region. This network was employed to prepare national reports from the respective countries to assess the environmental education situation of the region.

One of the remaining challenges is to increase cooperation among the governmental agencies dealing with environmental education.

5.3. Eco-Technology and Eco-Investment

To reduce environmental pollution and to use natural resources efficiently, the need for of environmentally sound technologies must be acknowledged and such technologies must be promoted. To this end, new and additional investment is necessary both in public and private sectors. In developing countries, however, technical and financial sources for eco-technology and eco-investment are limited.

Eco-technology and eco-investment are particularly relevant to the issues of Climate Change and Urban Environment Management.

Climate Change

In order to reduce the emissions of greenhouse gases, the technologies for promoting efficient use of fossil fuels, use of alternative energy sources and abatement of air pollution are crucial. Such technologies can be applied to many aspects of human activity such as production, consumption and transportation. Though such technologies have been created and promoted in developed countries, they have not yet been widely adopted in developing countries.

For developing countries in Asia, there are two barriers to eco-technology and eco-investment. Firstly, resources and funds are allocated towards economic growth rather than environmental protection. Secondly, there are insufficient financial resources devoted to eco-technology and eco-investment.

To facilitate the financing of greenhouse gas emissions reductions, donors have provided Official Development Assistance to developing countries. However, these funds have not been sufficient.

For further promoting eco-technology and eco-investment the following approaches have been recommended:

(i) Under quantified targets, designing and introducing appropriate emissions trading systems and carbon taxes could improve economic efficiency. Economic instruments that reduce emissions of CO_2 through price changes will not be effective unless practical energy-saving technologies are available.

(ii) Alternative sources of energy with low or zero CO_2 emissions, such as renewable energy (wind, solar, biomass, geothermal energy, etc.) and natural gas should be considered from a long-term perspective. In promoting the development of alternative energy, conventional measures such as subsidies for initial investment could be combined with policies to stimulate trade in electricity generated by alternative energy in a liberalized market (e.g. green certificates).

Urban Environment

Urban environmental management is another issue in which eco-technology and eco-investment are particularly relevant. Urban poverty, rapid economic growth, industrialization and the emergence of high consumption lifestyles have all put pressure on the urban environment of Asian cities. Lack of access to clean water for the urban poor, industrial pollution and lack of waste treatment facilities in Asian cities, particularly in Asian mega cities, suggest that investment in urban environment infrastructure has not been sufficient in these cities. It is expected that the countries at a “production stage” will soon enter the “consumption stage”, implying higher consumption lifestyles, which will bring up additional volume of municipal solid waste.

Investment in waste treatment facilities, water treatment facilities and public transportation is insufficient in Asian cities, due to biased resource allocation towards big cities over smaller ones and, the poor financial capacities of the governments. To overcome these difficulties, governments should enhance the public capacity to finance urban environmental infrastructure and mobilise private funds. The development of public-private partnership is critical in this respect.

The following set of policy instruments is required to help facilitate investment in urban infrastructure:

(i) Institutional arrangement: the creation of special governmental organizations (e.g. the BOT center in the Philippines) to encourage the participation of private sectors in private finance initiatives (PFI);

(ii) Participatory approaches: public participation in the process of policymaking at city level (e.g. the creation of environmental councils being composed of

representatives of the public and business as well as government);

(iii) Information diffusion & environmental education: the media has an important role in monitoring the environmental performance of government and business.

These three-policy instruments are relevant to overall urban environmental management of Asian cities and complement each other. To further enhance their effectiveness in achieving the desired environmental conditions, regional/international frameworks for cooperation are crucial. In addition, policy-makers should be concerned with investment in technological development of efficient energy aimed at reducing traffic air pollution.

Freshwater

Technological innovation and adaptation are key components of efforts within the water sector. At the conceptual level, models and forecasting systems are being improved to allow better predictions of temporal and spatial variations in the quantity and quality of water resources. Some of the areas where technology development policies should focus are:

(i) Water saving technologies in irrigation (e.g. drip irrigation);

(ii) Improved and cost-effective methods for the treatment and reuse of wastewater in industries and domestic systems, aquifer recharge technologies, human waste disposal systems that require no or extremely small quantities of water and cheap but effective water purification systems for villages.

Forest Conservation

Traditional Forest Related Knowledge (TFRK) will, alongside modern technology, play an important role in forest conservation and sustainable forest management. In order to understand/realize the potential of TFRK, further field research by anthropologists and ethnobotanists should be encouraged.

Biodiversity

Modern technology can foster biological protection in two ways - prevention and restoration. Using Geographic Information Systems (GIS) in the process of making a development plan can make it possible to identify crucial habitats for endangered species and ecosystems and suggest the most appropriate zoning plan for the conservation of species/ecosystems.

Once an ecosystem has been destroyed, some part of it will never be restored and it takes several years for other parts to recover. Some technologies have been developed and applied in various fields to restore deteriorated ecosystems and there are some successful cases. For example, botanical gardens and zoos can be used to recover lost populations. Head starting and transplanting to augment existing populations or establish new ones are among the other methods for recovering declined populations. International networks among botanical gardens and zoological parks can facilitate cooperation in *ex-situ* conservation. While technologies for recovery and restoration of biological resources should be promoted, the prevention of habitat destruction must be set as a priority in conservation policies.

5.4. Eco-Policy Linkage

There are three practical implications of the concept. The first one is that countries address their domestic environmental issues at a regional or global level. The merit in such an approach is that it provides developing countries with new flows of funding and technologies. The second one is that different sectoral policies are integrated to tackle environmental problems. The third one is to link different socioeconomic policies in their relation to the environment.

Climate Change

At the third session of the Conference of the Parties (COP 3) in December 1997, governments agreed to adopt the Kyoto Protocol, which requires developed countries to reduce their GHG emissions by 5.2 percent of the 1990 level by the period of year 2008-2012, while developing countries are exempted from reduction commitments.

However, in the future, the participation of developing countries will be indispensable in attaining global targets for emissions reduction. International climate policy frameworks, including the Kyoto Mechanisms, offer a golden opportunity for Eco-policy linkage between the developed and the developing countries.

International mechanisms such as the world trade system and development assistance also are of great relevance to the participation of developing countries in the Kyoto Protocol. However, domestic measures to achieve national emission reduction targets should be given priority in both developing and developed countries.

In addition to international policy-linkage, climate change in particular involves a strong dimension of sectoral linkage with policies relating to urban environment, forestry, water and biodiversity. Mitigating and adapting to climate change requires an integrated approach with these other issues.

Urban Environment

In the context of urban environment, there are two facets to policy linkage. The first is to address local urban environmental issues at the regional or global level. The second is to link different socioeconomic policies to tackle urban environmental issues.

Among urban environment management issues, transportation and waste treatment should be addressed at the regional or global level because air pollution by automobiles and inadequate waste treatment cannot be

confined at a city level or even at a national level, but become issues beyond municipal and national boundaries. Eco-Policy Linkage is crucial to:

(i) Finance urban infrastructure investment by foreign capital;
(ii) Exchange information and experiences among cities in Asia and the Pacific by bringing issues onto the international level.

Regarding air pollution, the mitigation of traffic pollution is particular important in Asia because many cities suffer from traffic air pollution and its impacts on the health of urban dwellers. To tackle traffic air pollution, the following policies must be linked:

(i) Energy related policy (e.g. Improvement of energy efficiency)
(ii) Urban development policy (e.g. Urban transportation policy)
(iii) Economic policy (e.g. Industrial policy).

Freshwater

International policy coordination would often be required in the management of water resources. Especially when dealing with international watercourses, all involved riparian countries have "natural monopolies" in data collection and dissemination within their national territories. In such contexts, developing mechanisms for openness and sharing of information is important. In the case of inter-basin water management, such as in Central Asia, policy coordination is needed. Physical linkage between hitherto separated water basins can facilitate joint management.

In the Pacific, which is characterized by the co-existence of small atolls with severe water shortages and water quality problems on the one hand, and larger volcanic and high mountainous islands where water is generally abundant, on the other hand, establishing mechanisms for international cooperation is crucial.

Inter-sectoral approaches to water management are a second dimension of policy linkage. The management of land use is as important as managing the water resource itself since it will affect flows, patterns of demand and pollution loads. For example, land uses may be regulated in upstream recharge areas and around reservoirs to prevent pollution, salinization and changed run-off regimes. Inter-sectoral coordination should also be considered for competing uses of water. Irrigated agriculture is already responsible for more than 70% of all water withdrawals in the world. With an estimated need for an additional 15-20% of irrigation water over the next 25 years, serious conflicts are likely to arise between water for irrigated agriculture and water for other human and ecosystem uses.

In order to develop appropriate ways to coordinate policy-making, we recommend that the integrated water resources management (IWRM) system (planning and implementation in an integrated manner across sectoral, institutional and professional boundaries) is adopted. IWRM is a process to improve planning, conservation, development, and management of water, forest, land, and aquatic resources in a river basin context, to maximize economic benefits and social welfare in an equitable manner without compromising the sustainability of vital environmental systems.

Forest Conservation

Regarding forest conservation, an increasing demand for timber from importing countries has accelerated public or commercial logging in exporting countries. For exporting countries in Asia, the export of timber is an important source of foreign exchange to finance their economic development. Forest loss as a result of over-logging is not simply a problem for exporting countries, but also importing countries. The issue of appropriate forest management should therefore be addressed at the regional or global level.

It has been observed that economic and forest policies set in one country often have effects in other countries. For example, since 1998, the logging ban in China has spurred a rapid increase in timber demand from neighboring Russia. As a result, unsustainable export-oriented commercial logging has taken place in Russia, accelerating the loss of forest.

Countries should make use of existing policy dialogue forums such as regional and sub-regional organizations to develop policy linkages among them. Such policy linkages can enable national authorities to take into consideration.

Regional cooperation mechanisms should be sought for addressing transboundary problems such as forest fires and the resulting haze problems.

Biodiversity

A number of biodiversity-related international agreements such as the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have been opened for signature and some of them have already been ratified. Many nations in Asia and the Pacific regions have ratified the CBD.

However, the capacity to implement scientific research on biodiversity is insufficient. In order to conserve the biodiversity of the region, it is necessary to have interdisciplinary and intersectoral collaborations.

5.5. Crosscutting Policy Recommendations

Reviewing the interactions between socio-economic factors driving environmental change and the critical environmental issues in Asia and the Pacific, taking into consideration the four concepts of Eco-consciousness, Eco-partnership, Eco-investment/technology and Eco-policy linkage, leads to several crosscutting policy instruments. These instruments, taken as a package, need to be considered in addressing major environmental problems facing countries in the region.

(i) Promotion of the monitoring of changing environmental conditions and dissemination of such information among the general public.

Environmental monitoring for a better understanding of the state of the environment and the extent of damage is necessary for devising countermeasures. In addition, sharing information and making such information available to the general public can foster concerns and action from all segments of society.

(ii) Creation of market systems that attach intangible (non-economic/social) value as well as tangible (economic) value to environmental assets.

For example, the price of resources should include not only the cost of production, but also the intangible value of the ecosystem.

(iii) Creation of institutional mechanisms that allow citizens and businesses to be involved in decision-making and also the implementation of environmental policies.

Governments, businesses and civil society organizations have their respective comparative advantages in contributing to the challenges of environmental conservation. Horizontal approaches that involve civil and business communities, create networks among National Commissions on Sustainable Development, and encourage local initiatives in the process of environmental policy-making and implementation are more likely to yield greater environmental benefits.

(iv) Promotion of a precautionary approach to health-related and irreversible environmental damage.

A systematic use of precautionary approaches needs to be adopted because for many of the environmental problems identified because i) the cost of prevention is relatively low or nil compared to the tangible and intangible loss from environmental damages and the cost of reparation and/or ii) environmental damage is often irreversible/irreparable and has negative human-health effects.

(v) Development of regional cooperation mechanisms to address cross-country environmental issues.

Many of the environmental problems facing the region are transboundary in nature and require response measures at the regional or global level. For that reason, existing regional mechanisms for cooperation should be strengthened and better integrated. New regional platforms, with multi-stakeholders' participation need to be considered to ensure cooperation in areas where no regional mechanism is in place.

(vi) Promotion of an inter-sectoral approach for interlinked issues.

There exist deep interlinkages between the different environmental problems - climate change, forest conservation, biodiversity, urban environment and freshwater - in Asia and the Pacific region. This applies to both their root causes as well as the responses needed. Taking an inter-sectoral approach to their solutions is therefore a crucial dimension of policy responses.

(vii) Selective application of traditional knowledge/techniques and modern technology.

Traditional knowledge and modern technologies relevant to environmental conservation should be promoted and diffused on a selected basis, taking into consideration their adaptability and relevance to the specific needs and circumstances of each country.

5.6. Forward-Looking Activities

The ECO-ASIA Long-term Perspective Project (LTPP) has identified major environmental issues confronting the Asia-Pacific region, examined their connection to socioeconomic issues, promoted four key Eco-concepts and recommended crosscutting policies that can contribute to the long-term sustainable development of the Asia-Pacific region. Issues discussed in this report still remain critical in the region and need further examination. Some issues not fully addressed under the LTPP, such as land degradation, waste management, and capacity building, are also to be further examined to respond to the regional concerns.

The product of the LTPP must reflect the shift of Eco ASIA activities from policy dialogue to actions. The following activities should follow the adoption of this LTPP report.

Asia-Pacific Environmental Innovation Strategies (APEIS)

The Asia-Pacific Environmental Innovation Strategy Project will be launched at ECO ASIA 2001. This Project is a successor of the LTPP and aims to realize and substantiate the four key concepts for long-term sustainable development in the region developed by the LTPP. The objectives of the Innovation Strategy Project are three-fold:

(i) To build the scientific infrastructure necessary to formulate innovative policies for sustainable development, for the use of policy makers in the Asia-Pacific region and as a common asset in the region.

(ii) To promote environmental cooperation and capacity building so as to enable Asia-Pacific countries to formulate their own policies that take into account their national circumstances, based on the scientific infrastructure, through participation in and collaboration with the Project.

(iii) To propose a model for a regional initiative that explores sustainable development and that can be presented by this Region to the rest of the world.

This project consists primarily of three international scientific activities: satellite and ground-based integrated monitoring, assessments using environment-economy integrated models and research on innovative strategy options. Although each can function as an individual research project, synergistic effects between these projects are anticipated because of their mutual interactions and because they collectively cover major elements required of environmental policy, i.e. the understanding of environmental conditions, assessment and future prediction, and policy formulation. The outcomes of the three main components of international scientific activities will be presented to meetings of policy-makers in order to support discussions for the elaboration and implementation of innovative environmental strategies in the Asia-Pacific region. At the same time, the scientific community will benefit from policy guidance from policy makers so that their activities can best reflect the policy makers' needs. ECO ASIA is supposed to be the primary audience and body providing policy guidance.

The Innovation Strategy Project is expected to ensure multi-stakeholder participation including scientists, policy makers and civil society and is designed to meet specific needs of the Asia-Pacific countries. Moreover, the Project is exploring collaboration and synergy with other relevant projects such as the "Millennium Ecosystem Assessment" and the National Environment Indicators and Performance Assessment Systems in Asian Developing Countries.

Asia-Pacific Forum for Environment and Development (APFED)

The establishment of the Asia-Pacific Forum for Environment and Development (APFED) was agreed at ECO ASIA 2000 and will be officially launched at ECO ASIA 2001.

In spite of the world's joint efforts towards implementation of Agenda 21 adopted at the United Nations Conference on Environment and Development (UNCED) in 1992, environment and development problems have been worsening. The APFED aims to explore a new vision for more balanced sustainable development in the context of the Asia-Pacific region and to present it to international policy dialogues on environment and development issues. APFED is expected to send messages to the United Nations World Summit on Sustainable Development (WSSD) in 2002 and present a final report to the world community at relevant occasions, including ESCAP/MCED 2005.

The critical environmental issues and socioeconomic issues identified by the LTPP could contribute greatly to the APFED in the selection of major environment-development issues to cover. In addition, crosscutting policies recommended in this section can also contribute to policy dialogues among eminent persons.

Kitakyushu Initiative for a Clean Environment

The Kitakyushu Initiative for a Clean Environment was adopted at the fourth Ministerial Conference on Environment and Development in Asia and the Pacific region, 2000. The Kitakyushu Initiative attempts to draw lessons from the experience of the city of Kitakyushu, Japan, which has successfully overcome environmental pollution and put them together as effective actions that could be useful in other cities in Asia and the Pacific region.

Its objective is to achieve measurable progress in improving the urban environment in Asia and the Pacific region, principally through local initiatives aimed at controlling air and water pollution, minimizing all kinds of wastes and alleviating other urban environmental problems. Measures considered to be effective include measures to enhance partnership, to improve the environmental technology base, to promote public and private sector investment in the environment, to promote environment information and education and to strengthen international environmental cooperation based on local initiatives as well as to strengthen local initiatives. These measures are in line with the environmental concepts developed by the LTPP. The Kitakyushu Initiative can be a showcase for enhancing the product of the LTPP.

Regional Cooperation

Regional cooperation is an essential tool for conservation of the environment shared by countries in the region. In the Asia and Pacific region, although environmental cooperation has been promoted to cope with serious environmental issues, further efforts are needed to enhance environmental cooperation.

We have high expectations that regional cooperative mechanisms such as Acid Deposition Monitoring Network in East Asia (EANET) and Asia-Pacific Migratory Waterbird Conservation Strategy could provide the venue to follow up the findings of the LTPP. They could also contribute to promote the activities under the Asia-Pacific Network for Global Change Research (APN).

Furthermore, the output of the LTPP might also be used to promote the soon-to-be established regional network in the Asia-Pacific region for environmental business, environmental accounting and environmental education.

Multi-dimensional Research Activities and Periodical Publications

Sustainable development requires a multidimensional and integrated approach. To that aim, further research efforts should be made so as to enhance the intellectual foundation for a greater integration of the social, economic and environmental dimensions of sustainable development. For that purpose, we should consider a periodical publication that provides a comprehensive analysis of these three components in the Asia-Pacific region, along with policy recommendations for actions.

Introduction

Introduction

This report is the final outcome of the two phases of the ECO ASIA Long-term Perspective Project (LTPP). The first phase of the project was initiated in 1993 and presented its report in 1997. The second phase started in 1998. Both projects were launched as forums for international collaboration in scientific research activities on the environment and development in Asia and the Pacific under the framework of ECO ASIA. The mission of the project is to provide ECO ASIA with scientific background information for discussions among its participants.

Taking the opportunity of the turn of the century, this report will first review developments relating to environment and development at the global and regional levels of Asia and the Pacific since the 1972 Stockholm Conference. The activities implemented under the framework of Eco-Asia are then examined within this broader context and put in the perspective of the up-coming World Summit on Sustainable Development.

The first chapter of the report makes a presentation of the driving forces of environmental change in Asia and the Pacific region. These driving forces revolve around social, -economic and technological factors that affect the environment and verse-versa.

The second chapter discusses future perspectives on critical issues related to the environment and development in the region, such as energy consumption and GHG emission, based on the analysis provided by the socio-economic integrated model, namely Asian-Pacific Integrated Model (AIM model), developed through the LTPP.

In the third chapter, critical environmental issues in Asia and the Pacific are reviewed. The issues considered are climate change, urban environment, biodiversity, forest conservation, freshwater and education for sustainability. These area studies looked closely at the relevance and application of the four concepts of *Eco-Consciousness, Eco-Partnership, Eco-Technology and Investment, and Eco-Policy Linkage* with respect to the six critical environmental issues.

As several of the environmental problems facing countries in the region are regional or global in nature, collaborative initiatives that have been under way so far in the various sub-regions of Asia and the Pacific are examined in the fourth chapter.

The final chapter of the report draws from the state of socioeconomic conditions and the analysis of critical environmental issues in the region taking into consideration the four keys concepts developed during the first phase of the Eco-Asia Long-term Perspective Project, to make policy recommendations and explore future paths for developing innovative policies towards sustainable development in Asia and the Pacific region.

Review of the Environment and Development in the Asia-Pacific Region: Stock Taking and the Way Ahead

From Stockholm to Rio and After

The twentieth century was marked by large-scale damage caused to the environment, for the sake of economic development. Following the path of industrialized countries, a number of developing nations, many in East and Southeast Asia, have embarked upon industrialization, which has taken a heavy toll on the environment. As the twentieth century came to an end and as we welcome the twenty first century, many of the socio-economic and environmental conditions sustaining life in Asia and the Pacific and the world in general, remain unchanged. The challenge of development under sound environmental conditions is more pressing, despite a great commitment by countries around the world to preserve and improve the human environment, as manifested in the two major environmental meetings of the outgoing century - the United Nations Conference on the Human Environment (Stockholm, 1972) and, twenty years later, the United Nations Conference on Environment and Development - UNCED (Rio de Janeiro, 1992).

The UNCED (also known as the Earth Summit) focused the political attention at the highest level of political world leaders, non-government organizations and civil society upon the themes of environment and development, culminating in the adoption of Agenda 21 and other binding and non-binding agreements. More than 178 governments adopted Agenda 21, a comprehensive

blueprint for action to achieve sustainable development. In June 1997, a Special Session of the United Nations General Assembly reviewed the implementation of Agenda 21, and identified priorities for future action.

The Asia-Pacific Region on the Move

Parallel to developments at the international level, the Asia-Pacific region has also been active, particularly after the 1992 Rio Summit. Since the adoption of Agenda 21, significant progress has been made which includes the updating of environmental laws and the introduction of new ones, the establishment of new institutions for environmental governance, the formulation of national environmental strategies including national Agenda 21. Most countries in the region now have agencies entrusted with the task of environmental management (United Nations, 2000a).

Environmental concerns have been incorporated in overall development policies and projects. The National Economic Development Authority in the Philippines, the Planning Commission in India, the National Environmental Board in Thailand and the National Planning Commission in Nepal are all high level government bodies with cross-sectoral decision-making, which generate an integrated approach to environmental protection and economic policy.

Important initiatives were taken collectively in different parts of the region, leading to new arrangements and institutions for environmental and economic cooperation. Today, the sub-regions of Asia abound with cooperative mechanisms to support national action for environmental protection.

In Northeast Asia, the North-East Asian Sub regional Programme of Environmental Cooperation (NEASPEC) initiated in 1993 has planned and implemented various project focusing on the three priority areas of energy and air pollution, ecosystem management and capacity building.

In Southeast Asia, following the 1977 ASEAN Sub-Regional Environment Programme (ASEP) developed in collaboration with UNEP, the ASEAN Strategic Plan of Action on the Environment was agreed upon in 1993, consisting of ten strategic thrusts and twenty-seven supporting actions. Cooperative action has also been undertaken with regard to transboundary pollution, environmental education and training.

In South Asia, the South Asia Cooperative Environment Programme (SACEP) was adopted in 1982. Specific environmental programmes were adopted, including the 1982 Regional Sea Program, the 1995 South Asian Seas Action Plan and the 1998 Male Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia.

At the regional level, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) has been a high-level policy forum for environment and development. The Ministerial Conferences on Environment and Development in the Asia and the Pacific, held in 1995 and 2000 respectively were occasions for identifying priority areas related to economic development, population growth, patterns of production and consumption for sustainable development. The 2000 Ministerial Declaration on Environment and Development in Asia and the Pacific[1] and the Regional Action Programme for Environmentally Sound and Sustainable Development, 2001-2005[2] identified a set of instruments including economic measures, regulatory control, technological interventions, institutional development, and capacity building and stakeholder participation in facing the major environmental problems of the region.

In addition, the ESCAP/MCED 2000 adopted the Kitakyushu Initiative for a Clean Environment[3], which aims at strengthening actions at the local level to improve the environment in urban areas in Asia and the Pacific, and promote cooperation among cities, drawing from the rich experience of the city of Kitakyushu in the area of urban environmental management.

The Long-term Perspective Project of ECO ASIA was another milestone in the region's initiatives towards sustainable development. Building on the four key concepts of *Eco-Consciousness, Eco-Partnership, Eco-Technology/ Eco-Investment, and Eco-Policy Linkage* developed during the first phase (1993-1997), the second phase of the project assessed how these concepts were relevant in practice as tools for addressing environmental problems in the region, with the aim of identifying remaining impediments and putting forward new strategies for improvement.

Building on the ESCAP/MCED 2000

In September 2000, the Ministerial Conference on Environment and Development in Asia and the Pacific adopted a Regional Message for the 10-Year Review of the Implementation of the Outcome of the United Nations Conference on Environment and Development[4]. The Regional Message noted that although crucial changes have been made in several aspects of sustainable development in all countries in the region, indications point to the fact that the momentum of negative environmental change continues to outpace achievements. The region still maintains a world record of land affected by soil degradation, high levels of demand for water resources, and air and water pollution largely above world averages. Poverty and population growth continue to be major challenges.

Against this background, issues of priority for the Asia-Pacific region were identified, as well as actions that would enable countries in the region to decouple economic growth and environmental degradation. The priority issues

[1] United Nations (2000b)
[2] United Nations (2000c)
[3] United Nations (2000d)
[4] ESCAP (2000)

include environmental quality and human health; biodiversity; the marine and coastal environment; freshwater resources; desertification and land degradation; environment and economics; climate change; and sustainable energy development. In addition to these, poverty and illiteracy in developing countries of the region were identified as being factors that continue to hamper efforts towards sustainable development.

In facing these challenges, using market instruments, moving towards more sustainable patterns of production and consumption, and developing innovative technology were recommended as areas of action for a better integration of economic growth and environmental quality. The World Summit for Sustainable Development as well as its preparatory process will be major occasions for the Asia-Pacific countries to put these issues forward onto the global agenda.

Towards WSSD 2002

The special session of the United Nations general Assembly on the implementation of Agenda 21, officially referred to as the World Summit on Sustainable Development (WSSD-also known as Rio+10) will be held in Johannesburg, South Africa from 2-11 September 2002. The WSSD will gather world governments, civil society, United Nations agencies and other major actors to assess global change since the historic 1992 Rio Summit, identify remaining obstacles and design future strategies towards sustainable development.

The WSSD involves a preparatory process, which includes a series of international but also regional meetings under the umbrella of the United Nations regional commissions for Africa, Asia and the Pacific, West Asia, Europe and Latin America regions. The regional preparatory meetings, which are to take place in the period of August-November 2001 will formulate regional platforms that would provide a regional assessment of the implementation of Agenda 21. The fourth and final preparatory session will be held at the ministerial level in Indonesia from 27 May-7 June 2002.

These regional meetings will be opportunities for countries in Asia and the Pacific region to formulate concrete measures for promoting sustainable development and provide a meaningful input to the WSSD. In preparing for the summit, the following elements should be given due consideration:

- the importance of reflecting the needs of developing countries;
- the need to use strategic approaches towards sustainable development;
- interdisciplinary linkages and balanced consideration of concerns among various environmental, social and economic factors; and
- strengthening of partnerships among politicians, governmental and non-governmental sectors.

Key Concepts of ECO ASIA LTPP to Attain Sustainable Development in Asia and the Pacific

The ECO ASIA Long-term Perspective Project (LTPP), through its research activities on conceptual framework building, has identified and examined 4 key concepts for attaining long-term sustainable development in the region. In the first phase of the LTPP (1993-1997), the basic idea of the 4 key concepts, i.e. *Eco-Consciousness, Eco-Partnership, Eco-Technology/ Eco-Investment, and Eco-Policy Linkage*, was developed and proposed. Intensive research activities on the 4 key concepts were conducted and the outcome was published as "ECO ASIA Long-term Perspective Project Final Report" (Environment Agency of Japan, 1997). It was widely welcomed and endorsed by the participants of ECO ASIA 1997. At the same time, the continuation of the LTPP to further examine and promote the 4 key concepts was suggested. The second phase of LTPP (1998-2001) aimed to further examine and materialize the 4 key concepts regarding critical environmental issues in the region.

Why 4 Key Concepts

Eco-Consciousness is the first key concept identified and proposed, through the early work of the ECO ASIA LTPP, as a fundamental basis for building a sustainable society. Eco-consciousness encompasses structures of environmental knowledge, beliefs, values and concepts that facilitate or motivate positive human behavior toward the environment. Promotion of Eco-Consciousness, i.e. to share common beliefs and values toward sustainable development among respective entities of societies, is considered to be essential for any policies and their implementation addressing environmental problems within the government sector, private entities and civil society.

Although all 4 key concepts are equally important, it is worth to note that Eco-Consciousness has different characteristics to the others. It is considered as a conceptual tool to enable us to share local, regional and global environmental problems as common issues, while the others are concepts to guide actions toward building a sustainable society.

ECO ASIA is an informal information exchange forum to discuss possible regional cooperative actions, sharing knowledge concerning the state of the environment and effective measures to tackle critical environmental issues and to attain sustainable development in the region. In other words, enhancement of partnership among participating countries and regions to tackle environment and development issues together is one of the fundamental outcomes expected for the forum, thus the LTPP identified *Eco-Partnership* as one of the key concepts.

Based on partnership among participating countries and regions, possible cooperative actions can be sought out. The LTPP identified *Eco-Technology/Eco-Investment* as another key concept to maximize the use of existing

Box Intro. 1 Roots of Eco-Consciousness

The importance of Eco-Consciousness has become acknowledged widely among people living in the region lately. Studies show that the Eco-Consciousness widely shared by people in the region has two different roots and some dilemmas as the followings.

i) Wisdom for environmentally-sound way of thinking in natural resource management found in traditional practices, modes of social conduct and rules for decision-making in rural indigenous communities.
- Eco-Consciousness embedded in Asia-Pacific traditional cultures is rapidly vanishing due to industrialization/ modernization.
- Some/ most of the traditional practices for a sustainable use of natural resources are becoming ineffective in modernizing/ modernized societies. Some traditional rules (e.g. land tenure system) to maximize the benefit of local community do not cope with newly imported concepts such as property right of individuals/ local authorities on local commons.

ii) Learning from the experience of industrialized countries facing various environmental problems such as pollution and waste caused by mass-production/ consumption economy.
- Mass-production/ consumption has been considered as the major driving force for economic growth, however the experience of developed countries warns it would cause various types of environmental degradation.
- Developing countries are encouraged and expected to take different paths to attain sustainable development, but plans towards such an endeavor are not ready yet.

Note: Based on comments made by Yok-shiu Lee, The University of Hong Kong, and summarized by Midori Aoyagi-Usui, National Institute for Environmental Studies, Japan, at the "International Seminar on Environmental Consciousness in Asia: Comparative Studies of Japan, China (Hong Kong), Vietnam and Thailand," Bangkok, 15-17 January 2001.

technological and finical resources in the region. Some existing environmentally friendly technologies are to be transferred to where they are appreciable and further innovative technologies are to be cooperatively developed.

Further to these concepts, the LTPP identified *Eco-Policy Linkage* as another key concept. Under financial and technological constraints in most of the countries and regions, integrated policy approaches to simultaneously address local and global environmental issues is important, e.g. a simultaneous approach to local air pollution and global warming issues.

Eco-Consciousness

In past ECO ASIA deliberations on policy analyses, it has been emphasized that enhancing Eco-Consciousness is of the utmost importance for achieving sustainable development in the region. At the same time, promotion of education for sustainability to generate such awareness has

Box Intro. 2 Eco-Consciousness as a Foundation for Environmental Ethics

Considering the accelerating trend of environmental degradation in the region, there are many important measures to be taken, such as information disclosure on the status of the environment, a regulatory approach, economic instruments, the promotion of environmentally sound technology, and international cooperation for capacity building. To further promote implementation of these measures, those who are decision-makers and also those who are in the position of electing them need to share environmentally sound values. Such values, i.e. eco-consciousness, are often found in indigenous/ pre-modernized societies in their natural resource management. Although wisdom of this kind may not be always directly applicable for the modernized/ modernizing society we live in, its core elements need to be learned and applied where they are applicable.

To this end, it is important to seek out and share environmental ethics, a thought system based on a sound understanding of the relationship between the environment and human being. By extracting the essence of eco-consciousness found in environmentally sound practices in the region, the following three core concepts of environmental ethics are identified.

i) Circulation (Securing sustainability for human society within the limitations posed on the earth)
ii) Harmonious Coexistence (Being aware that all humans are supported by various forms of life and a harmonious relationship among all people)
iii) Self-restraint (Being aware that unrestrained desire would eventually destroy human society).

Source: Kato 2001.

Box Intro. 3 Eco-Consciousness in Asia-Pacific Region

The cognitive anthropological research, *Environmental Consciousness in Asia: Comparative Studies of Japan, China (Hong Kong), Vietnam, and Thailand*, conducted under the framework of ECO ASIA Long-term Perspective Project, has provided the following key findings and policy implications.

Finding 1: Most individuals interviewed in all four Asian countries, regardless of whether they are lay people or members of the elite, are already concerned about the state of the environment.

Policy Implication:

We do not need to expend additional effort to convince people that they should be concerned about the environment. They already are concerned. But, as is suggested by findings 2 and 3, the scope of their concerns about the environment, and the environmental problems they perceive as important, may not be the same as those of scientists and policymakers.

Finding 2: The environmental concerns of most individuals in the four Asian countries are narrowly focused on their immediate living space. They do not show equal concern about the wider world or the global environment.

Policy Implication:

If people are to be expected to support taking difficult measures to protect the global environment, they must be shown how changes in the larger environment are likely to have negative impacts on their personal lives and immediate living situations.

Finding 3: In general, most people, regardless of whether they are lay people or members of the elite, do not display a strong scientifically-based understanding of environmental problems.

Policy implication:

Much more attention should be paid to promoting environmental education to increase the scientific literacy of the public.

Finding 4: The motivations for protecting the environment expressed by individuals in all four Asian countries are primarily personalistic and anthropocentric. In general, their environmental concerns are not related to broad religious or philosophical beliefs. They fear that environmental change will adversely impact their health, well-being, and quality of life. They do not express much concern with conserving biodiversity or maintaining the balance of nature for its own sake nor do they invoke religiously based motivations for protecting the environment.

Policy implication:

Campaigns to motivate public support for environmental protection should be based on appeals to self-interest and the strong desire to protect individual health and well-being. Calls to protect nature for its own sake and appeals to moral values or religious beliefs are likely to be less effective.

Source: Rambo 2001.

been equally emphasized. This was because Eco-Consciousness is considered to be the basis for any other policy approaches as it influences fundamental human thinking and behaviour as well as decision-making processes in implementing strategic actions to achieve sustainable development.

Eco-Consciousness can be defined as structures of environmental knowledge, beliefs, values and concepts that facilitate or motivate positive human behavior toward the environment[5]. It is a comprehensive term that carries a sense of being environmentally aware and having ecological viewpoints in individuals' mind. Being "eco-conscious" may differ from one person to another, but may include the following characteristics as common factors: being aware of ecological relationships between humans and the nature; having constant concerns on possible environmental degradation as a consequence of human behaviour; being proactive in reducing environmental risks; and being aware of ethical aspects of environmental management with due consideration of socio-economic and inter-generational implications.

The LTPP had examined the nature of eco-consciousness in the region to understand the commonality and difference among diverse countries and regions. Through the examination in the first phase research, it was suggested that wisdom for environmentally-sound way of thinking in natural resource management may often be found in traditional practices, modes of social conduct and rules for decision-making in rural indigenous communities. However, they are rapidly vanishing along with the introduction of modernization. This finding suggests that efforts should be made to identify, maintain, and encourage applications of such environmentally-sound wisdom, which may be common or unique in the region, to further promote eco-consciousness.

[5] As defined by Nickum (1999).

Box Intro. 4 Example of Eco-Partnership: BOT (Build-Operate-Transfer)

The BOT (Build-Operate-Transfer) scheme in project finance is widely used to involve the private sector in infrastructure building in developing countries, especially in East Asia. Examples of BOT-based projects include Shunde De Sheng Power Plant project in Guangdong Province of China, Shanghai Zhadian Gas Turbine Power plant in China, a geothermal power plant in Mindanao in the Philippines, and the Lumat Power Plant in Malaysia.

However, problems emerging from BOT schemes may include 1) lack of coordination between BOT projects and any master development plan at the national or provincial levels, 2) possible imposition of higher user fees than in the case of publicly provided infrastructure, and 3) lack of guarantee of continuous service. Appropriate design of BOT schemes is essential to avoid such problems. Asian countries are preparing legislation to address these problems and to enhance public and private partnership. China, for example, has enacted various laws, such as Implementing Rules of PRC on Cooperative Joint Venture Law (1995) and Temporary Procedures for the Administration of Project Financing Conducted Outside China (1997).

Source: IGES 2000.

The second phase of LTPP had conducted further exploration of the concept in two ways. One is to further develop the concept and summarize the key elements of Eco-Consciousness to be considered in all levels of our daily activities, i.e. Circulation, Harmonious Coexistence, and Self-restraint. The other is the attempt to explore the nature of Eco-Consciousness in 4 countries and regions (Japan, Hong Kong, Vietnam, and Thailand) and learn policy implications from the findings. (See Box Intro.1-3)

Eco-Partnership

Eco-partnership is a concept to reinforce cooperation and the exchange of experience in various actors. They consist of national governments, local authorities, private sectors, and NGOs. Respective actors are encouraged to promote partnerships among themselves crossing social sectors and national and other administrative boundaries. Enhancement of partnership in multi-level actors may provide each of them with more learning opportunities, encouragement, and empowerment to tackle common issues. As the consequence of cooperative actions, it may also leads to economic efficiency.

Among the various kinds of partnerships, that between public and private sector is especially vital for attaining sustainable development and building environmentally benign societies. A notable example of eco-partnerships is infrastructure development under the initiative of private sector. One of the main causes of environmental problems, especially in Asian cities, is the lack of adequate infrastructure, such as sewerage systems, waterworks, and mass transportation systems. The World Bank estimated that the total financial demand for infrastructure development in East Asia will amount to 1.2-1.5 trillion dollars (or approximately 7 percent of regional GDP) for 1995-2004. (World Bank, 1996) Although infrastructure development has been considered to be the responsibility of the public sector, it is recently recognized that the participation of the private sector has a number of advantages, including 1) enhanced mobility of private capital to meet the increased demands on infrastructure accompanying economic growth and 2) improved efficiency in building and operating infrastructure, using the know-how of the private sector.

Eco-Technology/Eco-Investment

Eco-Technology and Eco-Investment is a concept to promote the development and transfer of environmentally sound technology and to promote investment that reconciles economic growth and environmental protection. The sustainable use of environmental resources such as energy, freshwater and forests is the key to realizing sustainable development in the region. To this end, applicable technologies need to be identified, promoted and transferred to minimize economic and environmental costs. At the same time, the channeling of appropriate and strategic investment for this purpose is encouraged.

In the field of water resources management, applicable technologies may include diversified water supply systems and water treatment technologies, as well as facilities for rainwater collection and storage, equipment for efficient water use, and knowledge of management of water sources and reservoirs including conservation of surrounding forests.

In the field of sustainable energy in developing countries, applicable technologies should be promoted for utilization of renewable energy sources such as biomass, wind and solar power. In particular, new and additional investment should be strategically promoted for technologies for energy conservation and efficiency improvement, including the development of energy-efficient public transport.

Investment in environmental technologies would certainly contribute to increased environmental efficiency and reduction of environmental pollution. At the same time, the enhanced technology base achieved through such investment would also contribute to possible improvements in productivity and competitiveness in the international market, which continues to demand higher environmental standards. In this sense, strategic environmental investments and infrastructure building could improve both local environment and economic development.

Box Intro. 5 Regional Focus on Eco-Technology and Eco-Investment

According to "*A Long-term Perspective on Environment and Development in the Asia-Pacific Region*" which is the final report of the 1st phase of ECO ASIA Long-term Perspective Project, the following 3 issues are the most urgent in the region that is at a time of rapid economic growth.

i) Localization of Eco Industry
Much foreign direct investment now goes into real estate, manufacturing for export, and manufacturing consumer goods for domestic markets. Investment and joint ventures in local environment-related industries should be encouraged, with adaptation to the conditions and needs of the particular country.

ii) Promotion of Investment in Infrastructure for Environmental Protection
As industrialization accelerates the rate of urbanization in the Asia-Pacific region, the need grows for new infrastructure such as waterworks, sewerage, waste treatment, urban transportation, and other elements of social infrastructure. Energy-efficient public transport, which has less environmental impact, is also high priority.

iii) Promotion of Investment in Energy Conservation
A commitment to energy conservation is important at a time of economic growth; energy saving technologies should be incorporated at the same time as the manufacturing sector expands and investment in new facilities is large. Based on the experience of industrialized countries, market mechanisms can control energy consumption and promote energy conservation. In many developing countries where energy prices are held artificially low, an adjustment of energy prices to reflect true costs will encourage energy conservation, introduction of renewable energies, and research and development by the public sector.

Source: ECO ASIA 1997.

Eco-Policy Linkage

The concept of Eco-Policy Linkage is to develop linkage among domestic, regional, and global environmental policies. To accomplish environmental improvement under financial and technological constraints, an integrated policy approach that simultaneously addresses local and global environmental issues is important. At the same time, it is important to link inconsistent domestic policies that focus on different environmental problems or those that focus on non-environmental issues, e.g. air pollution and urban planning (housing, public transportation, etc.) for the purpose of sustainable development is also important.

Policy priorities for global environmental issues such as climate change are not given sufficient attention in most countries in the region. However, it should be recognized that measures to improve the local environment are often linked to the global environment. For example, energy efficiency improvements that improve local air quality could reduce CO_2 emissions, one of the major greenhouse gases. A new approach to simultaneously address global and local environmental issues and local economic development should be sought by introducing effective environmental policy reforms and integration of policy objectives.

Eco-Policy Linkage can provide many countries and regions in Asia and the Pacific with many opportunities to improve policy efficiencies and to create new flows of funding and technology, which can be used to address local environmental issues. In order to shift to sustainable development in the region and the world, opportunities to link policies, such as development and implementation of domestic/ sub-regional/ regional strategic action plans, careful designing of Clean Development Mechanism (CDM), need to be sought out.

Box Intro. 6 Example of Eco-Policy Linkage

CO_2 emissions are mostly from fossil fuel combustion, also a major cause of air pollution through dust, SOx and NOx emissions. The emissions lead to acute local air pollution as well as to acidification. Possible measures in all cases are energy conservation, switching fuel from coal and oil to natural gas, or switching fossil fuel-fired power generation to renewable energy sources such as solar, wind, and hydropower.

The Clean Development Mechanism (CDM) being developed under the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC) could be designed and utilized from this perspective, so that the mechanism serves as an incentive system for supporting sustainable development and a cleaner environment in developing countries, as well as addressing climate change at the global level. *Source:* IGES 2000.

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Driving Forces of Environmental Change: Review of Socio-Economic Issues Related to the Environment

Chapter 1

Driving Forces of Environmental Change: Review of Socio-Economic Issues Related to the Environment

Asia and the Pacific region is in the midst of a whirlwind of changes, many of which have a direct consequence on the environment. This chapter provides an overview of four socio-economic issues that comprise the driving forces of environmental changes that are taking place in the region. The topics chosen are: population, urbanization, and poverty; economic trends; lifestyle changes; and technological developments. These topics are both major driving forces that cause environmental problems as well as those that help precipitate positive environmental changes.

1.1. Population, Urbanization, and Poverty

Rapid Population Growth Concentrated in Urban Areas Add Strain on the Environment

Asia and the Pacific makes up approximately 60% of the world's population and is home to countries with the largest population, namely China, with 1.2 billion people, and India, with close to 1 billion (UN 2001b). The population in the region has doubled in the past 40 years (UN 2000b), and such an increase in population has been the cause of a host of environmental problems, such as depletion of natural resources, overconsumption of energy, water shortage, and pollution of water and air. In particular, population growth has centered around cities; in search of economic opportunities, there has been a mass migration of people from rural to urban areas, especially since the 1980s. Although levels of urbanization are relatively lower than those in other parts of the world, the urban population in Asia has grown more than those in the rural areas, as shown in figure 1.1. Urban population in Asia and the Pacific region grew by 3.2% per annum during 1990-1995, while rural areas grew by only 0.8% (UNEP 1999:91). Currently, around 37% of people in Asia and the Pacific live in urban areas, and nine of the world's fourteen megacities (cities with more than 10 million residents) in 1994 were in the region (UN 2000a:135; UNEP 1999:91).

Negative impacts on the environment that such rapid population growth in cities has had include deterioration of air and water quality, greater noise pollution, an increase in waste, and sanitation problems. It is reported that ten out of eleven megacities in Asia exceed WHO Guidelines by more than 100% on concentrations of suspended particulates (UNEP 1999:91). Such problems are exacerbated by difficulties many city governments face in urban environmental management, such as implementing legislation to control air quality and programmes for effective sewerage and waste management. Moreover, changes in land use such as agricultural land being encroached by urban development, and forests, wetlands and coastal areas used for residential and industrial purposes have put an additional strain on the environment. An estimate by USAID shows that in the developing countries of the region, half a million hectares of arable land is being taken each year by urban developments (UN 2000a: 139).

Overpopulation in urban areas has also resulted in the creation of slums in many cities of developing countries. Approximately half the total populations of Sri Lanka, Indonesia, and Bangladesh reside in slums and squatter areas of cities (UNEP 1999:92). Such problems contribute to health problems, seriously affecting the quality of life. For example, only 35% of residents in urban areas of Indonesia have access to safe drinking water, only 20% of urban sewerage in China receives concentrated treatment (UNEP 1999:92-93), and approximately 19% of all illnesses and deaths in India are reported to have been caused by environmental factors (World Bank 2000b: 51).

Rural Poverty Exacerbates Environmental Degradation

Demographic changes described above have had an additional impact on the environment because concentrations of people in urban areas have left rural areas desolate. Rural villages have faced breakdown in traditional subsistence economy because of limited access to land and natural resources, lack of human and financial resources, and sources of employment. Furthermore, rural areas are in many ways more vulnerable to environmental degradation because of poverty. As shown in figure 1.2, approximately two-thirds of the world's poor—defined as those living on less than US$1 a day—live in Asia and the Pacific, concentrated primarily in South Asia, and approximately 80% of poor people in South Asia live in rural villages (World Bank 2000a: 3; World Bank 2000b:50).

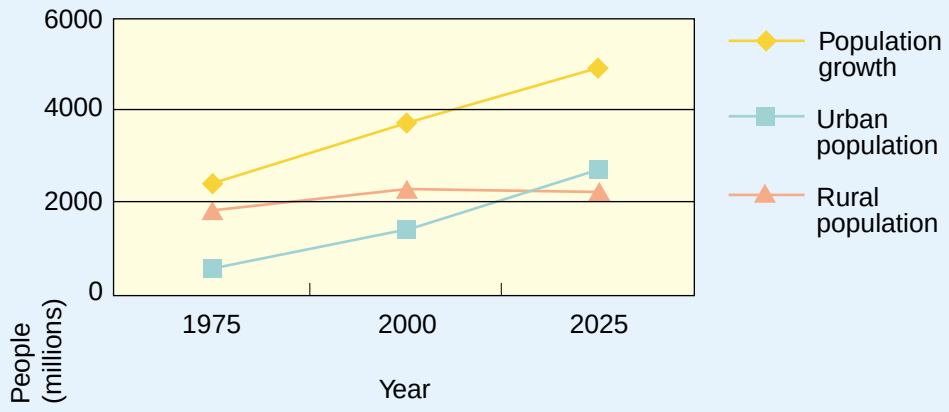
The fact that there is extreme poverty among one quarter of the population in Asia and the Pacific is significant because poverty, especially rural poverty, negatively affects the environment in several ways. Firstly, as was mentioned above, the poor lack resources and assets, as well as control over important decisions that affect them, to be in control of their own surroundings. In particular, the poor lack access to resources which can promote environmentally sound activities and lifestyles, such as education. Social exclusion experienced by women, indigenous peoples, ethnic minorities, and low castes further exacerbate this problem, intertwined with human and social development issues. Secondly, poverty is often concentrated in ecologically fragile areas, where residents face and/or contribute to different kinds of environmental degradation (UN 2000a:183). In times of economic crisis, for example, the rural poor have no choice but to engage in environmentally destructive activities, such as slash and burn agriculture and overgrazing, to survive. Thirdly, in developing countries, efforts to reduce poverty have often been concentrated in urban areas, and development policies and funding have increasingly gone to industries in urban areas while funds for agriculture have decreased (UN 2001a:4). Fourthly, rural areas can be rich in natural resources and are often targets of overexploitation and environmentally destructive development strategies. As a result, rural areas are vulnerable to exploitation not only by the locals but also by outsiders. All the above factors thus create a vicious cycle in which poverty not only negatively affects the environment in various ways, but such negative impacts further reinforce poverty.

1.2. Economic Trends

Economic Trends and the Financial Crisis Affect the Environment in Various Ways

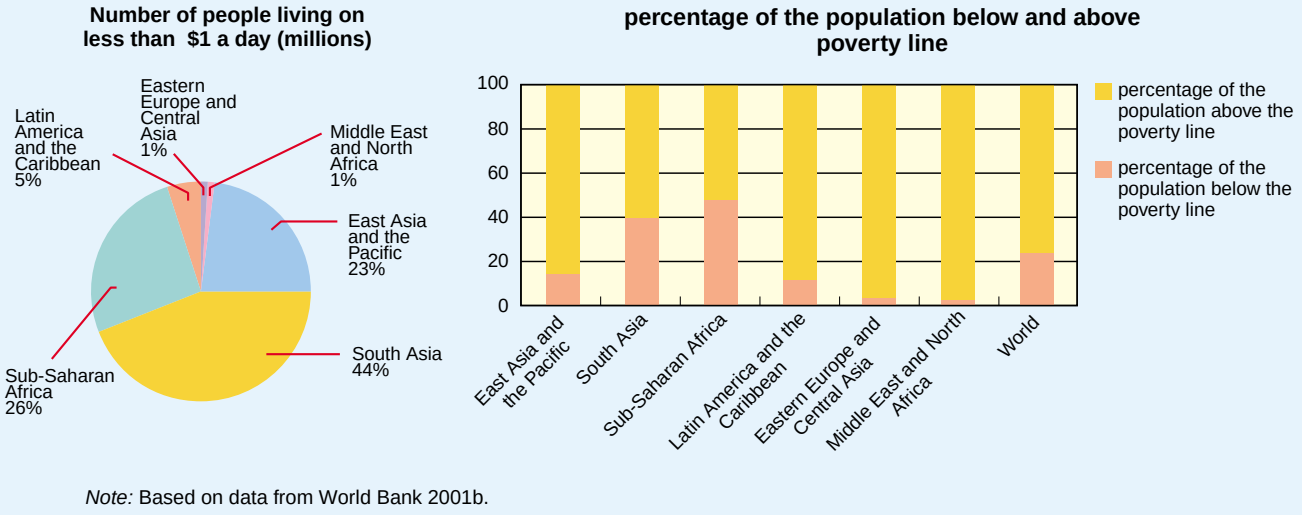
Globalisation, accelerated by trade liberalization, has led to economic development in the region. Economic globalisation has had various economic and social impacts, and between 1965 to 1990, countries with open market policies improved their economic performance at a rate of about two percentage points faster per year on average than countries with closed market policies (ADB 1997, pp 73). Unprecedented economic growth in Asian countries during the early- to mid-1990s, which marked 9.9 percent for East Asia and the Pacific and 6.2 percent for South Asia in growth of real GDP between 1991 and 1997 (World Bank 1998/99 pp194), was strongly supported by their trade activities. Thus, both growth in GDP and merchandise exports show the same shape on figure 1.3 with the bottom tip of 1998 due to the unexpected Asian financial crisis. This graph helps interpret environmental changes that occurred in the region in the time frame.

Along with industrialization and rapid economic growth, energy consumption in Asia increased 2.67 times from 1971 to 1996, while for the world as a whole it increased 1.71 times. Moreover, the region consumed 29.7 % of energy consumed world-wide, and became the largest energy consumer by 1996 (Asia Kankyou Hakusho



Source: HABITAT 1996.

Figure 1.1 Size and Growth of Urban and Rural Population in Asia



Note: Based on data from World Bank 2001b.

Figure 1.2 World Poverty

2000/01 pp13). In particular, China's energy consumption make up 39.3% of the total in the region (Asia Kankyou Hakusho 2000/01 pp14). Combined with the fact that China depends on coal for 70% of its energy source, which emits high levels of carbon dioxide when burned, the country's large share of energy consumption could negatively influence climate change and threaten air quality measures not only domestically but also transboudary-wise.

The newly industrialized economies, whose flourishing economies in the first half of the 1990s resembled the fast economic development of Japan in 1960s, suffered a tremendous blow due to the financial crisis in 1997. As a result of the crisis, exchange rates destabilized, investments were stagnated, domestic consumption was discouraged, and unemployment rates became extremely high.

The crisis had a range of environmental impacts. On the positive front, in the short-term, slowed economic activities led to a reduction of industrial manufacturing and transportation of the products. Other factors such as availability of advanced technologies and effective policy development in addition to stagnated economic activities contributed to easing of air and water pollution to some extent, as well as less extraction of natural resources. However, on the other hand, to compensate for decreased income from manufacturing, people simply extracted natural resources. As for mid- to long-term perspectives, there are concerns that public spending has become more favorable to economic recovery rather than environmental improvement, pulling down the one-time popular word 'sustainability' from their propaganda.

In spite of widely-held expectation, the Asian economy recovered at a faster pace than had been expected. The Asian Development Bank (ADB) forecasted an average annual growth of 4.4 percent in early 1999, but this was revised to 5.7 percent in the fourth quarter of 1999, and was actually 6 percent (ADB 2000, pp9), although the pace of recovery differs country by country.

The crisis countries, namely Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand, already started showing signs of recovery in mid-1998 as a result of changes in macroeconomic policy, structural adjustments, and external demand from the United States and Europe (World Bank 2000, pp9). By 1999, GDP growth of these five countries began to go up again, and lowered interest rates and fiscal drivers prompted increase in government spending and private consumption (World Bank 2000, pp9).

External Debt Puts Pressure on the Environment

Through the process of recovery, new employment opportunities were created, lowering the unemployment rate and easing poverty along with the growth rate. Nevertheless, the region remains vulnerable. As shown in table 1.1, external debt in the region skyrocketed from 1985 to 1998 with the exception of Fiji, and heavy debt continuously puts pressure on the economies of poor countries. It compels those countries to excessively increase production and productivity for extra earnings, and the imbalance in supply-and-demand affects energy and resource consumption. Furthermore, production of cash crops for foreign currency is also accelerated by heavy debt, and activities such as clearing forests for expansion of farmlands and excessive use of pesticide and chemical fertilizers have negative effects on the environment. In order to rehabilitate this unfavorable cycle, Debt-for-Nature swap type strategies should be promoted, involving all members of the international community.

Under such vulnerable conditions, the region's economy is largely affected by external conditions. Turn-down of the US economy and the chronic Japanese recession have directly affected the Asian economy. The robust US economy largely reinforced by Information Technology (IT) rescued Asian countries from recession and substantially contributed to the rebuilding of their

economies. Approximately one-quarter of total exports from the region, except for Japan, heads to the US (ADB 2001 pp1), and the IT boom exports were noticeable in the Republic of Korea and Malaysia from 1999 to late 2000. Thus, not surprisingly, as sales related to IT started to drop in mid-2000, merchandise exports declined accordingly for these two countries, and the region as a whole experienced a similar pattern (ADB 2001).

Most countries in Asia have competitive advantage in labor intensive manufacturing due to the availability of inexpensive labour. Due to this, as well as for other strategic reasons, an increasing number of companies in industrialized countries are seeking opportunities to establish their product lines beyond borders into the developing countries in the region, and this trend is expected to continue under globalization.

It is thus clear that countries in the region need to work further on their economic reform. It is also crucial that environmental safeguards are incorporated into schemes of economic reform in order to minimize adverse impacts on environment in advance. Underestimation of environmental degradation can threaten economic achievement. Indeed, the costs of rehabilitation of environmental damages have become higher and higher, and industrialized countries are putting more efforts on the precautionary measures than on compensation.

Table 1.1 External Debt of Asia and Pacific Developing Member Countries

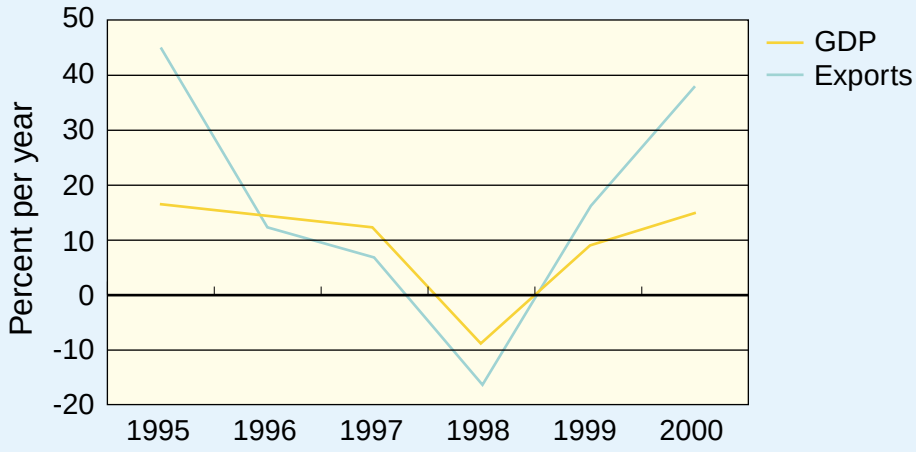
	1985	1998
Bangladesh	6,870	16,376
Bhutan	9	120
Cambodia	7	2,210
China	16,696	154,599
India	40,951	98,232
Indonesia	36,715	150,875
Lao	619	2,437
Malaysia	20,269	44,773
Mongolia	...	739
Myanmar	3,098	5,680
Nepal	590	2,646
Pakistan	13,465	32,229
Philippines	26,637	47,817
Sri Lanka	3,540	8,526
Thailand	17,546	86,172
Viet Nam	61	22,359
Fiji	444	193
Papua New Guin	2,112	2,692

Note: Based on data from UNDP 2000. (US$ millions)

Foreign Direct Investment Policies and Their Positive and Negative Impacts on the Environment

Although the trend varies country by country due to different foreign direct investment (FDI) policies and other social and economic conditions, Southeast and South Asian countries as a group marked their highest FDI in the year of the financial crisis, as shown in figure 1.4, but did not attract investors' interests back to them in 1999. In contrast, the Pacific's figures are unique. With its peak of US$ 557million in 1995, the number rapidly dropped to US$ 152 million in the very next year, and recovered more than twofold from $108 million in 1997 to $220 million in 1998. In particular, the FDI flows were concentrated in Papua New Guinea, followed by Fiji, Vanuatu, and the Solomon Islands.

Pros and cons on the impacts of FDI on the environment have been discussed in many places. One



Note: Based on data from ADB 2000b.

Figure 1.3 Growth Rate of GDP and Merchandise Exports of Southeast Asia

argument is that through their direct management, multinational corporations (MNCs) could introduce their advanced cleaner technology and transfer efficient know-how in environmental management to the host countries which suffer from financial and human resources constraints. On the other hand, concerns on FDI and environmental degradation remain. Lax local environmental standards and low compensation fees against health damage in host countries may become a motivation for MNCs to relocate their product lines. In the meantime, environmental standards in host countries may be kept low in order to attract FDI. As FDI is an important component of economic growth, the impacts of FDI on environmental quality should be carefully considered.

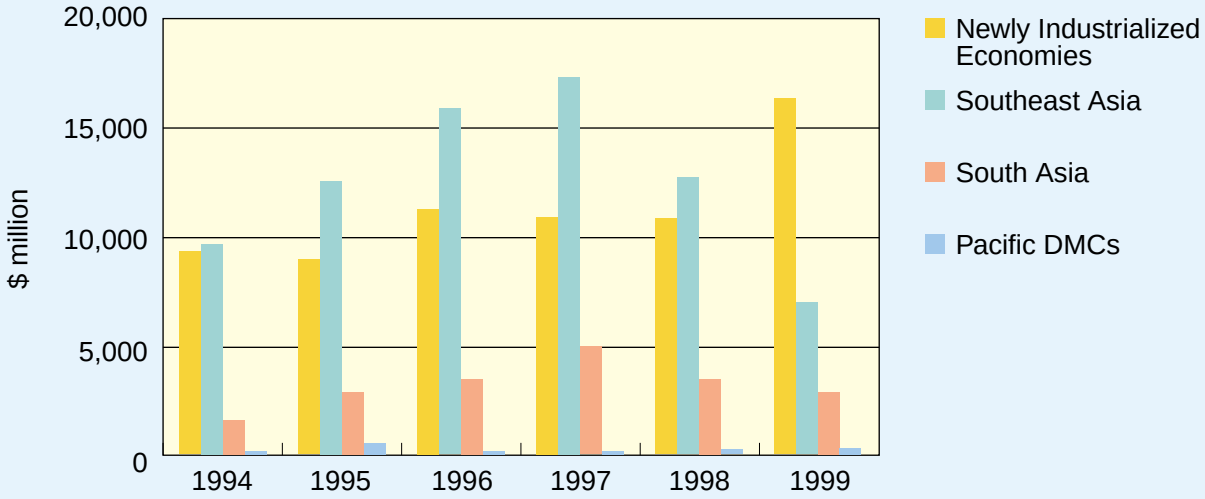
1.3. Lifestyle Changes

Prevalence of Environmentally Wasteful and Inefficient Lifestyles

Population growth, combined with industrialization and economic development, has contributed to a world-wide shift in consumption patterns, resulting in increased production of goods and services, and increased consumption of energy, food, water and other resources. In industrialized countries in particular, affluence is marked by possession of material goods, such as private automobiles and durable consumer products, and consumption of meat, dairy products, and wood products. In Japan, for example, a refrigerator, washing machine, and television set were considered to be the "three sacred treasures", three electronic must-haves in a household, in the 1960s. This changed to a colour TV, air conditioner, and private automobiles in the 1970s. Since the 1990s, convenience stores, which stock not only basic necessities but also items that are popular, and offer financial services at all hours of the day, have become wildly popular. Although the growth in store numbers have fallen in recent years, there are currently over 35,000 convenience stores in the country, and figures announced by the Statistics Bureau show that over 50% of houses in Japan are located within 500m distance to a convenience store. Such trends demonstrate that convenience is what sells, not necessarily price or value. Similarly, in industrialized countries all over the world, emphasis is increasingly placed on a lifestyle which focuses on mobility, convenience and product disposability. Such changes in lifestyle have negatively impacted the environment in terms of air and water quality, land use, wildlife habitat, climate change, and waste generation and disposal (UNEP1999:11-12).

It is important to stress, however, that many of the above-mentioned lifestyle changes have been concentrated in industrialized countries. As is clearly shown in figure 1.5, benefits of globalisation have been distributed unevenly and unequally and thus the rich are enjoying environmentally wasteful and inefficient lifestyles while the poor have benefited little from such changes. Movement of people on a global scale, such as international labour migration from developing countries to industrialized countries, and tourists travelling from industrialized countries to developing countries, has reinforced the international economic hierarchy, further contributing to the widening of the economic gap between industrialized countries and developing countries.

Globalisation has resulted in the spread of mass consumerism to the rest of the world, including its unsustainable lifestyles, and there is a growing concern regarding the added stress this will have on the environment when, and if, such mass consumption patterns become prevalent in rest of the world. In Asia and the Pacific region, many industrializing countries are



Note: Based on data from ADB 2000b.

Figure 1.4 Foreign Direct Investment in Asia and Pacific Developing Member Countries

already quickly catching up to such lifestyle trends.

Moreover, not only have mass production and consumption had a negative impact on the environment of the industrialized countries, consumption patterns in a few industrialized countries have directly caused environmental destruction in developing countries, such as deforestation, loss of biodiversity, and land use (OECD 2001:67). During 1990-1995, for example, the region's forests were reduced by 17 million hectares, deforestation being concentrated in Southeast Asia (UNEP 1999:79).

Efforts Have Been Made by Various Sectors of the Society to Bring Forth Positive Environmental Changes

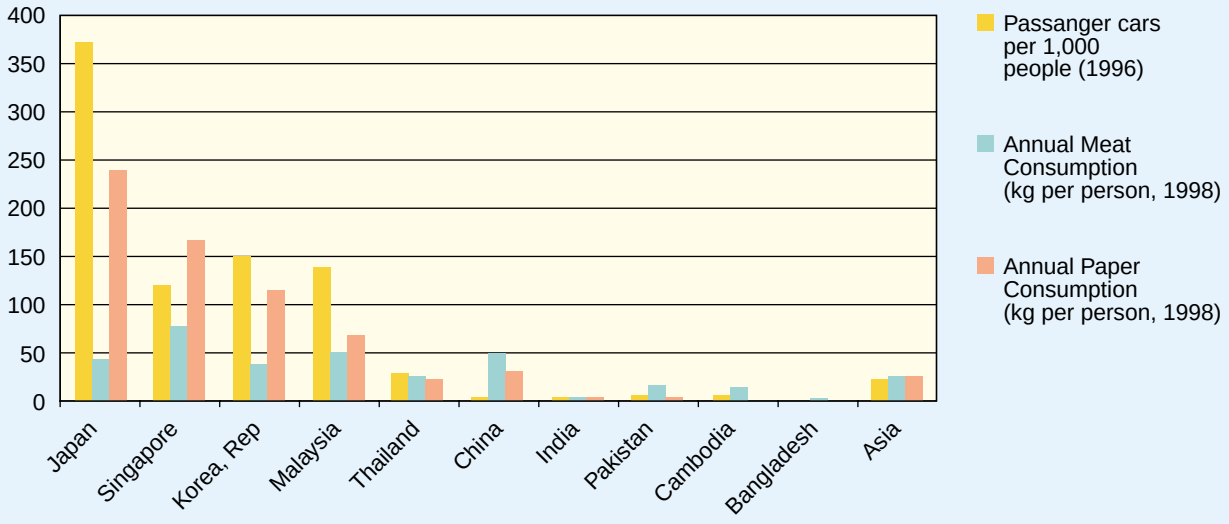
Efforts are now being made, in countries all over the world, to change such environmentally destructive lifestyles and consumption patterns by setting standards and regulations, introducing environmental taxes and eco-labels, and increasing consumer awareness. Efforts to introduce environmental taxes in Asia and the Pacific include Thailand's tax structure that puts a rate of 100% or higher on automobile imports, and a price differential on leaded petrol; and China's Pollution Levy System which levies and enforces flat-rate taxes on pollutants according to a pollution equivalent index value, based on emissions such as noise pollution, wastewater, and garbage (UN 2000a: 247-250). Eco-labels have been introduced in various countries in the region, such as Japan's Eco-Mark Scheme instigated in 1989, Australia's Environmental Choice Australia in 1991, the Republic of Korea's Eco-Mark Scheme in 1992, and Ecolabelling Scheme Indonesia in 1993 (UN 2000a: 266-267).

In industrialized countries in particular, efforts to increase consumer awareness are being made by public interest groups, in collaboration with public authorities. Emerging partly in response to environmental crises, civil society can play a significant role in forcing environmental issues onto national policy agendas and engendering a new environmental consciousness in societies. NGOs that work on international, regional, and national levels have played a variety of roles in promoting better environmental governance by acting as problem solvers, advocates, visionaries, watchdogs, and service providers (ADB 2000b: 10-2). At the Earth Summit in 1992, it was reported that 1,500 Asian and Pacific NGOs were represented; in recent years the number of active groups has increased to nearly 10,000 (UN 2000a:287). Such organisations continue to play an important role in growth of a market for environmentally friendly products, such as organic products and fair trade.

1.4. Technological Developments and Transfer of Technology

Cleaner Production: Technological Developments to Generate Positive Environmental Changes

Technological developments have profoundly affected civilization throughout history, but since the Industrial Revolution in particular, technological changes have brought about high productivity and economic efficiency as well as environmental degradation. In the face of surmounting environmental challenges, recent technological developments endeavour to address such problems. Preventing pollution and using cleaner technology are being recognized as more cost-effective than attempting to solve problems at the "end of the pipe". As a result, "cleaner production" methods, which address the environmental impacts of all phases of the product life-cycle—from the design of the product, selection, extraction, and processing of production inputs, to the distribution, use, and ultimate disposal of the product –are



Note: Based on data from UNDP *et al*. 2000.

Figure 1.5 Resource Consumption in Selected Countries in Asia

being developed and adopted (ADB 2000a:78). Cleaner production research and development activities taking place in the region include waste reduction and recycling schemes in Australia and New Zealand, the development of Green Products in Hong Kong, and utilization of solar power in Malaysia (UN 2000a:262-263). Such technological developments attempt to shift the structure of the economy to a more environmentally friendly one, promotes more efficient and/or "cleaner" technologies, and provide information to increase awareness of the impacts technological changes can have on the environment (OECD 2001:75).

MNCs have made vast progress in this area, by including some aspect of cleaner production in their corporate policies, implementing them in their operations, and placing requirements on, or offering assistance to, their suppliers to integrate cleaner production in their operations. According to a survey of over thirty corporations in U.S. and Asia, leading multinational firms have made commitments to apply home-country standards in host countries with lower environmental compliance obligations (US-AEP 1998).

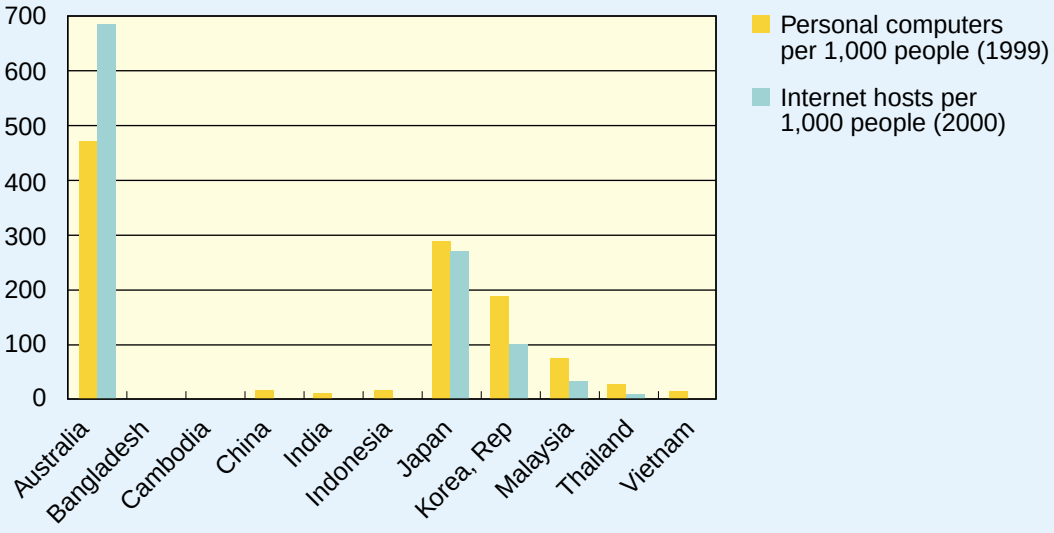
Transfer of Cleaner Production Technologies Through Development Assistance

Various efforts are being made to transfer clean technology from developed countries to developing countries. Examples in Asia and the Pacific region include efforts by organizations in Japan to transfer charcoal production related technology to Indonesia in 1998, and a project to transfer small-scale decentralized energy development technology to Sri Lanka since 1996 (IGES 1999:28-35). Such efforts are particularly important when considering the fact that developing countries in Asia will be going through rapid industrialization in the future, and adopting cleaner production, it is possible to avoid negative environmental impacts, as well as make industrial growth more competitive. It is important to note, however, that in spite of the achievements mentioned above, many barriers currently exist to the adoption of cleaner production, including lack of awareness by decision makers and by members of the general public of the benefits of adopting cleaner production, a lack of enforcement and monitoring of environmental standards and regulations, and in Asia in particular, the lack of transparency of industries, with very few firms reporting publicly on their operations (ADB 2000a:79).

According to the ADB, over fifty international organisations are currently spending many millions of dollars annually to promote cleaner production in Asia. For example, the ADB in recent years has spent over US$ 3.2 billion supporting programs promoting cleaner production in the region, and is planning to spend US$ 451.6 million more in the near future (ADB 2000b:6-2). Development assistance and international cooperation have enhanced developing countries' abilities to deal with environmental issues by promoting development of public policy which support the adoption of cleaner production, by supporting networks and technical assistance for cleaner production activities, and by investing in funds which focus on encouraging local investment in cleaner technologies.

Will Information and Communication Technologies Bring Positive or Negative Environmental Changes?

Other technological developments which have potential to bring about environmental changes include



Note: Based on data from World Bank 2001a.

Figure 1.6 Distribution of Computers and Internet Hosts in Selected Countries in Asia and the Pacific

biotechnology and space technology (OECD 1987:217-218). A development that has dramatically affected the world in recent years is the introduction of information and communication technologies (ICT), which have been viewed by many as having the potential to provide a shift to more environmentally sustainable development. It is speculated that advances in microelectronics and computer science, together with advanced communication technology, may improve productivity, enable efficiency in terms of energy and resource consumption, and reduce material consumption. Moreover, the internet has made it possible for members of civil society to exchange information and to communicate with one another on environmental issues, and to network and build coalitions with each other on a global scale much more cheaply and quickly than ever before. Examples of such internet forums include "ProPoor", an internet site that provides networking opportunities for NGOs across South Asia, currently listing over 1,500 organizations that work on environmental issues and is concentrated in India. There are over seventy organizations currently participating in "FENV", a forum of NGOs that works on environmental conservation in Japan.

Despite the potential ICT have to bring about positive environmental changes, prevalence of such technologies may also lead to increased consumption of energy and materials, in particular paper, and increase waste due to the constant upgrading of hardware and software. Annual paper consumption, which has increased by 44% in the region in the past decade (UNDP et al 2000:294), shows no sign of decreasing. Moreover, although the internet makes it possible for those with access to a computer to obtain vast amounts of information and to conduct research on the environment efficiently, in most developing countries around the world, many people still do not have access to a computer, as shown in figure 1.6.

There is growing concern regarding the digital divide, that developing countries, which lack the resources to benefit economically from ICT, will be further marginalised by the information revolution that is largely taking place in industrialized countries. Efforts need to be made to tackle the widening disparities between rich and poor countries, and to enable developing countries to benefit from the technology in their development process. In this respect, international cooperation in the area of technology and information is of crucial importance. Research is currently underway to determine the relationship between ICT and environmental changes.

Concluding Remarks

As shown above, socio-economic aspects shape current environmental changes that are taking place in the region to a substantial extent. Rapid population growth, coupled with poverty and urbanization, is closely related to environmental degradation. Economic activities reinforced by globalisation, and current consumption trends threaten the availability of resources in the near future. Under such conditions, technological developments have the potential to reverse negative environmental changes, though some concerns still remain. This overview focuses on socio-economic issues to demonstrate that policy formulation should be focused on these issues in order to combat environmental problems. What is clear is that in order to tackle environmental problems, it is important to take a holistic approach, rather than dealing with problems one by one.

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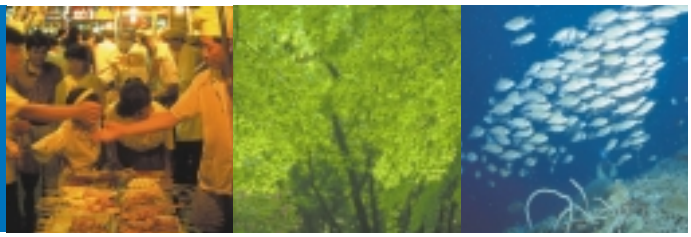
Future Perspectives

Chapter 2



Future Perspectives

This chapter discusses future perspectives on critical issues related to the environment and development in the region, such as energy consumption and GHG emission, based on the analysis provided by the Asian-Pacific Integrated Model (AIM model).

2.1. Possible Scenarios

The region that is most in need of the urgent introduction of sophisticated policies to integrate economic development and environmental conservation is the Asia-Pacific region. This region has over half the world's population and will have a level of economic activity equivalent to that of the United States of America or Europe and the Commonwealth of Independent States in near future. The region's growth of energy consumption and the production of environmental loads such as sulphur dioxide and carbon dioxide emissions will be most rapid in comparison with other regions. As a result, the development of effective environmental protection policies is of the utmost importance.

Future environmental conditions depend on numerous driving forces including population growth, economic development, energy supply and use, land-use patterns and a host of other human activities. These main driving forces that determine environmental trajectories in possible scenarios often also provide input to assess possible policy strategies for mitigating environmental degradation.

The IPCC SRES (2000) examined various kinds of greenhouse gas emission scenarios and characterized several future paths for analyzing mitigation and adaptation strategies to avoid serious social and economic impacts of climate change. Future evolution is highly uncertain. The following scenarios are alternative images of how the future might unfold and are an appropriate tool with which to analyze how driving forces may influence future emission outcomes and to assess the associated uncertainties.

The scenarios adopted here are labeled *Conventional Development*, *Policy Reform*, *Fortress World* and *Great Transitions*. The *Conventional Development* view describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increase cultural and social interactions, with a substantial reduction in regional differences in per capita income. In a variation on this conventional story, *Policy Reform* scenarios envision a world in which these goals are achieved only with the active use of well-designed policies, while still relying on the market to determine resource allocation and ensure an increase in prosperity. But there are other ways in which environmental limits on the scale of economic activity might play out. Some visions are bleak, including the possibility of an authoritarian control over resources in order to avoid catastrophic environmental and social breakdown - a *Fortress World*. It describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other storylines. The forth scenario is idealistic, picturing a fundamental transition to a world dominated by post-consumerist values and lifestyle - *Great Transitions*. It describes a world in which the emphasis is on local solutions to economic, social and environmental sustainability. It is a world with continuously increasing global population at a rate lower than Fortress World, intermediate levels of economic development, and less rapid and more diverse technological changes than Conventional Development World. While the scenario is also oriented toward environmental protection and social equity, it focuses on

Box 2.1 Critical Environmental Trends and Projections in the Asia Pacific Region based on Four Scenarios

A. Scenario Classification:

Conventional Development (Conventional): Market-driven global development leads to convergence toward dominant values and development patterns.

Fortress World (Fortress): As socio-economic and environmental stresses mount, the world descends toward fragmentation, extreme inequality and widespread conflict.

Policy Reform (Policy): Incremental policy adjustments steer conventional development toward environmental and poverty-reduction goals.

Great Transitions (Transition): A new development paradigm emerges in response to the challenge of sustainability, distinguished by pluralism, planetary solidarity, and new values and institutions.

B. Classification of region

Region		Countries
ASIA	OECD90	Australia, Japan, New Zealand
	CPA	China, Hong Kong, Kampuchea, Korea, DPR, Laos, Mongolia, Viet Nam
	OTHERAP	Afghanistan, American Samoa, Bangladesh, Bhutan, Brunei Darsm, Fiji Islands, Fr Polynesia, India, Indonesia Kiribati, Korea, Republic Of ,Malaysia, Maldives, Myanmar, Nepal, New Caledonia, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, Vanuatu

C. Time horizon

Year: 1995, 2000, 2015, 2032

Data from 1995 to present (1997, 1998 or 1999: depending on data availability) are the actual value.

local and regional levels (IPCC SRES, 2000; UNEP GEO3, 2001).

Driving forces characterized by scenarios such as population, urbanization, GDP, technological progress and resource availability are the bases of estimating indices such as energy consumption, CO_2 emissions, SO_2 emissions, land use change, water withdrawal and consumption.

A methodology to estimate driving forces and environmental indices country by country is also developed through the ECO ASIA Long-term perspective project. It is a communication tool to enhance discussions and search for countermeasures by envisaging environmental conditions in a consistent way. Appendix 1 shows some outputs projected by this tool. It is noted that the outputs should be carefully checked by the participants to lead to final projections.

2.2. Basic Future Frameworks: Population and Economic Growth

Population

The population assumptions have a significant influence on the future environment. The population assumptions range from 4.3 billion (Policy Reform) to 5.0 billion (Fortress World) in 2032. The difference of population will increase in 2100 ranging from 3.0 billion to 7.5 billion in the Asia-Pacific region and from 7.1 billion to 15.1 billion in the world. Figure 2.1 compares populations in the Asia-Pacific region with other four regions; North America, Latin America, Europe and CIS, and Africa and Middle East. The left hand diagram is the population projection under the high growth scenario (Conventional Development) and the right is the population projection under the low growth scenario (Fortress World). Both show the dominant share of population in the Asia-Pacific region.

Key components of the demographic driving forces are population size and its rate of increase, population distribution, particularly the extent of urbanization, and population structure. Figure 2.2 shows the population density in 1990 (left) and 2050 (right) in a three-dimensional way. An excessive population increase in the big cities can be observed in 2050. This increase might be a fundamental root of various environmental problems, such as water shortage, water pollution and air pollution, and also enlarge damages of those environmental problems.

Economics

Environmental impacts associated with resource consumption, such as energy-related emissions, are strongly influenced by the GDP assumptions. Although some countries in the Asia-Pacific region suffered from serious economic recession, it is expected that the economy in this region will recover and increase at a high speed. The recent estimation indicates that the GDP growth rate in China was 8.8% in 1997 and 8.5% in 2000 and that of India grew from 5.2% in 1997 to 6.6% in 2000, which is higher than the world average of 4.7%.

The share of GDP in the Asia-Pacific region was about 25% in 1995 and it will increase to between 29% and 40% in 2030, depending on the scenario envisaged. In the Fortress World, the GDP growth rate is much smaller than the Conventional Development World and the difference becomes much larger in non OECD countries than in OECD countries. Uncertainties in future GDP levels are governed by the pace of future productivity growth and population growth, especially in developing regions. Different assumptions on conditions and possibilities for development "catch-up" and for narrowing per capita income gaps in particular explain the wide range in projected future GDP levels. The Conventional Development scenario explores alternative pathways to gradually close existing income gaps.

The difference in per capita GDP between Conventional Development and Fortress World is much larger, especially in China and South East Asia. The average per capita GDP will reach 5,000 dollars in 2025 in the Conventional Development, while it will be less than 2,500 dollars even in 2030 in the Fortress World.

Changes in Economic Structure

Figures 2.3 and 2.4 show the relationship between per capita GDP and the economic structure in OECD countries in the Asia-Pacific region, and figures 2.5 and 2.6 show those in other countries in this region. A rise in the per capita GDP tends to be accompanied by a decline in the share of GDP occupied by the agricultural sector and rise in that occupied by the service sector. The share of GDP occupied by the manufacturing sector rises corresponding to the increase in per capita GDP at first and then declines in relation to the GDP increase in the service sector. In the Conventional Development World, the per capita GDP will reach to a certain level that is enough to make the GDP share in the manufacturing sector decrease, while in the Fortress World, the GDP share in the manufacturing sector is increasing through 2030, keeping the level of GDP share in the service sector low.

2.3. Future Perspectives

Energy Consumption and Gas Emissions

Population and economic growth will increase energy consumption and gas emissions of CO_2, SO_2 and other pollutants substantially. Primary energy consumption in the Asia-Pacific region was 119 EJ in 1995 and 126 EJ in 2000. It is estimated to increase to 2.4 times the 2000 level in the Conventional Development and 1.8 times in the Policy Reform Scenario by 2032. Appropriate policies will enhance energy efficiency and make it possible to reduce energy consumption, especially coal consumption.

The high economic growth scenario leads to high energy demand and hence to a steep increase in CO_2 emissions in the first decades. Figure 2.7 shows CO_2 emissions in five regions under Conventional Development (left) and Fortress World (right) scenarios. Structural changes in the energy supply side become effective only in the longer term due to the inertia caused by long-lived capital stock and existing infrastructure. Emissions start to decline in the second half of the century, even though an increasingly prosperous population continues to consume more and more energy. Emissions peak around 2050 at a level 2.7 times that of 1990 and then start to fall to two times the current level by 2100, around 13 GtC in the Conventional Development World.

CO_2 emission is 2.54 GtC in 2000 and will increase 2.2 times in the Conventional and 1.6 times in the Policy Reform Scenario by 2032 in the Asia-Pacific region. The increase of CO_2 emission is slower than that of energy consumption in the Policy Reform Scenario, partly because of the energy shift from coal to gas. Coal consumption will be dominant in the Fortress World that leads to the CO_2 emission increase in spite of the less primary energy consumption compared to the Conventional Development scenario. Figure 2.8 shows CO_2 emission intensity in the Asia-Pacific region in 1990 and in 2030 in the conventional development scenario.

Fossil fuel burning causes emissions of SO_2 that have important local and regional effects on human health, food security and ecosystems. Sulphate aerosols have also an important influence on the climate system. Inventories of anthropogenic sulphur emissions are subject to uncertainty, particularly at the regional level. Reflecting this uncertainty, global base-year (1990) estimates range from 128 to 154 $MtSO_2$, excluding the 6 $MtSO_2$ from shipping. Figure 2.9 shows SO_2 emissions in five regions under two scenarios; the Conventional Development and Fortress World. Important differences in economic development status and resource endowments lead to different patterns of sulfur emissions across scenarios. In the Conventional Development scenario (left), high economic growth combined with high demand growth results in global sulfur emissions increasing to a peak of more than 80 $MtSO_2$ in 2020. After 2020 sulphur emissions decline steadily. The relatively rapid desulfurization in the high growth scenario is mainly due to high capital turnover rates and, therefore, rapid diffusion of new and clean technologies combined with high income levels. In the low growth scenario (right), as technological progress and income growth is slow, the primary energy mix in 2100 is dominated by fossil fuels; for example about 50% of the primary energy is supplied by coal in 2100.

Although measures are adopted to limit local and regional environmental damages, sulfur-mitigation measures are less pronounced than in the high growth scenario.

SO_2 emissions would drastically increase in China if no countermeasure were adopted. Figure 2.10 shows SO_2 emission intensity in 1990 (left) and 2025 (right) in China. The total emission is 19 $MtSO_2$/year in 1990. It is estimated to be 47 $MtSO_2$/year in 2025. Emissions in areas such as East China, Beijing-Tianjin, Sichuan-Guizhou are expected to increase.

Municipal Waste

With rising incomes and the spread of affluent life styles, the volume of municipal waste to be treated will increase. Reduction of municipal waste has become a pressing policy issue in such countries as Japan and Republic of Korea, which suffer form a shortage of land and lack of adequate disposal sites.

The content of municipal waste varies country by country, making it difficult to draw international comparisons. Furthermore, data on waste volumes are in extremely short supply, and it is not unusual for per capita figures for such volumes in one area of a single country to be several times larger than those in another. In developing countries, industrial waste is often mixed with municipal waste. Cities in developing countries, therefore, are forced to deal with solid waste from domestic, commercial as well as industrial sources.

Generation of municipal waste varies from city to city and season to season. In most Asian and Pacific cities, municipal waste rates range from less than 0.5 kg/capita/day to 0.8 kg/capita/day. But some cities have higher generation rate of more than 1.0 kg/capita/day. In Japan, daily waste generation per person has been about 1.1kg during last 10 years.

Municipal solid waste generation potential is calculated from GDP per capita and population. Figure 11 shows the increase in waste in the high growth scenario (left) and the low growth scenario (right). In the Conventional Development scenario, the generation potential becomes very high caused by the rapid increase of economic activity. But there is also a high potential to reduce the amount of waste by the technology innovation.

In developed countries, re-examination of people's affluent lifestyles will be increasingly important not only for the reduction of waste but also for ensuring the efficient use of natural resources. In this regard, reuse and recycling of resources should be further promoted.

Land use Changes

Land use changes influence the environment of the Asia-Pacific region. Forest area will slightly increase under the Great Transitions scenario, while under Fortress World it will decrease. Although forest area will decrease in the Conventional Development scenario, the biomass field will increase, especially in the Policy Reform scenario.

Water use

Water availability would be changed not only by the expansion of regional activities but also by climate change. Figure 2.12 shows a spatial distribution of water availability per capita in 2050. In this study, water availability is defined as a small surface runoff that may statistically occur once in ten days divided by the population density. Blue-colored cells show an area abundant with freshwater, and the red- or orange-colored cells show an area suffering severely from freshwater restriction. The resolution of the estimation is 5 minutes. To calculate the daily surface runoff, the climate factors observed in 1992 provided by ECMWF were used. The distribution of population was compiled from the current population distribution in Asia region provided by NCGIA and the future population projected by UN.

Water withdrawal and water consumption are calculated based on driving forces such as population, industrial value added and agricultural value added. Water withdrawal in Pacific OECD countries will decrease in all scenarios except Fortress World, while all scenarios indicate the increase of water withdrawal in developing countries. Water withdrawal in the Conventional Development scenario indicates the steepest increase of water because of the increase of industrial water use.

Figures for water consumption trends differ. Water consumption in the Fortress World is the highest followed by the Conventional Development scenario in 2030 in the Asia-Pacific region. This is due to the adequate control of water use in the industrial sector in a high growth scenario.

It is highly possible that water shortage will occur in the Fortress World. Furthermore, climate change would have a significant impact on water resources. Changes in the magnitude, frequency and duration of hydrological factors influence the availability of water resources, flooding intensity as well as agricultural and natural terrestrial ecosystems. Figure 2.13 shows annual average stream flow under current climate and after climate change in 2100. It shows that steam flow in many areas would decrease.

2.4. Analyses of Eco-Policy Linkages

In order to move towards a "sustainable" world, integrated assessment processes of policies are required. The specific needs for these are: (a) technological assessments to break through the trade-offs between rapid economic growth and serious environmental pollution; (b) policy linkages to integrate policies on global environmental problems with policies on domestic environmental and social issues; (c) the development of partnerships in the region based on the increasing economic interdependence, particularly for the creation of environmental protection policies; and (d) a recognition of the region's uniqueness and identity that will become a consciousness for environmental conservation. The AIM

project team has analyzed several eco-policy linkages

Global Climate Change and Local Air Pollution

Policies aimed at mitigating greenhouse gases can have positive and negative side effects. In some cases the magnitude of co-benefits of mitigation may be comparable to the costs of mitigating measures, adding to the no-regret potential. The exact magnitude, scale and scope of these ancillary benefits and costs will vary with local geographical and baseline conditions. In some circumstances, where baseline conditions involve relatively low carbon emissions and population density, benefits may be low while there are many places where the ancillary benefits are high, especially benefits related to public health (IPCC, 2001).

One very important co-benefit of climate change policy is related to the public health effects caused by SO_2 emissions. By introducing energy-conservation technologies, it is possible to reduce CO_2 emissions without scaling back productive activity or standards of living. This reduction of energy consumption can also reduce SO_2 emissions. Figure 2.14 shows one example of reducing both CO_2 and SO_2 in Dalian, China.

Forest Management

Under the terms of the Kyoto Protocol, Annex I countries will have to reduce greenhouse gas (GHG) emissions by 5% compared with those in 1990. But GHG reduction costs in Annex I countries are more expensive than those in non-Annex I countries. In the Kyoto Protocol, the cooperative way to reduce GHG emissions between Annex I countries and non-Annex I countries is defined as the clean development mechanism (CDM). Although it is not specified that greenhouse gas emission reduction by afforestation or reforestation in non-Annex I countries is included in the CDM, here, the afforestation program in non-Annex I countries by investment of Annex I countries is regarded as one aspect of the CDM. By using an economic model to present the afforestation policy between Japan and China, the economic benefits of the afforestation activity in China by Japanese investment are evaluated.

The concept of this study is shown in Figure 2.15. In order to mitigate the target of carbon emission reduction, the afforestation policy is taken into consideration. When afforestation is carried out in Japan, this policy is not expected to bring remarkable effects because of the very expensive afforestation cost in Japan. On the other hand, when Japan invests in afforestation in China, the economic benefits will be brought to both China and Japan. For Japan, the CO_2 constraint is mitigated because of counting the CO_2 absorption in China. For China, the afforestation activity spreads to the other economic activities, and of course the forest area in China is expanded.

In order to investigate the quantitative effects of afforestation activity, the GTAP (Global Trade Analysis Project) database and the global general equilibrium model are used. In the original GTAP database, regions and sectors are divided into 45 and 50 respectively. In this study, regions and sectors are aggregated as shown in Table 2.1. The 4 scenarios are set up as represented in Table 2.2 for this study. The annual afforestation area from 2000 to 2020 in Japan is assumed to be 10,000 ha, a figure recently observed in Japan. In China, the annual afforestation area is calculated from the equivalent cost of afforestation in Japan, that is almost 3 times larger than that in China.

GDP gains from the afforestation policy are shown in Figure 2.16. GDP in Japan will reduce by introducing a CO_2 reduction policy based on the Kyoto target, but the afforestation policy can mitigate this GDP loss. Even if the afforestation policy is carried out in Japan, the economic benefits to Japan will saturate even if the total afforestation area is expanded. When the afforestation policy is introduced in China using Japanese investment, the economic benefits to Japan will continue to increase until 2020. On the other hand, in the case of China, GDP will increase by introducing the CO_2 reduction policy in Annex I countries because of the influence of carbon leakage. Moreover, when the afforestation policy carried out in China, economic benefits to China will also be increased. But when the afforestation policy is carried out in Japan, the economic benefit is smaller than that in the case of afforestation in China. Furthermore, the forest area in China will be increased through the afforestation policy.

Global Climate Change Policy and Recycling

The AIM project team has been developing a new type top-down economic model, which can analyze environmental industries and waste management systems. In Japan, the waste management problem is one of the most severe domestic environmental problems. It is said that there will be a shortage of final disposal sites in the near future. This new economic model has been developed in order to investigate the economic effects on recycling policy.

This model is based on the recursive general equilibrium model. The module of the pollutants generation such as solid wastes and their management are internalized. Figure 2.17 shows the structure of this model. In order to produce goods and services, inputs of capital, labor, energy, other intermediate goods and pollution management are needed. The input of pollution management means appropriate pollution treatment and reduction activities in each sector, based on environmental regulations. Manufactured goods and services are supplied to the market, and distributed for final consumption, investment and intermediate demand. During production and consumption, pollutants and wastes are emitted into the environment even though pollution management input is introduced. In the case of solid waste, some of it is recycled into the market by using resources such as capital and labor, and some of it is disposed in final disposal sites. Generally speaking, waste managing through recycling is

costlythe, but recycling has some benefits in reducing the mass of final disposal waste and in supplying recycled goods to the market. This study evaluates the economic benefit of recycling activities under severe constraints on the availability of final disposal sites.

This model is not a global model but a Japanese model. The economic sectors are divided into 33 sectors including the environmental industry, such as the waste management sector, and goods and services are divided into 31. The waste types treated in this study are shown in Table 2.3. In order to estimate the economic benefits of recycling activities, the 3 scenarios are set up as represented in Table 2.4. CO_2 reduction and final disposal reduction are taken as environmental constraints.

The simulation result is shown in Figure 2.18. If the environmental constraints of CO_2 and final disposal sites do not exist (Scenario 1), the GDP will be about 596 trillion yen in 2010. On the other hand, if the environmental constraints exist (Scenario 2), GDP in 2010 will be 580 trillion yen. When the paper recycling policy is included under environmental constraints (Scenario 3a), GDP will recover by about 55 billion yen compared with Scenario 2. And the marginal costs of reduction of CO_2 emissions and the final disposal will be decreased by introducing paper recycling policies. In addition to paper recycling, if the entry of low emission vehicles into the market is promoted (scenario 3c), GDP will recover about by 729 billion yen compared to Scenario 2. These results show the recycling policy has potential to mitigate the environmental constraints and, as a result, to promote the economic activities. Although this simulation is applied to only Japan, the AIM project team intends to expand to other Asian countries.

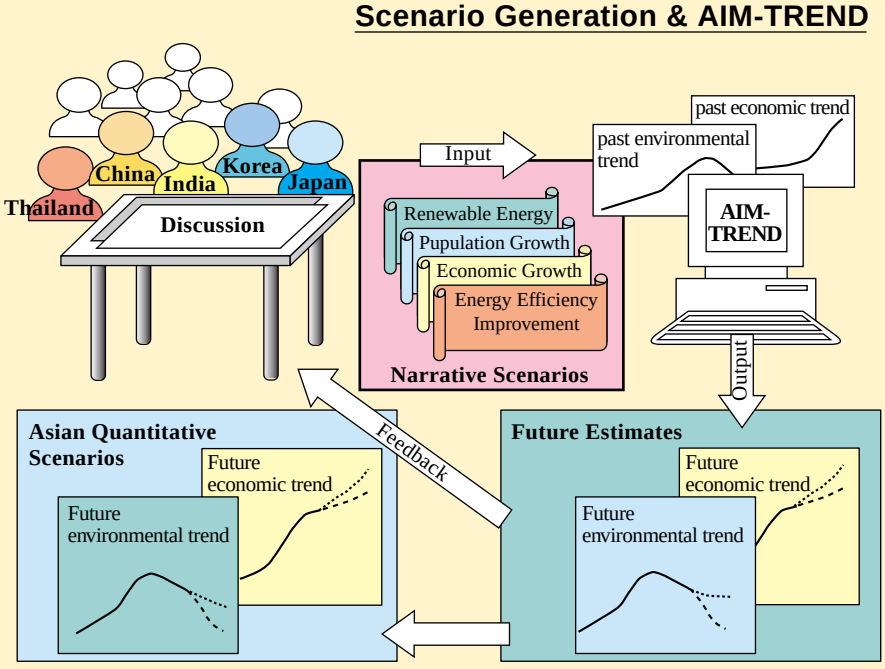
Water Resource Management

In aiming towards a solution to the global warming problem, we must urgently set up concrete actions that should be taken in the coming decades, with consideration given to long-term efficiency. Together with GHGs reduction, adaptation to climate change impact is considered to be an important and efficient strategy. Although there are many difficulties in analyzing efficient adaptation strategies, we should positively look for what we can and should do in order to mitigate the future negative impacts of climate change.

The AIM project team has focused on robust adaptation strategies that are of some service regardless of the degree of climate change. One example is to invest in

Box 2.2 About AIM-Trend Model

AIM project team has been developing the model for assessing the future environmental burdens based on the past socio-economic trends and future scenarios. By using this model, the environmental trends until 2032 in the Asian-Pacific countries have been estimated. This “AIM-Trend Model” is a communication tool to enhance discussions and search for countermeasures by envisaging environmental conditions in a consistent way.

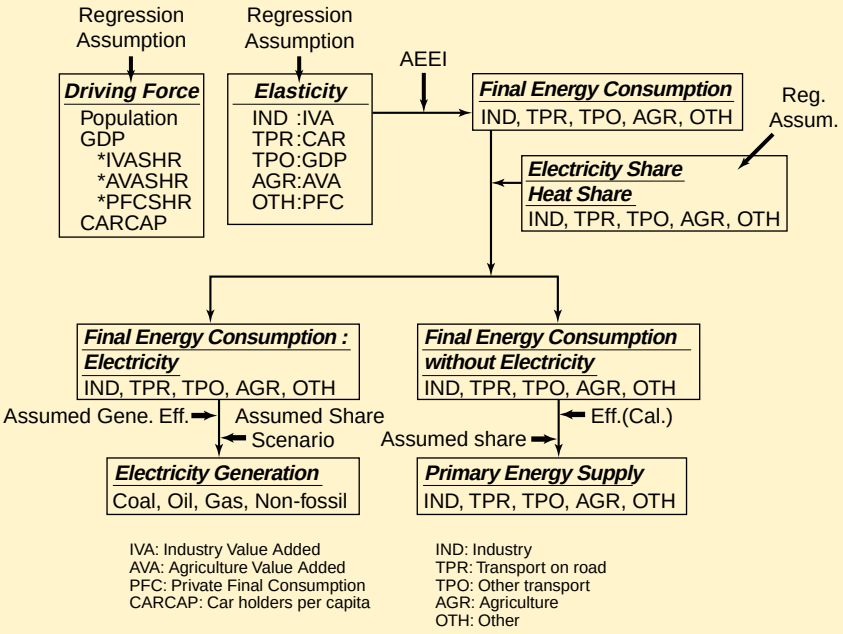


Note: This model is written in ATPL (AIM Trend Programming Language) using VBA in Excel. If you have a computer with Microsoft Excel, you can install and use AIM-Trend Model.

Box 2.3 Structure of AIM-Trend Model

One example of AIM-Trend Model is explained here.
Steps of calculation are as follows;

1. Final energy demand is divided into 5 sectors: IND, TPR, TPO, AGR, OTH.
2. Driving force and elasticity are calculated by regression with historical data or assumed for each final energy sector
3. Final energy demand is calculated with driving force and elasticity for each final energy sector
4. Electricity share and heat share are calculated by regression with historical data or assumed for each final energy sector
5. Final energy demand is divided into electricity demand, heat demand (CHP) and other demand
6. Electricity is generated with power plants (COL, OIL, GAS, CRW) and so on (NUC, HYD, GEO, NEW). Heat is generated with CHP.
7. Electricity generation by each type is calculated with assumed efficiency, share between fossil fired power plant, and assumed non-fossil generation.
8. Primary energy supply (COL, OIL, GAS, CRW, NUC, HYD, GEO, NEW) without electricity and/or heat generation is calculated with assumed energy share.
9. Emissions (CO_2, SO_2, NOx, CH_4, N_2O, CO) are calculated. About SO_2 and NOx emissions, Kuznetz curves are assumed.



Note: There have been several test results calculated with AIM-Trend Model. The next step is to integrate these results and set several environmental policy cases.

social infrastructures that not only improve current society but also add adaptive capacity against climate change in future. We are expected to create framework that can evaluate strategy options considering both the near-term benefit and long-term benefit.

Figure 2.19 shows the relationship between national stock for flood control per capita and the ratio of flood disaster damage to GNP in Japan after World War II. The disaster damage is found to decrease according to the stock for flood control. This relationship should be different among countries, but a similar tendency is still expected in most Asian countries. Considering this possibility to reduce flood disaster by assigning more capital on the construction of infrastructure, we set up a simple optimization model. As an example, we applied the model to estimate the damage potentially avoided thanks to appropriate investment on flood control infrastructure in China

Flooding, one of the main natural disasters in China, happens frequently, not only in southern China which has a humid monsoon climate, but also in the arid and semi-arid northern China. Shortage of infrastructure on flood prevention is the main reason. Flood prevention facilities in most rivers and river watersheds cannot meet the safe standard (Table 2.5 and Table 2.6). Projected climate change is expected to enhance both the frequency and intensity of flooding, which will surely reduce the effectiveness of infrastructure being built to adapt the current climate variability.

Four scenarios combining climate change and

investment on flood prevention infrastructure were assumed for simulation. It is assumed investment in infrastructure for disaster prevention based on climate variability without considering climate change is adopted in all scenarios.

Scenario CnAn: Climate change is assumed not to occur, therefore, no adaptation investment to climate change is arranged.

Scenario CyAn: Climate change does occur while policymakers ignore the existence of climate change. No adaptation investment is arranged; damage from flood may increase.

Scenario CyAy: Climate change does occur, however, investment on water infrastructure is optimized by considering climate change.

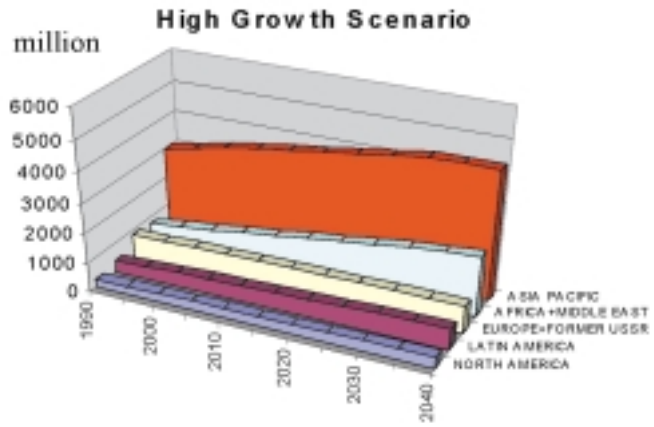
Scenario CnAy: Climate change does not occur, although investment on water infrastructure is optimized by considering climate change.

With four alternative scenarios, we calculated the optimal investment on flood prevention in China, and estimated GDP gain, consumption per capita and damage reduction.

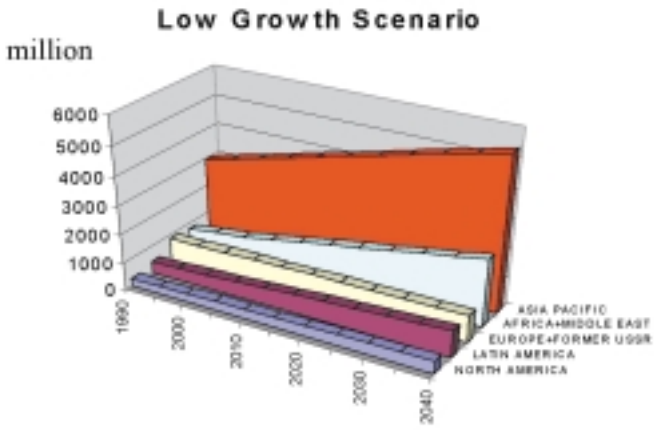
The model is run on the following assumptions: population growth follows a medium population scenario (1.033 billion in 2100); non-agricultural sector employs 70% labor in 2050 and 80% in 2100; marginal adaptation cost to climate change is assumed to be same as that to current climate variability. When climate change does not happen while investment is implemented to adapt climate change, the damage from flooding is lower than the base scenario, CnAn, because adaptation investment adds extra adaptive capacity mitigating the damage from climate variability. Damage to agricultural capital stock and non-agricultural capital stock under the four scenarios have similar patterns to that of agricultural land, however, damage from flooding reduced more quickly.

Figure 2.20 compares GDP changes in the CnAn scenario with the other three scenarios. When policymakers ignore climate change, but it occurs, flood damage to agricultural and non-agricultural GDP would be increased to 0.71% and 0.25% (CyAn) in 2100, respectively, compared with base scenario (CnAn). Damage would be effectively reduced to 0.03% in the agricultural sector and 0.01% in non-agricultural sectors if investment were implemented to adapt the climate change. In case climate change does not occur while investment aiming to adapt to increased flood damage by climate change is being made, agricultural and non-agricultural GDP would increase by 0.03% and 0.003% in 2100, respectively.

Investment on flood infrastructure would increase the GDP compared to the base case if no climate change occurs. However, consumption per capita shows a different pattern (see Figure 2.21). Consumption per capita would slightly decrease if investment were taken and no climate change occurs and the decrease of consumption per capita would be much larger in the case of climate change with no action (CyAn). Comparing this slight decrease in per capita consumption in CnAy case with the large decrease in CyAn case, we can say that an appropriate amount of investment on flood control infrastructure is a kind of robust no-regret policy which seems efficient whether or not climate change occurs.

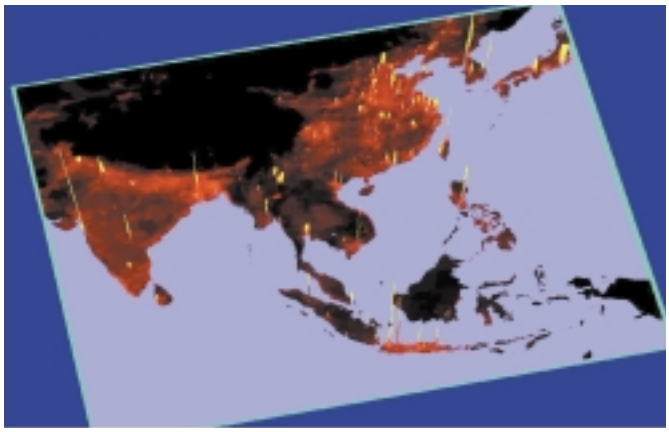


(a) Population projection under the Conventional Development Scenario

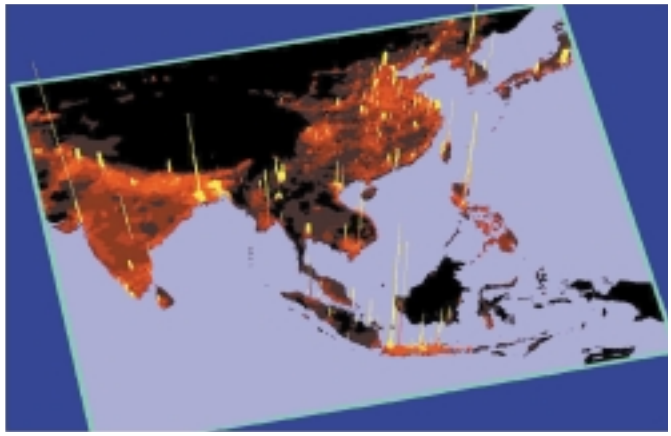


(b) Population projection under the Fortress World

Figure 2.1 Projection of population in the five regions



Population density in 1990



Population density in 2050

Figure 2.2 Change of urban population density

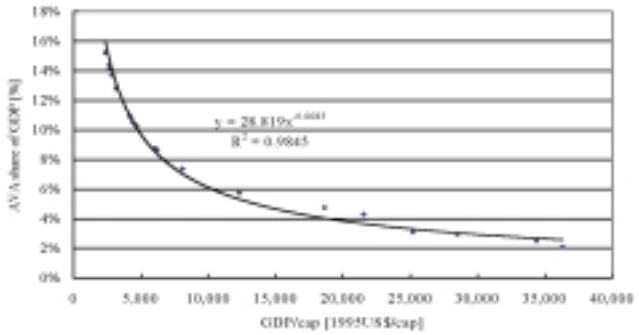


Figure 2.3 Relationship between AVA (Agricultural Valud Added) share and GDP per capita in OECD-Pacific countries

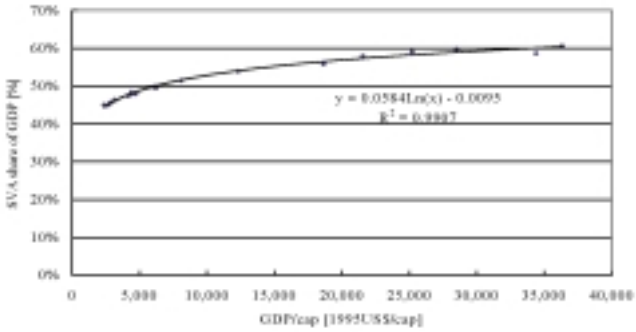


Figure 2.4 Relationship between SVA (Service Value Added) share and GDP per capita in OECD-Pacific countries

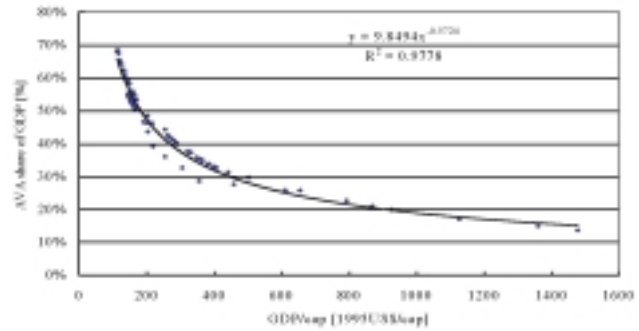


Figure 2.5 Relationship between AVA (Agricultural Valud Added) share and GDP per capita in Central Planned Asia and South East Asia

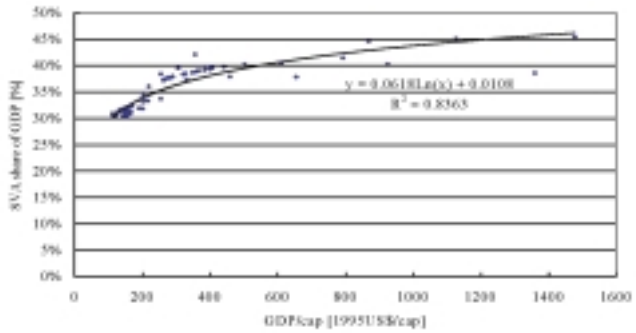
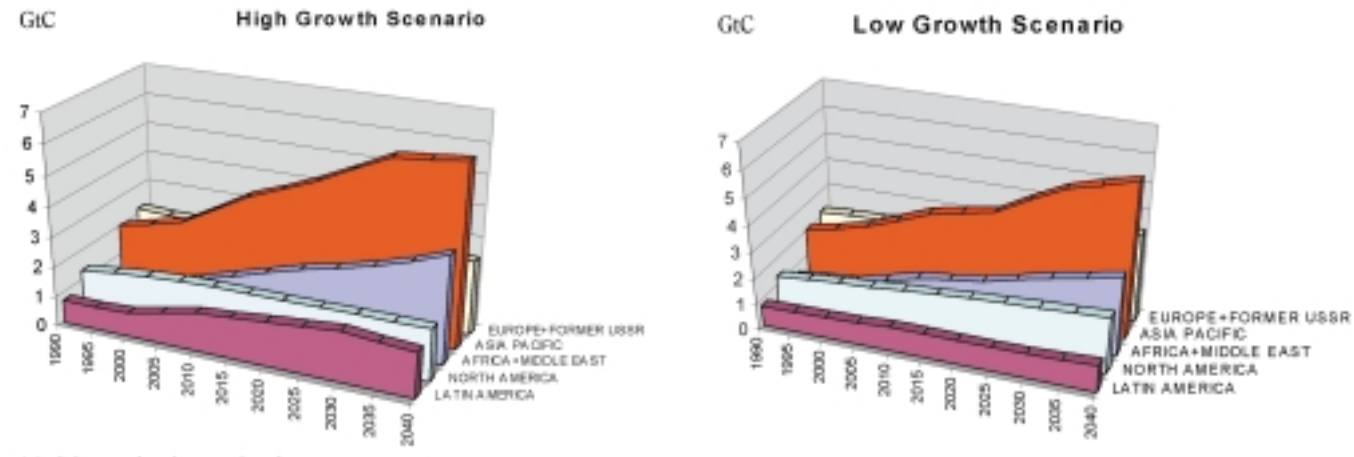


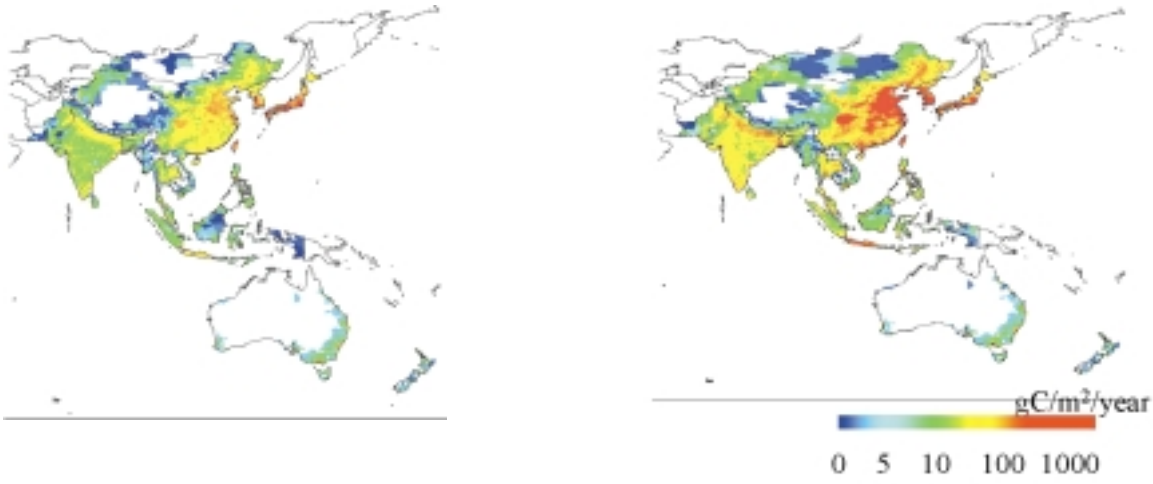
Figure 2.6 Relationship between SVA (Service Value Added) share and GDP per capita in Central Planned Asia and South East Asia



(a) CO_2 projection under the Conventional Development Scenario

(b) CO_2 projection under the Fortress World

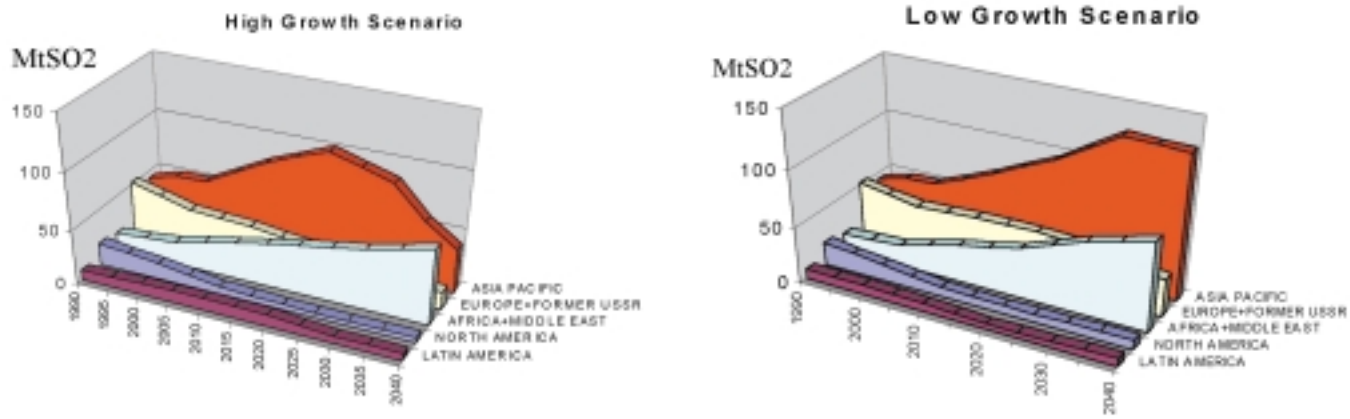
Figure 2.7 Projection of CO_2 emission in the five regions



(a) CO_2 emission intensity in 1995

(b) CO_2 emission intensity in 2032 (Conventional)

Figure 2.8 CO_2 emission intensity in the Asia-Pacific region



(a) SO_2 projection under the Conventional Development Scenario

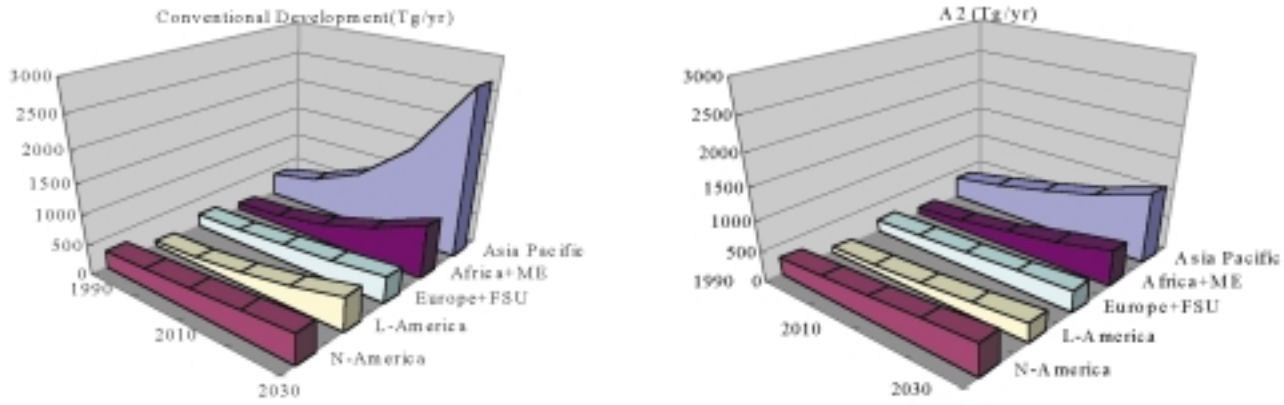
(b) SO_2 projection under the Fortress World

Figure 2.9 Projection of SO_2 emission in the five regions

(a) SO_2 emission intensity in 1990

(b) SO_2 emission intensity in 2025 under the high growth scenario

Figure 2.10 Emission intensity in China



(a) municipal waste projection under the Conventional Development Scenario

(b) municipal waste projection under the Fortress World

Figure 2.11 Projection of municipal solid waste in the five regions

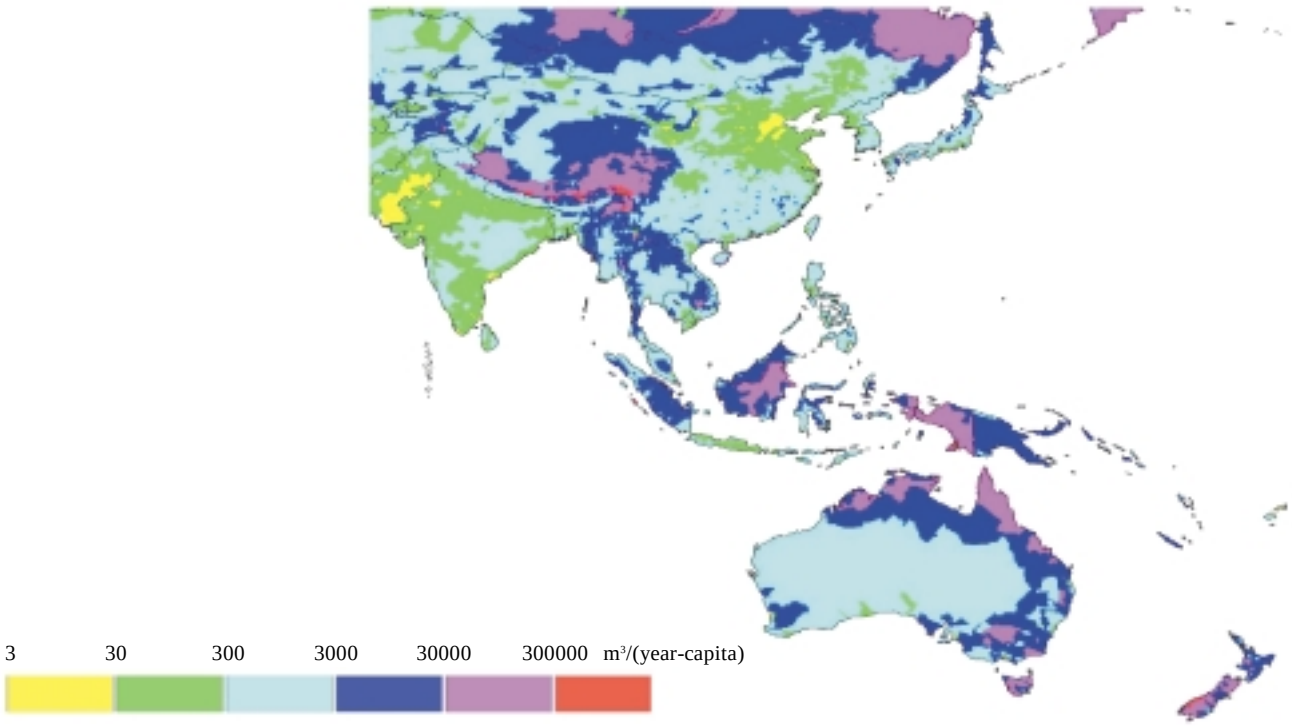


Figure 2.12 Water availability per capita, 2050

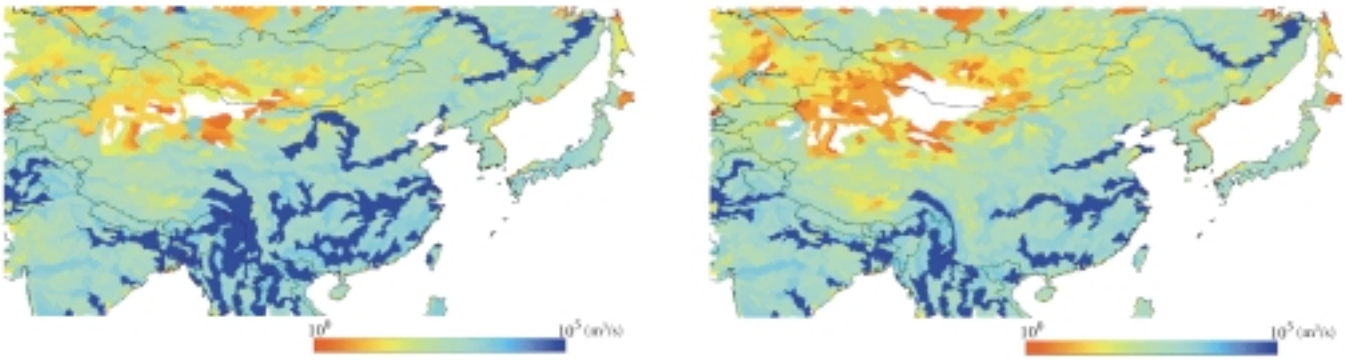
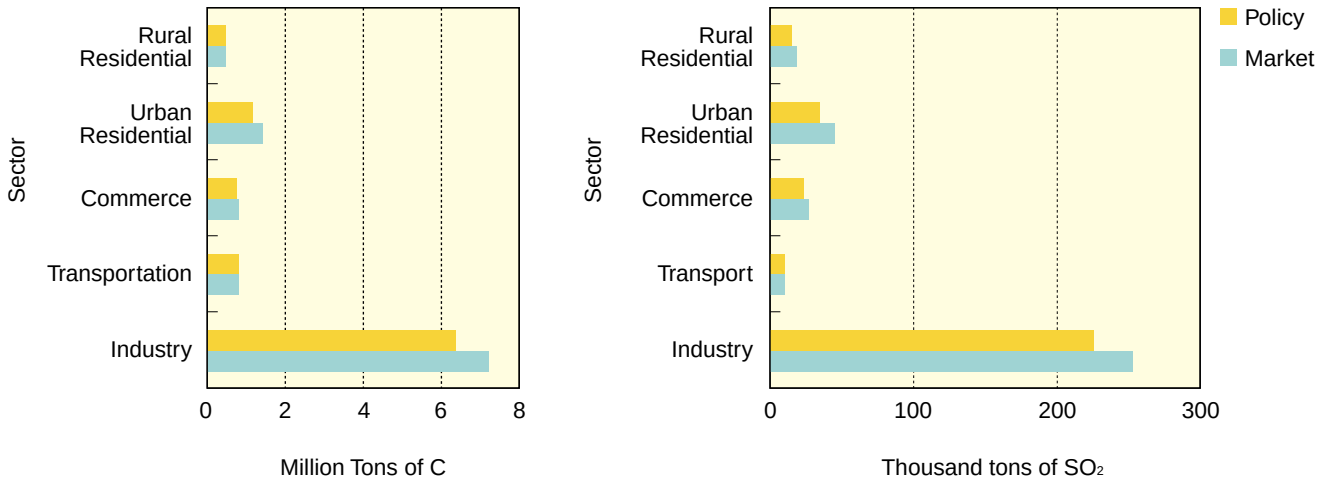


Figure 2.13 Annual averaged stream flow under current climate in 1983 (left) and after changed climate in 2100 (right)



(a) CO_2 emission reduction

(b) SO_2 emission reduction

Figure 2.14 CO_2 and SO_2 emissions in Dalian in market and policy cases in 2010

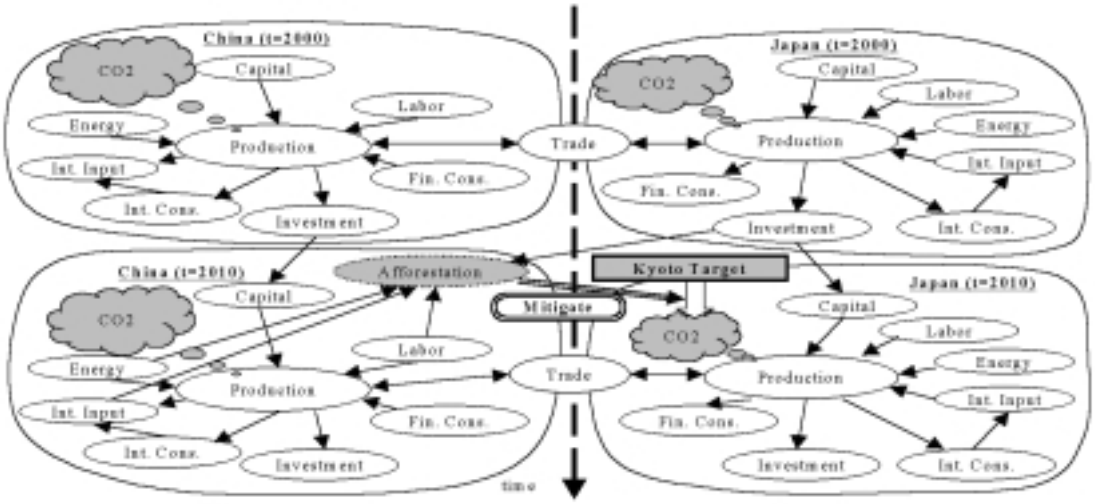


Figure 2.15 Outline of model for Eco-Policy Linkage of forest management

Table 2.1 Country and sector classifications used in this model

ID	Countries and regions	ID	Goods and service sectors
ANZ	Australia and New Zealand	AGR	Agricultural goods
JPN	Japan	LVS	Livestock
CHN	China	FRS	Forestry
IDI	India	FSH	Fisheries
RAS	Rest of Asia	MIN	Minerals
CAN	Canada	DAR	Dairy products
USA	USA	FOD	Processed foods
LAM	Latin America	MAN	Manufacturing
EUR	Western Europe	SER	Services and utilities
FSU	Former Soviet Union and Eastern Europe	COL	Coal & oil products
MEA	Middle East Asia	GAS	Gas products
AFR	Africa	ELE	Electricity
ROW	Rest of the World		

Table 2.2 Scenarios for this study

Scenario	CO_2 reduction in Annex I countries	Afforestation
Scenario (1)	×	×
Scenario (2)	○	×
Scenario (3)	○	○ (in Japan)
Scenario (4)	○	○ (In China)

Note: Non-Annex I countries have no responsibility to reduce CO_2 emissions.

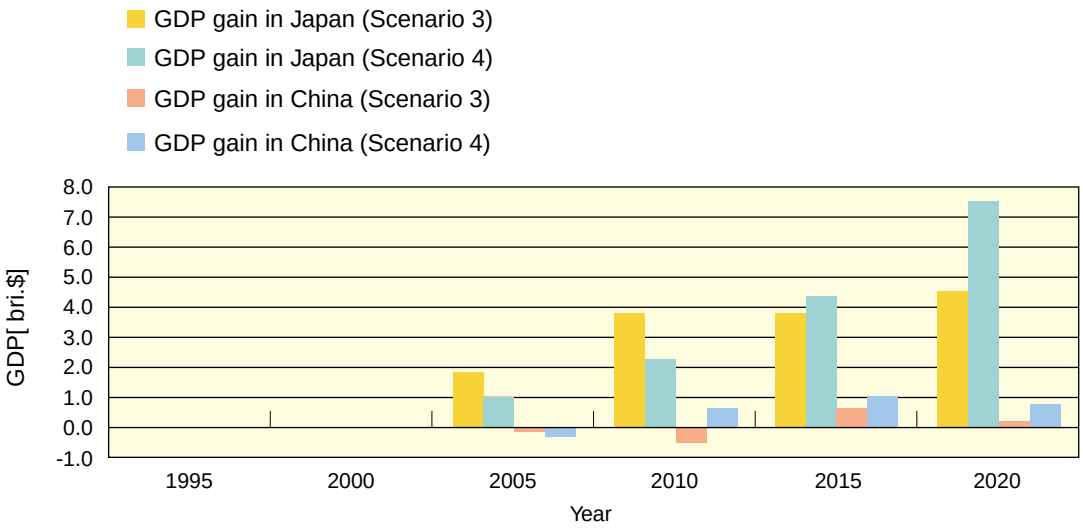


Figure 2.16 GDP gain from afforestation

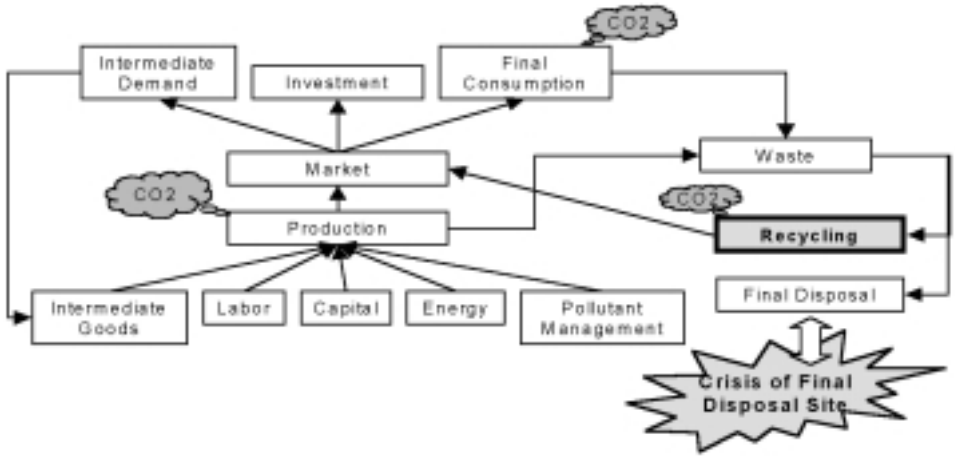


Figure 2.17 Structure of a top-down model to analyze climate change and waste policies

Table 2.3 Waste type in this study

Ash, conbustion residure
Sludge
Slush, waste oil
Waste acid
Waste alkali
Waste plastics
Waste paper
Waste wood
Waste textile
Animal and plants wastes
Waste rubber
Scrap metal
Glass and ceramics wastes
Slag
Construction waste
Soot and dust
Animal excrement
Animal carcass

Table 2.4 Scenarios for recycling model

scenario1	No constraint both CO_2 emission snd waste disposal
scenario2	CO_2: Kyoto Target/ Waste: 5%/year reduction of final disposal, without recycling policy
scenario3a	Promotion of low recycled paper demand
scenario3b	Promotion of low emission vehicle demand
scenario3c	Promotion of both recycled paper and low emission vehicle
scenario4	Enhancement of investment for waste management

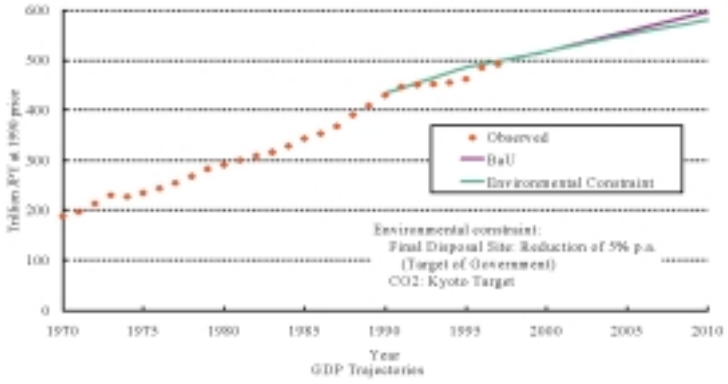


Figure 2.18 Change of GDP Trajectories

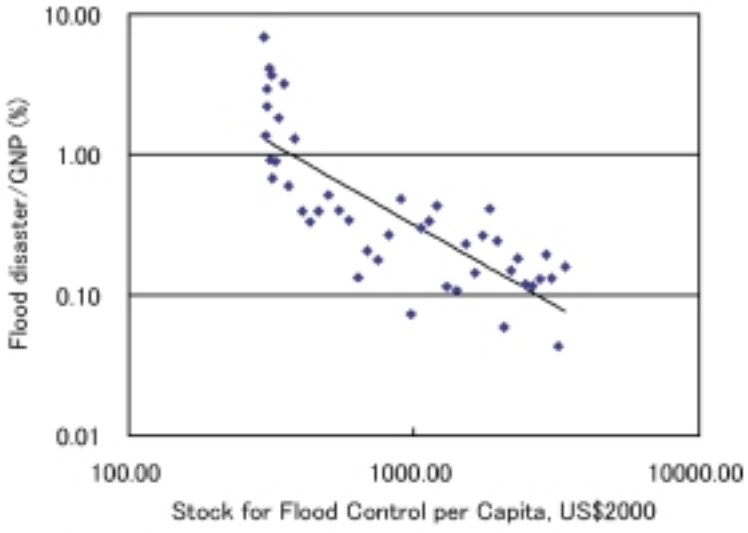


Figure 2.19 Japanese experience of reducing flood disaster

Table 2.5 Actual Safety Status of Main Rivers/Watershed in China

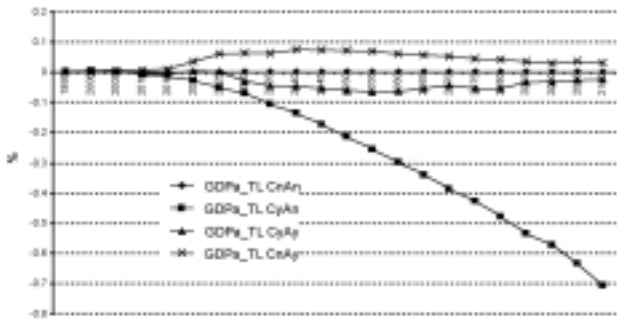
River/watershed	Location	Guaranteed Safety
Yellow River		1/60
Huaihe River	main streams in the middle reaches	1/40
	the lower reaches	1/50
	Main branches	1/10-1/20
Haihe River & Luanhe River		1/20
Yangtze River	The main streams and lakes in the middle and lower reaches	1/10-1/20
Taihu Lake & its Surrounding area		1/20
Pearl River	Some important economic area	1/50
	Other area	1/10-1/20
	The dikes of main streams in Xijiang	1/10-1/20
Liaohe River	Dikes of main streams	1/20
	Branches	1/10-1/20
	Shenyang, Liaoyang, Fushun	1/100
	Benxi	<1/20
Songhuajiang River	farmland	1/20
	Harbin, Qiqihaer, Jiamusi	1/40

Source: (1) Liu, 1993; (2) China Agricultural cyclopedia - Water conservancy (A), Agricultural Publishing House, 1987, pp 151.
Note: Safety standard of infrastructure against flood is expressed in terms of the frequency of overtopping the flood prevention system.

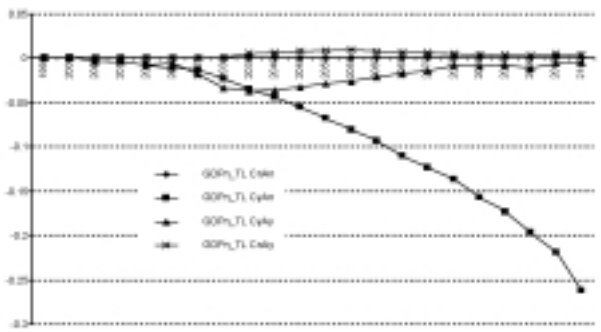
Table 2.6 Actual Safety Status of Main Rivers/Watershed in China

Standard of flood preventon	Cities (Non-agri.popu, in 1000 persons)	Mineral Area	Cultivated area (1000 ha.)
=< 1/200	>= 1500	Very Important	> 333.3
1/100~1/200	500~1500	Important	333.3~6.67
1/50~1/100	200~500	Medium	2~6.67
1/20~1/50	=< 200	Less	< 2

Source: (1) China Agricultural cyclopedia - Water conservancy (A), Agricultural Publishing House, 1987, pp 152; (2) Li, 1997.



(a) GDP gain of agricultural sector



(b) GDP Gain of non-agricultural sector

Figure 2.20 Change of GDP of climate change policies compared to the case without climate change and adaptation

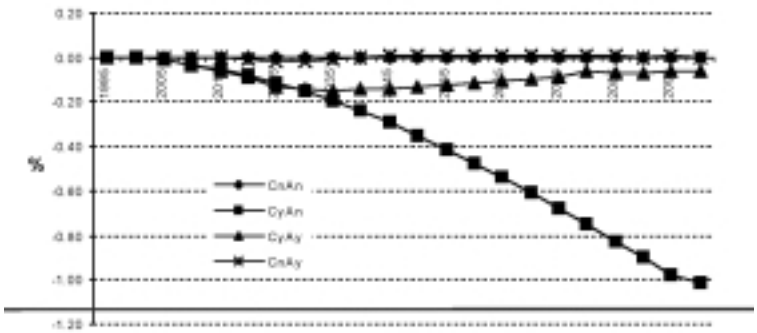
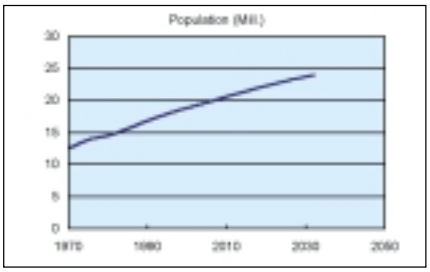
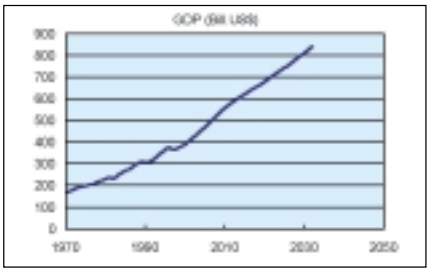


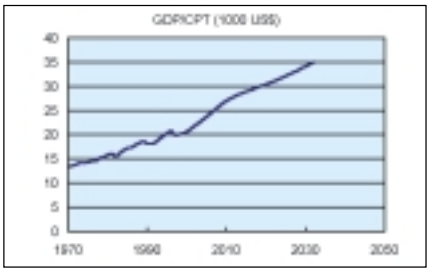
Figure 2.21 Consumption per capita

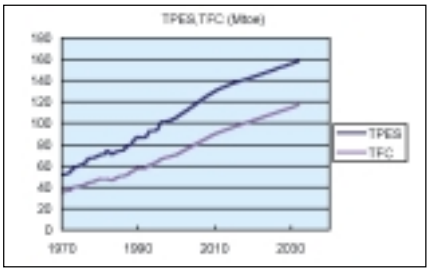
Appendix 2.1 Simulation for Selected Asian-Pacific Countries / Areas

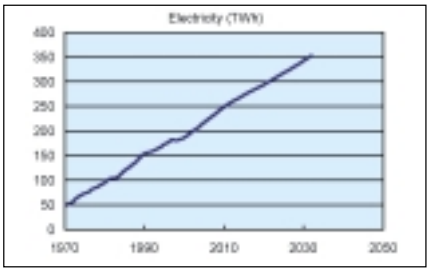
Australia

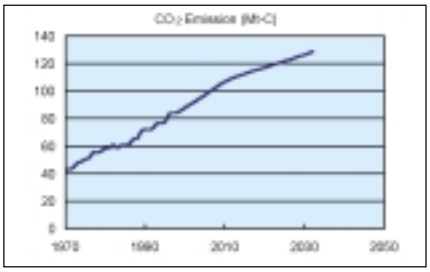




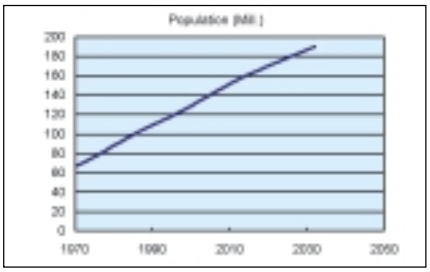


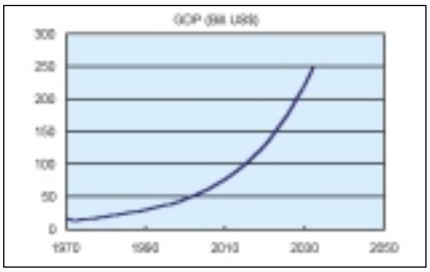


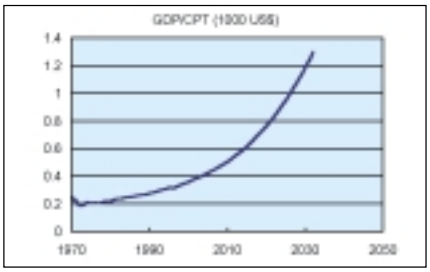


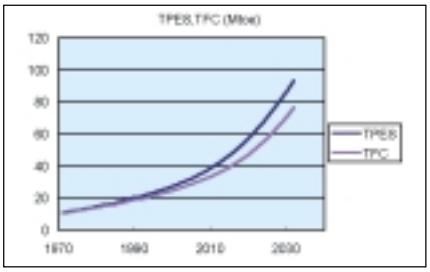


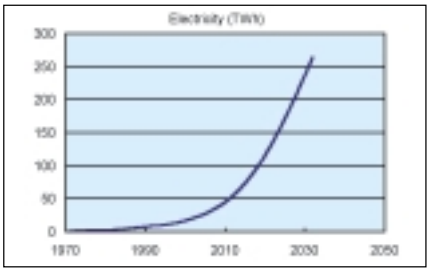
Bangladesh

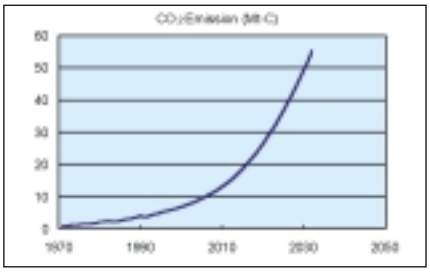




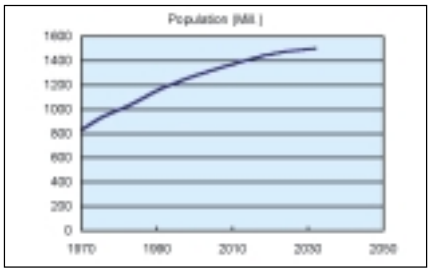


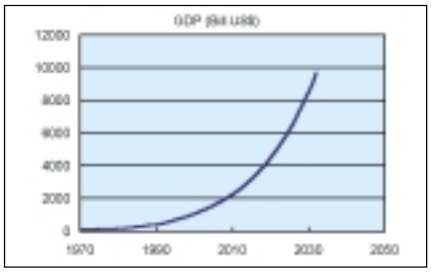


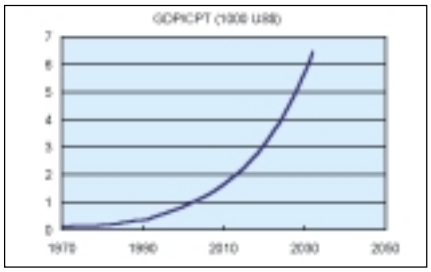


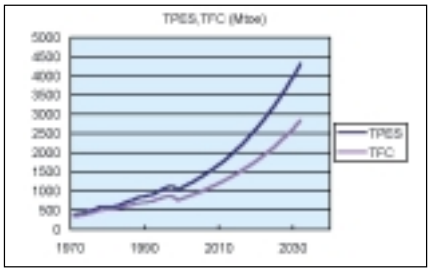


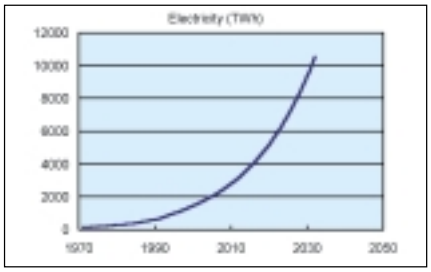
China

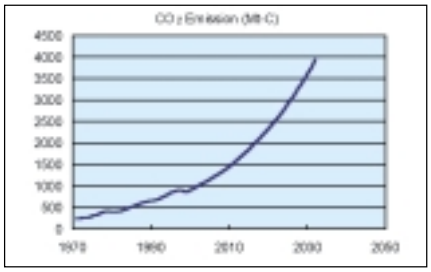

Population (Mill.)


GDP (Bill US$)

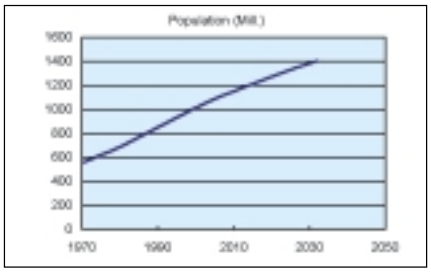

GDP/CPT (1000 US$)

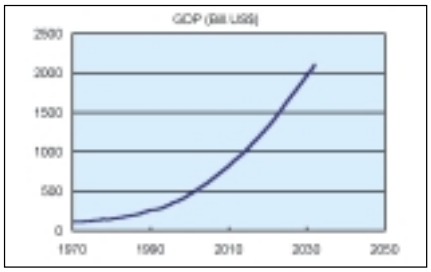

TPES,TFC (Mtoe)
TPES
TFC

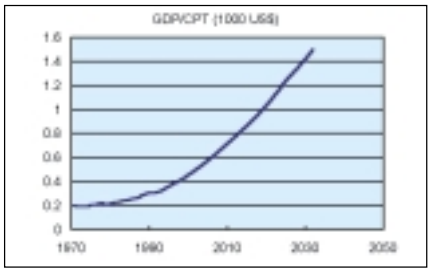

Electricity (TWh)

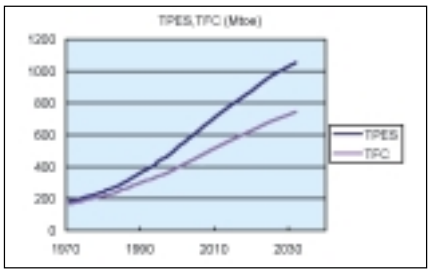

CO2 Emission (Mt-C)

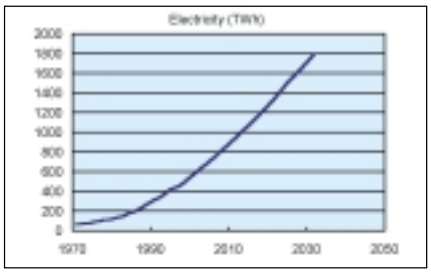
India

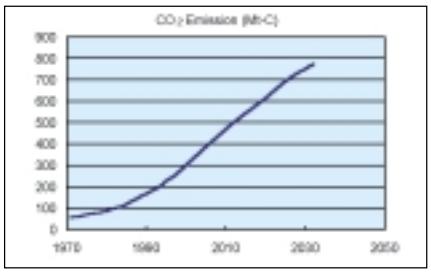

Population (Mill.)


GDP (Bill US$)

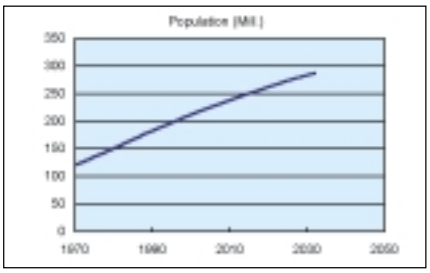

GDP/CPT (1000 US$)

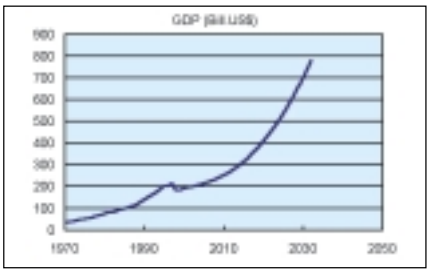

TPES,TFC (Mtoe)
TPES
TFC

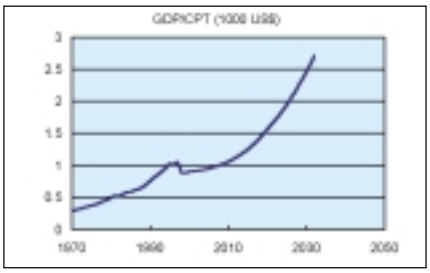

Electricity (TWh)

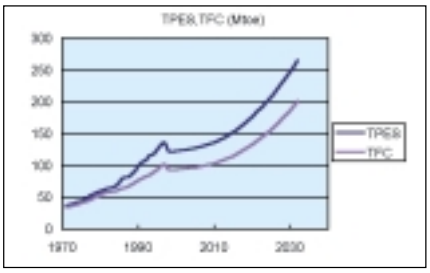

CO2 Emission (Mt-C)

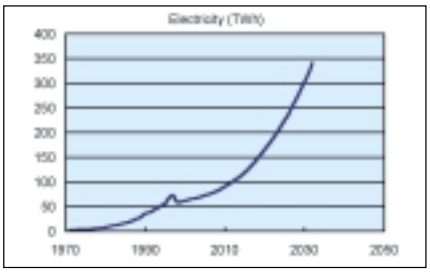
Indonesia

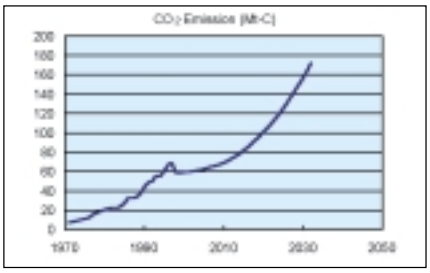




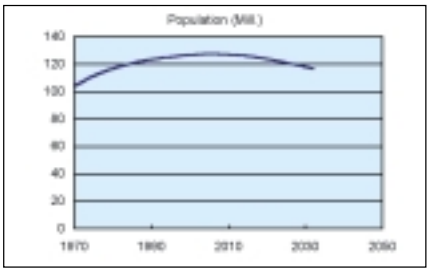


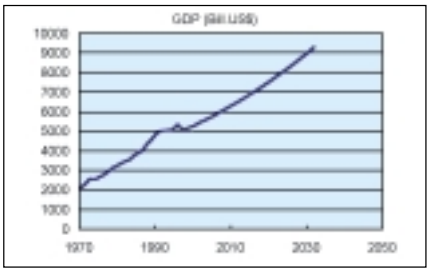


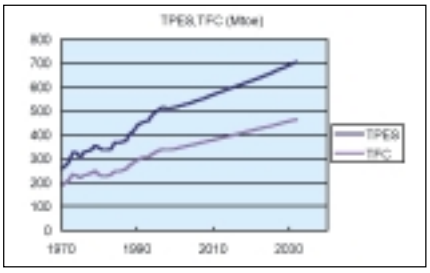


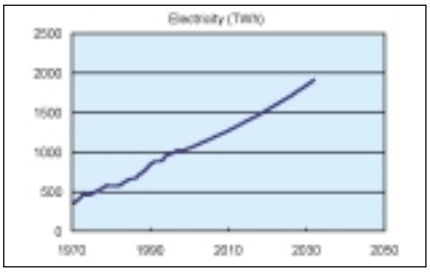


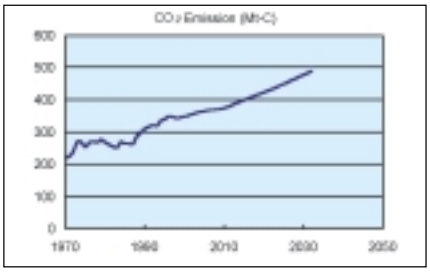
Japan



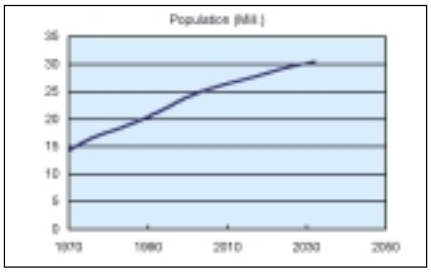


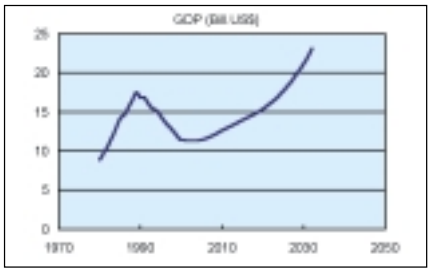


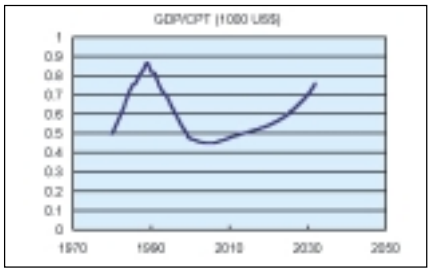


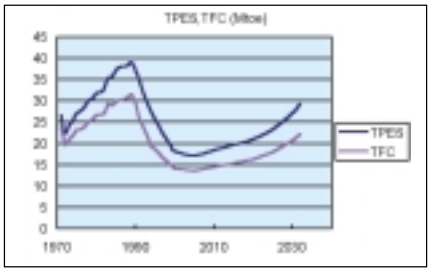


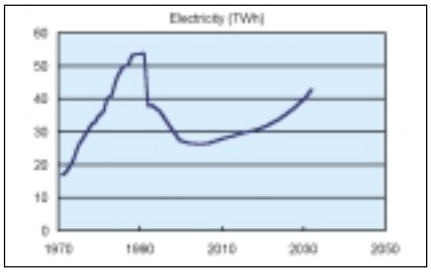
Korea, Dem

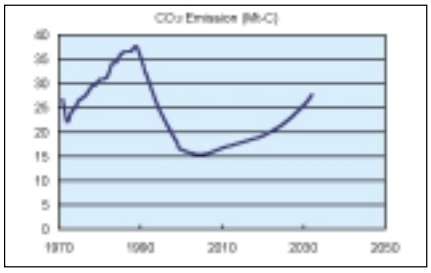












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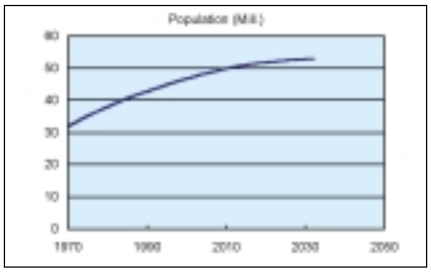

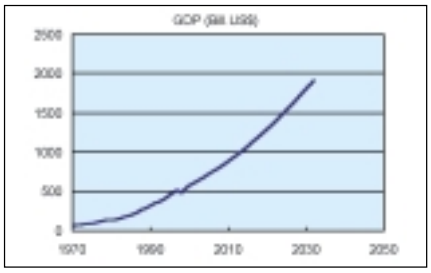

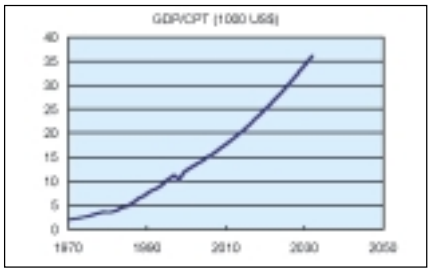

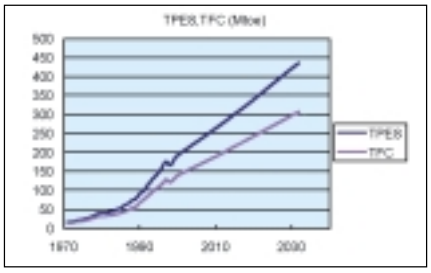

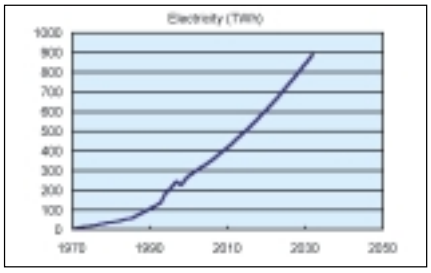

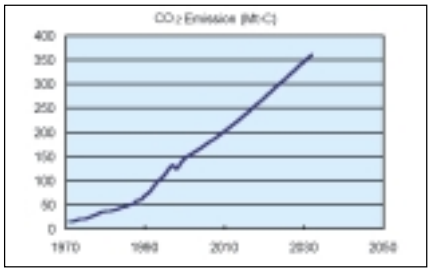

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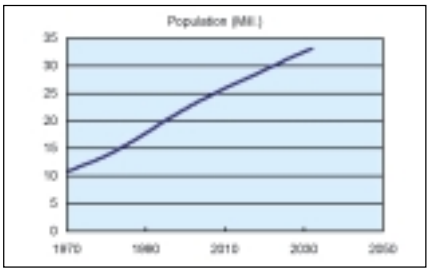
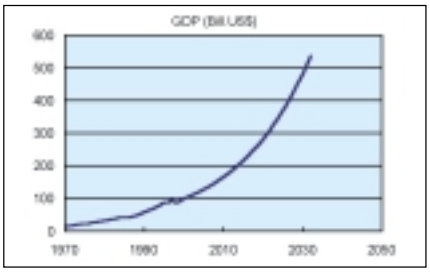
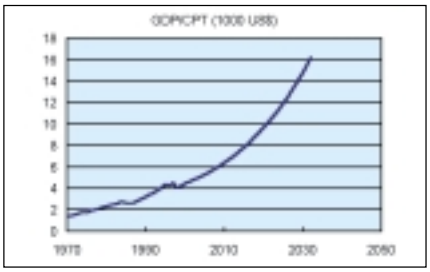
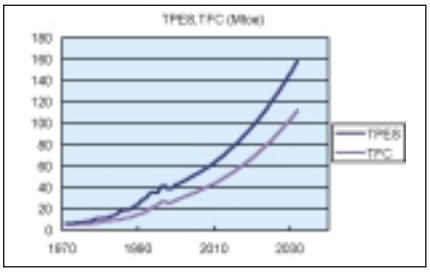
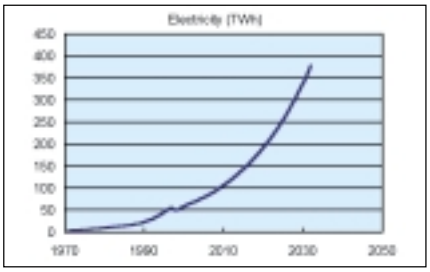
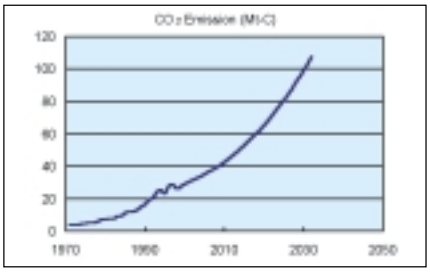




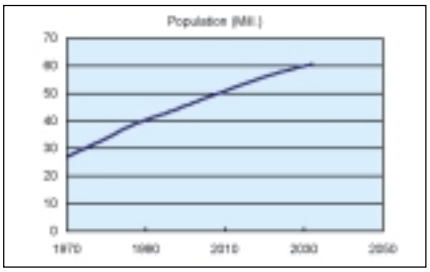


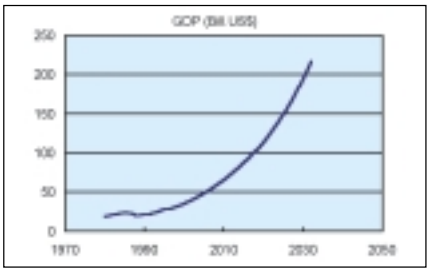


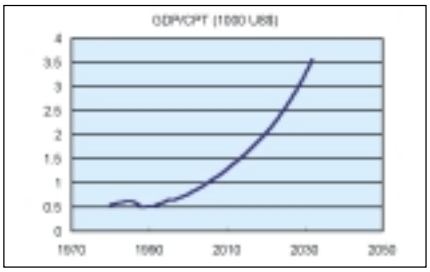


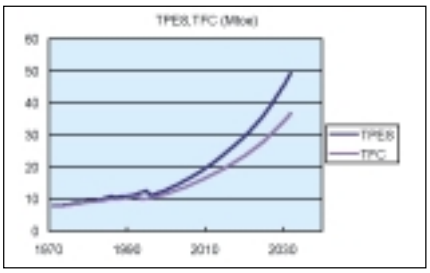


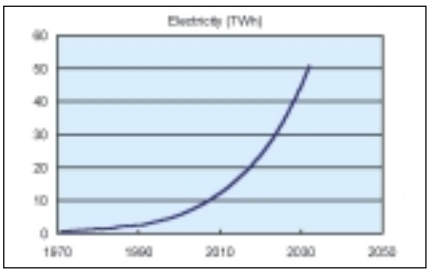
Myanmar

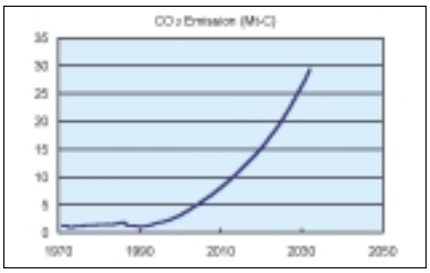




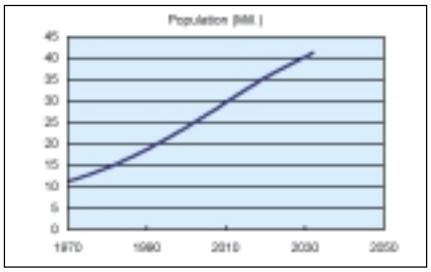


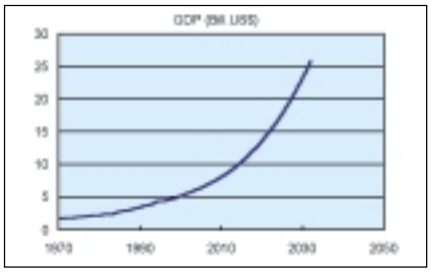


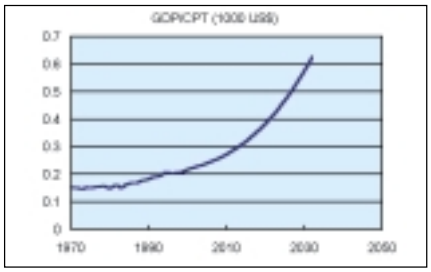


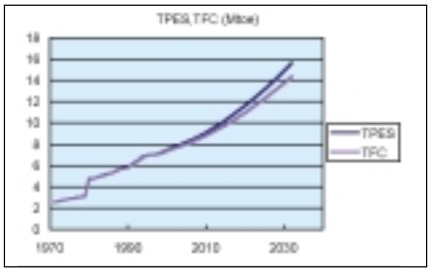


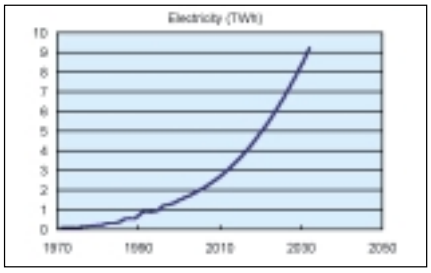
Nepal

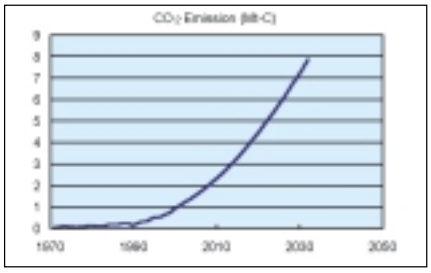




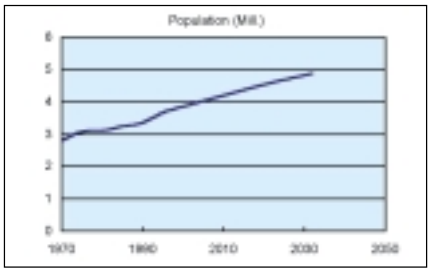


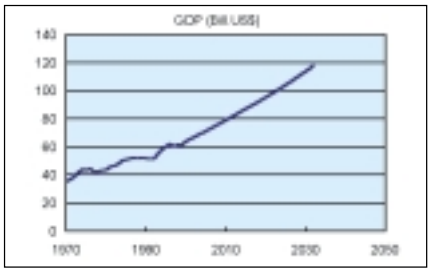


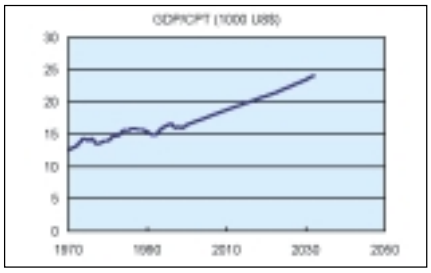


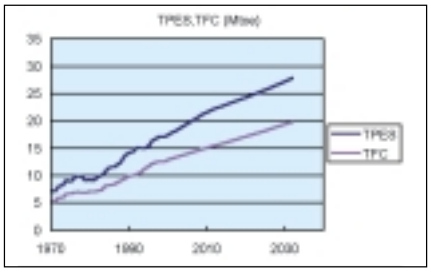


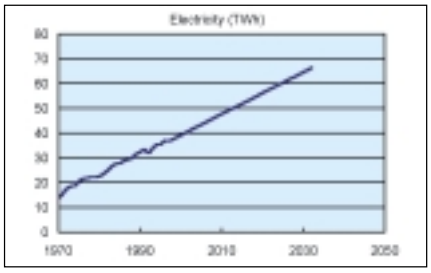
New Zealand

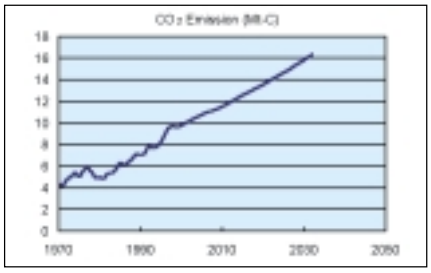




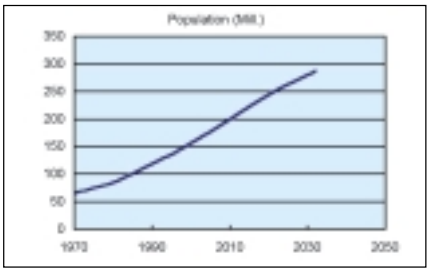


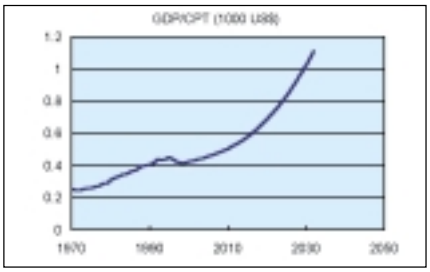


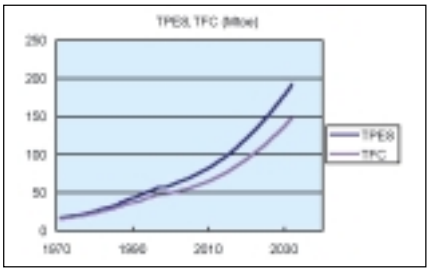


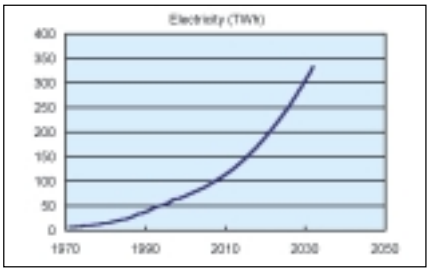


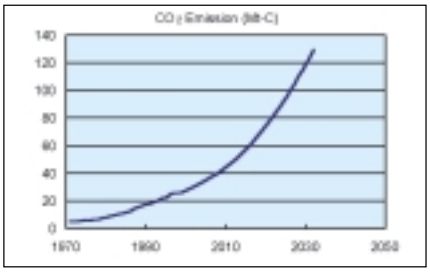
Pakistan



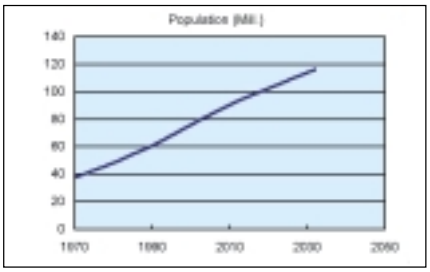


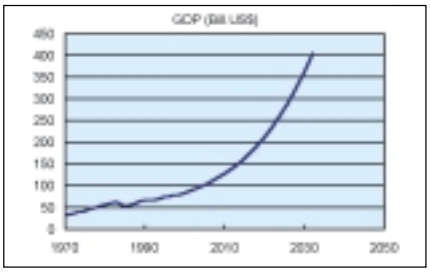


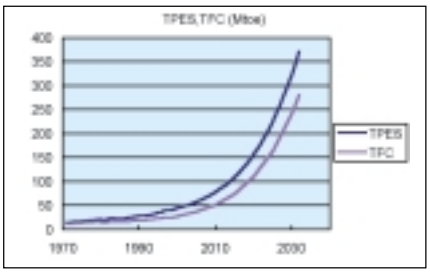


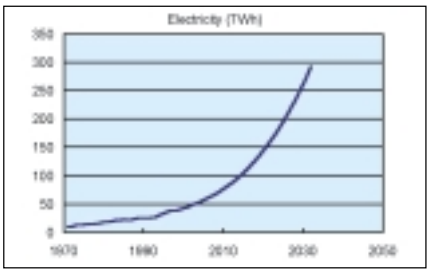


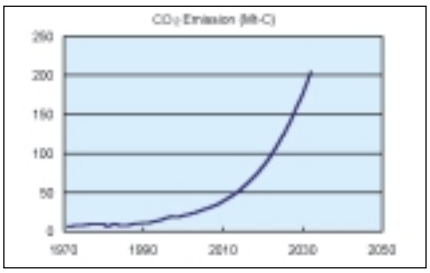
Philippines



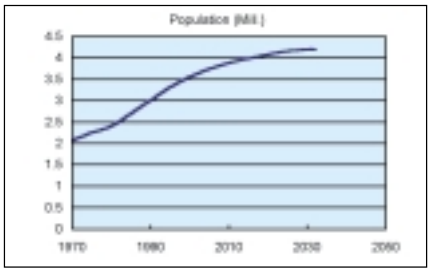


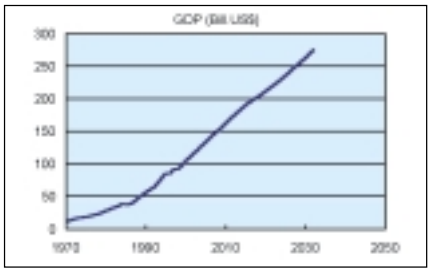


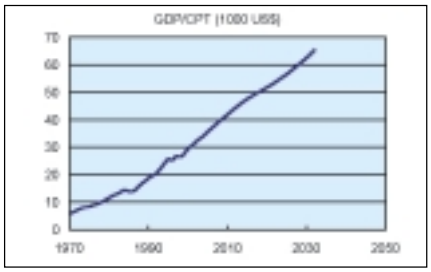


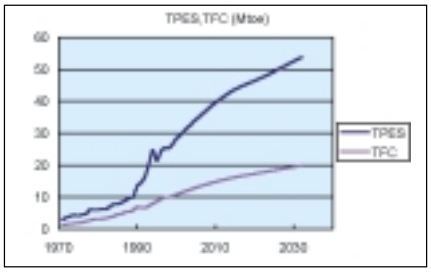


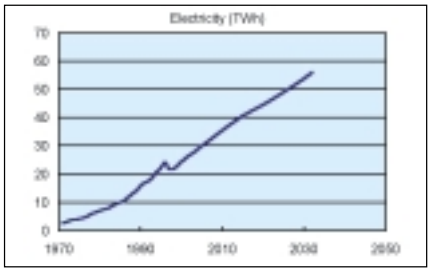
Singapore

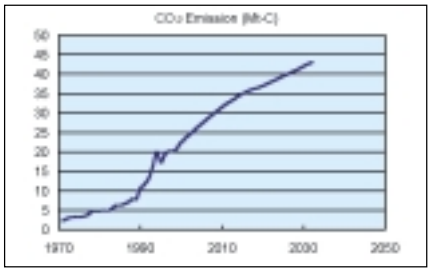




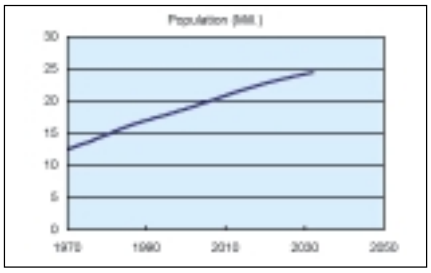


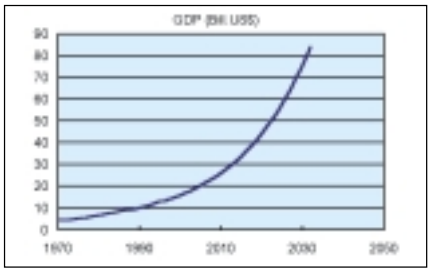


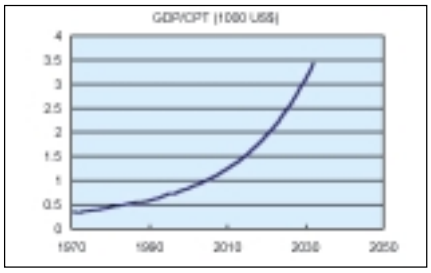


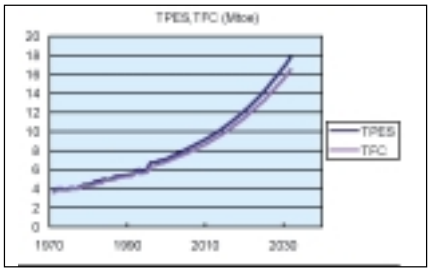


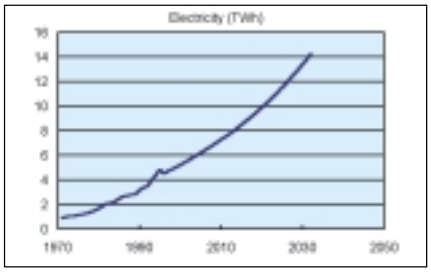
Sri Lanka

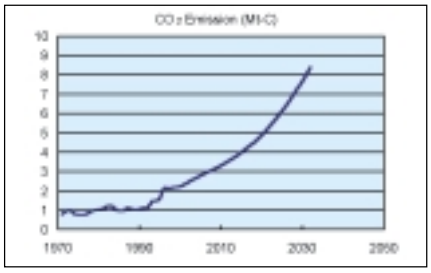




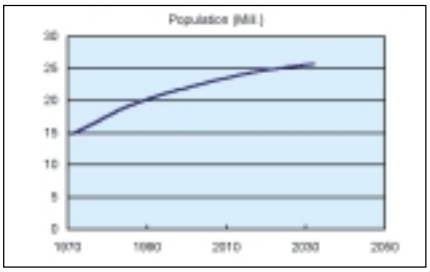


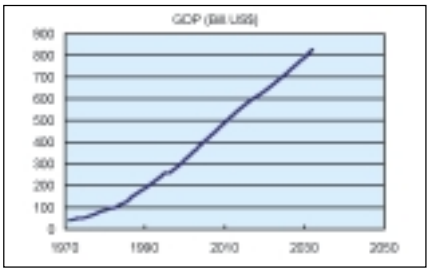


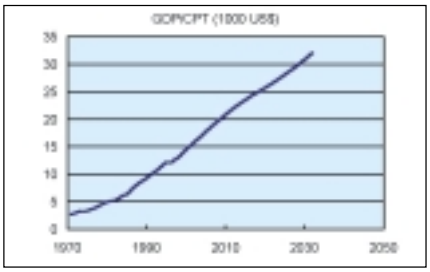


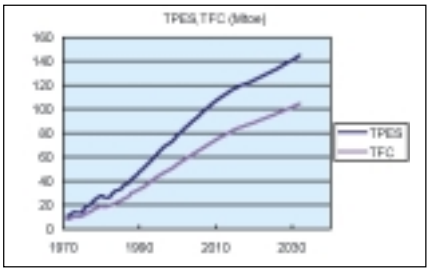


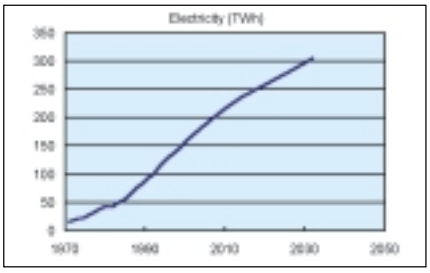
Taiwan

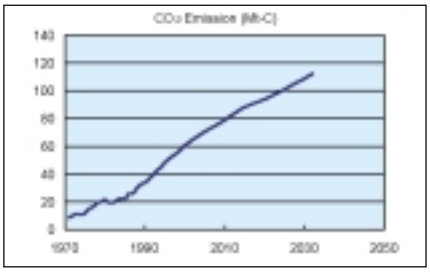




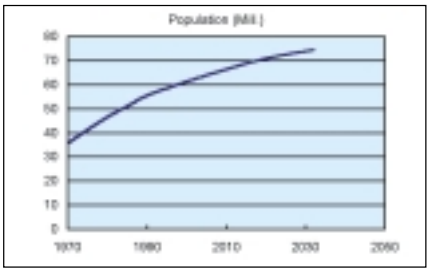


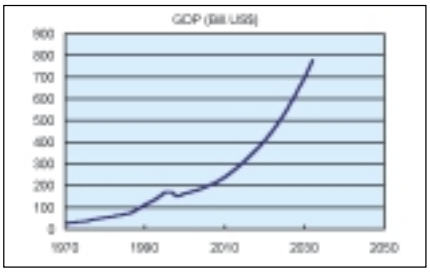


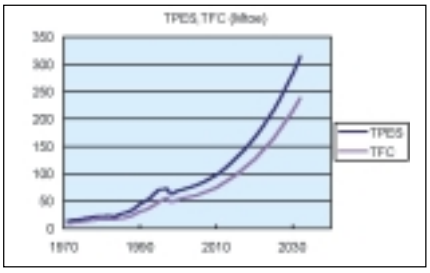


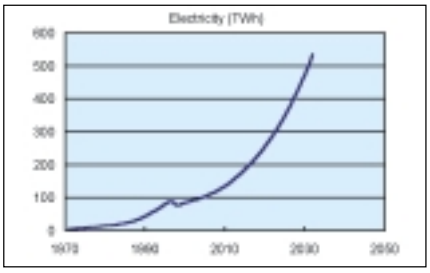


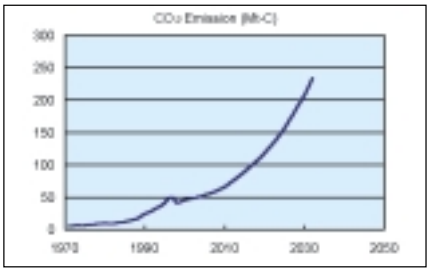
Thailand



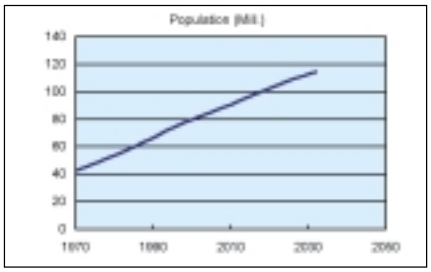


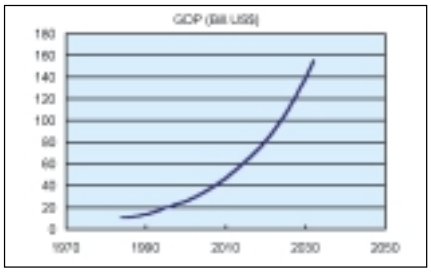


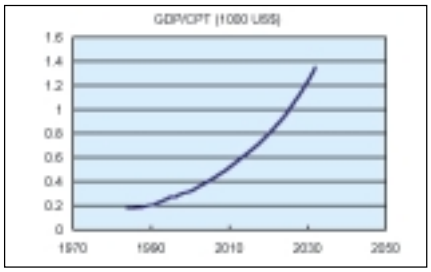


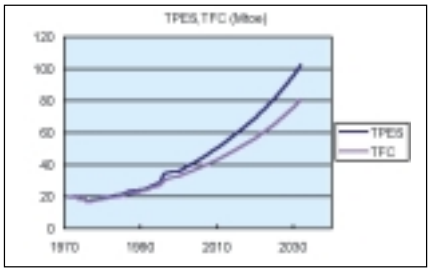


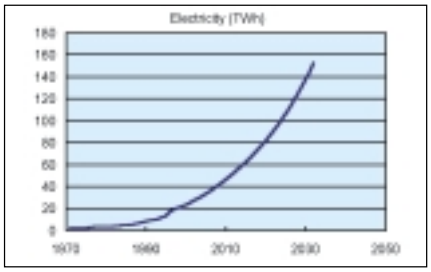
Vietnam

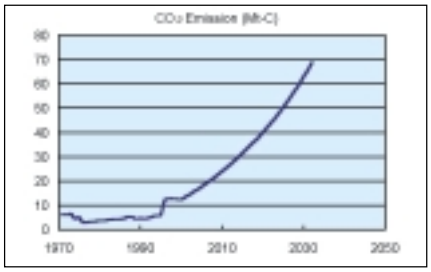

Population (Mill.)
140
120
100
80
60
40
20
0
1970
1990
2010
2030
2050


GDP (Bill.US$)
180
160
140
120
100
80
60
40
20
0
1970
1990
2010
2030
2050


GDP/CPT (1000 US$)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1970
1990
2010
2030
2050


TPES, TFC (Mtoe)
120
100
80
60
40
20
0
1970
1990
2010
2030
TPES
TFC


Electricity (TWh)
180
160
140
120
100
80
60
40
20
0
1970
1990
2010
2030
2050


CO2 Emission (Mt-C)
80
70
60
50
40
30
20
10
0
1970
1990
2010
2030
2050

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Critical Issues and Countermeasures

Chapter 3

Critical Issues and Countermeasures

In this chapter, critical environmental issues in Asia and the Pacific are reviewed. The issues considered are climate change, urban environment, biodiversity, forest conservation, freshwater and education for sustainability. These area studies looked closely at the relevance and application of the four concepts of Eco-Consciousness, Eco-Partnership, Eco-Technology and Investment, and Eco-Policy Linkage with respect to the critical environmental issues.

3.1. CLIMATE CHANGE

3.1.1. Current Status and Issues

The issue of climate change is the first serious difficulty that we face as humanity starts to move towards a society with sustainable development. Stable climate is a prerequisite for all living things on earth. Procreation and living have been carried out in a relatively stable climate in the past. However, the expansion of human activity has now begun to destroy stability.

Global climate change is the phenomena of changes in the earth's climate due to human induced interference with the natural systems of the earth. Scientists have predicted that the global mean temperature in 2100 might increase by 2°C (the most recent IPCC reports, which were endorsed in Bonn/COP6bis by all ECO ASIA countries suggest that temperatures are likely to rise by between 1.4° – 5.8° C by 2100) compared to 1990[1]. Many climate-related adversities such as more frequent storm events, increased occurences of drought, an increased number of El-Nino and other adverse climatic situations are attributed to global climate changes. Such adverse events along with sea level rises are expected to accelerate in the future in the absence of any efforts to prevent future climate changes. The development of human civilization in the past two centuries is based on intense exploitation of natural resources and increasing pressure on the environment.

In 1990, the Intergovernmental Panel on Climate Change (IPCC), which is composed of several thousand international scientists, compiled information on and analysis of the climate change issue and submitted its first report. The report warned the world about the alarming possibility of global warming in the next 100 years and stated that the range of effects will be extremely broad encompassing the whole eco-system, water resources, agriculture and the well-being of people. It also indicated that the reduction of greenhouse gas emissions, which is the cause of global warming, is quite difficult due to their relation to energy use or agriculture.

The Framework Convention on Climate Change was signed at the United Nations Conference on Environment and Development in 1992 and came into effect in 1994. The actual implementation of the provisions provided in the convention was to be decided in a protocol, and in December 1997 the Kyoto Protocol was adopted at COP3 (the third Conference of the Parties). Thus, the international community proceeded to mitigate global warming.

The international negotiation process is, however, proceeding with difficulty due to differences in opinion among countries.

The developed countries' reduction targets set in the Protocol are still far from climate stabilization levels. At the same time, however, IPCC warned in its Third Assessment Report that climate change caused by human activity is advancing. Drawing up a reduction plan which can achieve international agreement is a pressing necessity.

The most important issue in climate change policy is the development of domestic measures to achieve national reduction targets, and this has a strong connection with

[1] Assuming best estimate value of climate sensitivity at 2.5°C. The result is obtained from non-intervention scenario, IS92a, of Second Assessment Reports of Intergovernmental Panel on Climate Change, 1995.

the international framework. The participation of developing countries is indispensable, and this is related to the world trade order and the policy for development assistance.

Causes of the Climate Change

Emissions of greenhouse gases through various human activities increase their concentrations in the earth's atmosphere because of their long atmospheric lifetimes which range from a few years to a few decades[2]. The concentration of carbon dioxide, one of the major greenhouse gases, has increased from 280 ppmv[3] in the pre-industrial era to 355 ppmv in 1992 (Houghton *et al*., 1995). This increased concentration is responsible for trapping a greater amount of outgoing long-wave radiation from the earth[4] and increasing the global mean temperature. The major gases responsible for the greenhouse effect are carbon dioxide, methane, nitrous oxide, CFC-12, HCFC-22c and CF_4, but the relative global warming potentials of these gases are different.

Carbon dioxide is the major greenhouse gas emitted in large volume by human activities. Carbon dioxide is emitted during the production, transportation and consumption of fossil fuels as energy sources in numerous activities to produce goods and services. Higher carbon content fuel such as coal emit greater amounts of carbon dioxide into the atmosphere during the combustion process compared to lower carbon content fuel such as natural gas. Efforts to mitigate carbon dioxide emissions would therefore require reductions in the use of fossil fuels, improvement of energy efficiency, switching to low carbon content fuels, greater use of renewable energy resources and the enhancement of carbon dioxide sinks[5]. Such shifts in the use of energy resources might have serious negative implications for the economy, and this is the major concern for developed as well as developing countries. Apart from fossil fuels, deforestation and changes in land uses are also responsible for net increases in carbon dioxide emissions by decreasing carbon uptake from the atmosphere during the photosynthesis process and by releasing carbon stock into the atmosphere.

GHG Emission Profile in the Asian Region

Total CO_2 emissions in 1997 from fuel combustion in Asia is estimated at around 5196 million metric tons (IEA, 1999) which represents 22.6 percent of the world's emissions from fuel combustion. Despite the fact that the Asian share of greenhouse gas emissions is relatively low at the moment, unprecedented economic growth and reliance on high carbon content fuels such as coal is likely to accelerate Asian greenhouse gas emissions in the future. China alone constitutes 61 percent of total Asian CO_2 emissions from fuel combustion while India and China together constitutes 77.8 percent (IEA, 1999). Figure 3.1.1 illustrates Asian (excluding Middle-East) CO_2 emissions from fuel combustion and its share in world emissions.

Mitigation of CO_2 and other GHGs is a major challenge to Asia. Although strict measures to mitigate GHG emissions might have detrimental effects on the economy, environmentally friendly development paths need to be explored to proceed towards sustainable development. Improvement in the energy efficiency of industrial processes and transportation system, conservation of energy, switching to cleaner fuel and the use of renewable energy resources can play important roles. In the long term, changes in lifestyle and movement towards a social system which consumes fewer resources are crucial issues. Apart from that, rapid deforestation in developing Asian countries is another major challenge. Good forest management practice, afforestation, reforestation and planned land use changes would be important to preserve GHG sinks.

Implications and Asian Vulnerability of the Climate Change

The IPCC scenario suggests that the global mean temperature might increase by 2°C between 1990 and 2100 as an optimistic estimate in the case of no intervention to prevent climate changes. A scenario with high emissions and high climate sensitivity[6] has reported a rise of up to 4.5°C rise in temperature by 2100 compared to 1990. Changes in the regional climate may differ from the global mean substantially. This means that regional variability in climate change might be more severe than the global mean in some regions. Such global warming is expected to result into the thermal expansion of the ocean, the melting of glaciers and ice sheets and increases the global mean sea level. Global mean sea level is predicted to rise by about 49

Box 3.1.1 Possible Effects of Climate Change

There have been recurrent floods, drought and cyclones, more so in recent years, which continuously weakened the economy of the rural people. In 1988, Bangladesh had the biggest flood of the century immediately after a big flood in 1987. Thereafter a devastating cyclone in 1988 and in 1991, drought in 1989 and damaging tornadoes in 1989 and 1992 took place in Bangladesh. It seems that Bangladesh is becoming prone to frequent natural calamities.

Source: Karim 1993.

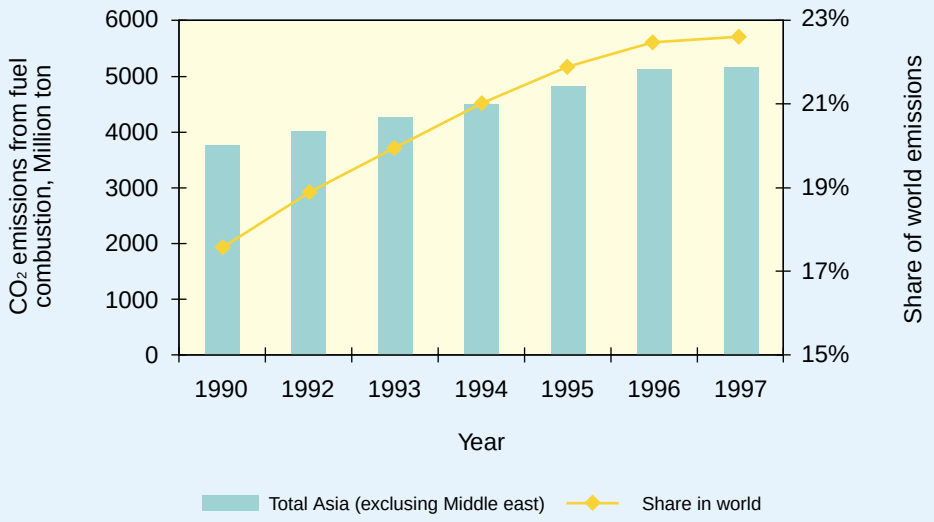
[2] The atmospheric lifetime of CO_2, CH_4, N_2O, CFC-12, HCFC-22c and CF_4 are 50-200, 12-17, 120,102,13.3 and 50,000 years, respectively. Sources Houghton *et al.* (1995).

[3] Parts per million by volume.

[4] Green house effect is responsible for maintaining the earth's temperature at about 34°C warmer than it would be otherwise. The additional concentrations due to human activities enhance the greenhouse effect.

[5] Sink includes, land use changes and forestry.

[6] IPCC scenario IS92e.



Source: IEA 1999.

Figure 3.1.1 Carbon Dioxide Emissions from the Fuel Combustion in Asia and Asian Share in the World Emission from Fuel Combustion

cm in the period 1990-2100[7] in the most optimistic estimate however, the high emissions scenarios[8] have estimated a rise of about 110 cm for the same period. Apart from sea level rise, global warming is expected to affect the global hydrological cycle and the weather. This would change the amount and geographical distribution of precipitation and increase the possibility of more extreme rainfall events. A small change in climate has the capability to produce larger changes in occurrences of extreme weather events.

Many Asian regions are already under considerable environmental stress, and climate change will exert additional stress on the ecological and social systems of these regions. Climate changes have implications on hydrology and water resources, food and fiber productions, coastal systems and human settlements.

The spread of vector borne diseases and heat stress are expected common implications of climate change for the whole Asian region. Scientific studies have shown that marginal grasslands, rangelands, wood resources and water resources are likely to be specially affected by climate changes in Middle East and Arid Asia. Small islands and low-lying Asian countries (such as Bangladesh, The Maldives) are extremely vulnerable to sea level rise, inland intrusion of salt water, extreme weather events (cyclones and typhoons), coastal erosion and effects to the coastal ecosystem. In temperate Asia, changes in boreal forests, the loss of glaciers and shortages in water supplies are predicted. Tropical Asia is ecologically rich but prone to significant changes in the crop-yields, water shortages, and health risks (IPCC, 1997). Although different methods for adapting to climate change are possible, adaptation requires huge economic resources. Most Asian countries, with a few exceptions, are developing countries with a lack of institutional, scientific and economic resources to adapt to climate changes and this consequently makes them more vulnerable to climate change.

Box 3.1.2 Economic Implication of Climate Change

An estimated economic costs assuming 1 meter rise in sea levels in India were 71.2 billion US dollars including costs of land loss, displacement of population and households, rebuilding of the breakwaters, and damage to the road networks, etc. A November 1970 cyclone killed 200,000 people and over 800,000 livestock, destroyed over 200,000 houses and more than 80 percent of rice crops.

Source: CGER 2000.

[7] Best estimate of IPCC scenario IS92a.
[8] IPCC scenario IS92e.

3.1.2. International Regime on Addressing Climate Change

International Institutions

Two international institutions have been established to address the climate change issue. One is the IPCC for the establishment of natural and socio-economic scientific aspects of climate change as the basic input for policy making. Another is the UN Framework Convention on Climate Change (UNFCCC), which provides the international legal framework for implementation of mitigation (and adaptation) measures.

In December 1997, the governments agreed to adopt the Kyoto Protocol at the third session of the Conference of the Parties (COP 3), which limits greenhouse gas

(GHG) emissions in industrialized countries (so-called Annex-I counties). It reflects the guiding principle of "common but differentiated responsibilities" mentioned in the UNFCCC. The Kyoto Protocol has required developed countries (Annex-I countries) to reduce their greenhouse gas emissions by 5.2 percent of the 1990 level by first commitment period (year 2008-2012). Japan, the United States and the European Union have agreed to reduce their greenhouse gas emissions by 6%, 7% and 8% of the 1990 level, respectively. Developing countries are exempted from any reduction commitments with the argument that developed countries are responsible for past emissions and are in better shape (economically, technologically and institutionally) to take action at present, and therefore should take the lead in any initiatives to mitigate greenhouse gas emissions.

Kyoto Mechanisms

As an inseparable part of the emission targets, the Kyoto Protocol gives epoch making flexibility to comply with quantified emission targets by using market based Kyoto mechanisms (emissions trading, joint implementation (JI) and the clean development mechanism (CDM)). These Kyoto mechanisms serve as the integration of business and climate change mitigation. The rules regarding how to operate such mechanisms was left to be decided at COP 6 (in the Hague in 2000) at COP 4 in Buenos Aires in 1998.

Emissions trading and JI are flexibility mechanisms for Annex-I countries, bound by quantified targets under the Kyoto Protocol, to comply with the commitment by allowing acquisition of emissions permits (emissions trading) or emission reduction credits through climate mitigation projects (JI) within Annex-I coutries.

In particular emissions trading is a new and innovative instrument for countries, apart from the US, which has experience of many federal and local schemes in the field of air pollution like SO_2 emission control. There remain a variety of difficulties in designing the GHGs emissions trading regime among diverse countries as a workable international mechanism. For the CDM, which is the international mechanism between Annex-I and Non-Annex-I countries, the baseline issue is one of the key issues. How to establish standardized methodologies to evaluate the emissions most likely to occur in the absence of the project is the core question to be answered in relation to this issue.

Financial Mechanisms

In order to reduce GHG emissions in developing countries in the Asian region, which are expected to grow rapidly, significant financial assistance from developed countries will be required in the near future. So far, assistance for climate change mitigation has come mainly from public financing. Despite some efforts, little progress has been made in investments in so-called climate-friendly projects that generally entail higher risks and higher initial costs than conventional projects. Under these circumstances, the introduction of the CDM is expected to facilitate private sector investments in more climate-friendly projects in developing countries. Connected with this are, research on related issues including the design of the CDM, its potential and constraints from various viewpoints and a way forward to the construction of more effective financial mechanisms. The research results are presented at several regional and international workshops and seminars, and discussed actively with experts and policy makers in the region.

Funding sources for GHG mitigation projects in developing countries have always been one of the crucial issues in the international debate about tackling climate change. So far, several steps have been taken to assist developing countries in financing climate change mitigation, including grant provided by Global Environmental Facilities (GEF), and Activities Implemented Jointly (AIJ). The CDM, a market-based mechanism agreed to be introduced by the Kyoto Protocol of 1997, is considered to have significant potential.

It can be argued that financial assistance using limited GEF or Official Development Assistance (ODA) resources does not sufficiently promote private sector investments in mitigation projects, in the face of huge private flows to climate-relevant conventional projects in developing countries. It is reported that among the contracts brought to fruition between 1990 and 1997, large green field private Independent Power Producers (IPP) projects exceeding 100MW comprised 137 projects, worth US$65 billion of investment. Of this, IPPs mobilized US$51 billion in private funds. In contrast, the total amount of GEF grant during a similar period (1991-1998) was only US$735 million. Without relevant environmental regulation in place, and with cheap energy prices due to governmental subsidies, justifying climate-friendlier investments, which are not internalised in economic appraisals of the projects, is even more difficult in developing countries than in developed countries. However, the mobilisation of private sector investment is the key to achieve global GHG emissions reductions, particularly in developing countries, because of the size of its flows and the importance of Foreign Direct Investment (FDI) and the sustainability of projects. In this connection, the CDM could offer great potential in directing FDI to climate-friendlier investments by giving market-based incentives and internalising externalities associated with mitigation projects.

In order to facilitate climate friendlier investments though the CDM, it would be effective to utilize public funds to complement private investment and reduce some of the risks and barriers. Normally, risk mitigation measures for conventional projects in project financing include contractual agreements, financial design of the project, and insurance and guarantees provided both by the private and public financial institutions. We could distinguish those best covered by multilateral/ regional banks by reinforcing existing risk coverage measures, those

best addressed by development of new financial products by private financial institutions, or those to be covered by government guarantees or bilateral export credits agencies.

3.1.3. Climate Policy Implications

Climate Policy Directions

Combination of Multiple Policy Measures

It is worthwhile to note that each of the policy measures — such as carbon tax, emissions trading, command and control, and voluntary agreements — have both advantages and disadvantages. Therefore, it is commonly recognized that a combination of multiple policy measures should be used to mutually enhance the advantages and complement the disadvantages. In particular, great importance is attached to the implementation of measures for the development and diffusion of technology as well as those for regulating emissions. The next topic to be discussed is how to find the optimum combination of policies when considering the characteristics of energy consumption in each sector.

Importance of CO_2 Reduction/Energy Conservation Technologies

With regard to economic instruments such as carbon tax, the importance of technological development is emphasized as a means to ensuring the reduction of CO_2 emissions. Economic instruments that reduce emissions through price change will be less effective unless practical energy-saving technologies are available. Economic measures will encourage technological development, but many of the proposals consisting of carbon tax or emissions trading also included measures for the promotion of technological development through subsidies, regulations, etc.

Change in Lifestyle

From a technological standpoint, it is necessary to restrict energy consumption and energy-intensive activities, since a sufficient CO_2 reduction could not be implemented solely through technological development. From an economic point of view, it is also expected that economic instruments to reduce energy consumption can achieve their targets through higher energy prices. Consequently, it is commonly recognized that reduction of energy consumption and a change in underlying lifestyles, in addition to technological development, are indispensable in order to achieve the quantified emissions targets that are stipulated in the Kyoto Protocol.

Neutrality of Government Revenues

Some have made the argument that the government revenues from the implementation of policies should be returned to emissions sources in some form, or should be used as subsidies for the development of energy conservation technologies. The government revenues themselves are not necessarily for emission reduction, but just the result of additional charges for economic incentives made by measures to encourage reduction. Therefore, if they are given back to emission sources, the burdens on them can be significantly relieved without impairing the effects of incentives. The greening of the taxation system in the long-term, which incorporates carbon tax revenues in the general budget while reducing conventional taxes, such as income tax, is necessary.

Necessity to Relieve Energy-Intensive Sectors

The carbon tax will place enormous burdens on energy-intensive industries and have a serious impact on their international competitiveness. For this reason, counter measures to relieve the burdens on these industries are essential.

Broad Use of Alternative Energy

Alternatives to electricity that have fewer CO_2 emissions, such as renewable energy (wind, solar, biomass, geothermal energy, etc.), and natural gas, untapped energy, should be considered from a long-term perspective. As measures to encourage alternative energy, conventional measures such as subsidies for initial investment could be combined with policies to stimulate trade of electricity generated by alternative energy in a liberalized market (e.g. fixed-priced purchase, mandatory purchase and green certificates).

Climate Policy Issues Still under Discussion

Domestic Reduction and/or Use of the Kyoto Mechanisms

There were differences of opinion regarding an important premise of policy design; to what extent should the Kyoto Mechanism be used instead of domestic reduction? Some argue for reducing CO_2 to 6% below the 1990 levels only through domestic reduction, while others suggest that the Kyoto Mechanism should be used freely until the marginal reduction cost becomes equal to the permit price in the international market. However, the dominant opinion was that complete dependence on domestic measures would impose too heavy a burden on emission sources, while completely free use of the Kyoto Mechanism would delay the development and diffusion of energy conservation technologies.

Effectiveness of Policy Measures on Emission Reduction

There were inconsistencies among the analyses on the effectiveness of policy measures on emission reduction—emissions trading, carbon tax, voluntary action and command and control.

The incentives for emission reduction, and policy measures regarding consumers, are considered from two different aspects. One point under discussion is the effectiveness of incentives for emission reduction through price mechanisms. Based on relations between prices and demands seen in the past, including the oil shock period, the residential and transportation sectors had low price

elasticity and consequently, substantial price increases would be needed for sufficient emission reduction. Therefore, command and control, or voluntary actions, which do not place a huge burden on industry, are superior to economic instruments. In addition, there is an argument on whether there is a difference in the strength of reduction incentives when the point of regulation (taxation) is "downstream" or "upstream". It is claimed that because "downstream" regulation (taxation) directly places additional costs on energy consumers, it would have a greater announcement effect. This brings about greater awareness of additional costs, than "upstream" regulation that places indirect burdens on consumers. Therefore, carbon tax, which could have a wider coverage of the "downstream" sector, would be superior to emissions trading. However, discussion is still going on regarding the relative incentives of "upstream" regulation and "downstream" regulation.

With regard to the control of total emission volume, emissions trading might be most effective, if a balance of emission reduction among sectors is not insisted on too much. Under command and control, control of total emissions is difficult due to reliance on standards of CO_2 intensity, double counting or rebound effects. Carbon tax often needs a change of tax rate in accordance with a change in economic situation, and in addition, accurate control of the emission volume is almost impossible. Voluntary actions, which have no enforcement measures, leave uncertainties in terms of total emission control. The advantage of emissions trading is emphasized, since the control of total emissions is critical in considering the fulfillment of quantified emissions targets as an international commitment. At the same time, it is pointed out that domestic emissions trading would discourage domestic efforts for emission reduction, since they are likely to facilitate the purchase of credit from the international market.

Reduction in Residential and Transportation Sectors

Command and control measures, which generally impose restrictions on energy consumers, can directly force regulated emission sources to cut their emissions. In the case of emissions trading or carbon tax, emission sources with high reduction costs can help reduction simply by paying taxes or buying emissions permits, and thus, reduction will be implemented from emission sources with lower reduction costs. As a result, allocation of reduction volume among sectors will be based on reduction costs rather than on emission volume, and accordingly, volume of reduction is likely to be smaller than that of emissions in the residential and transportation sectors. In the long run, policies of command and control requires a change in energy-intensive lifestyles or economic systems based on mass production, consumption and dumping. A change in lifestyle would be brought about by emission reductions in the industrial, residential and transportation sectors. There is no decisive means for those sectors, and various measures including urban planning and campaigns, in addition to regulations or subsidies, should be considered. It is also important that energy conservation on a commercial level as in the case of ESCO (Energy Saving Company) should be encouraged.

On the contrary, there is an argument that economic instruments such as carbon tax or emissions trading could enhance emission reduction in the residential and transportation sectors when regulated "downstream", and that all proposals using economic instruments take the form of "downstream" regulation. Some studies suggest that reduction in commercial use in the residential and transportation sectors would be much less than in other sectors. In particular, it is recognized that there could be a tendency for emissions trading to hamper the progress of reduction in the those sectors, because of the difficulties in directly controlling small-volume energy consumers, and linkage to the international emission permits market, which would significantly discourage domestic efforts.

Economic Efficiency

Under quantified targets, designing and introducing appropriate emissions trading and carbon taxation can improve economic efficiency. Command and control and subsidies are inferior in terms of efficiency, even when implemented by the government with the benefit of a large amount of information and excellent means of prediction. However, there is the opinion that in the long-term, it would be more effective to intensively promote the technological development of the residential and transportation sectors, and change energy demands of these sectors at an early stage. To relieve the burden from the economy at large is critical for early implementation of CO_2 reduction measures, because it could reduce the adverse effects on economy, such as a loss in GDP, unemployment and weakened international competitiveness.

Fairness

Regarding fairness, initial allocation of permits under the emissions trading system is important. There is an argument that under "grand-fathering" allocation, in relation to conventional emission levels, it would disadvantage those emission sources that had already engaged in improvement of energy efficiency, and also new entrants. Carbon tax, or command and control measures, - for which uniform standards are applied - would be considered as previous reduction efforts and thus, would be fairer. However, command and control has been a problem regarding fairness among different sectors, and carbon tax could be unfair if relief measures are applied to energy-intensive industries. In the case of voluntary actions, one question is whether the targets set by industrial associations would be fair or not in terms of the appropriate sharing of reduction quotas within the national economy.

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3.2. URBANIZATION AND URBAN ENVIRONMENTAL MANAGEMENT

3.2.1. Current Status

In human history, there is no comparison to the scale and speed of urbanization experienced in many Asian countries after World War II - a phenomenon that is predicted to continue for some time into the future. Significant as well was the environmental impact and transformation of society that was accompanied by urbanization. With economic development, city dwellers in industrialized countries enjoy affluent lifestyles, however a great number of people in developing countries remain who continue to suffer from problems due to poverty. Job opportunities and better access to social and cultural services contribute to increasing the gaps between urban and rural areas in a country, further accelerating population migration into cities.

Cities are microcosms in which the most intensive interaction between human activities and the environment takes place. With increasing urban populations and urbanized areas, human pressure on the environment has surpassed a breaking point in various respects. Increasing consumption of resources in cities causes the increasing generation of wastes and environmental impacts not only in cities and their peripheries but also in distant places outside the cities. Explosions in urban population cause environmental degradation due to the lack of financial resources to construct infrastructure for safe drinking water, wastewater treatment and garbage collection and disposal. Industrial facilities in urban areas emit air and water pollutants and increases in automobile traffic and delays in constructing public transportation systems also cause traffic congestion and air pollution in many Asian cities.

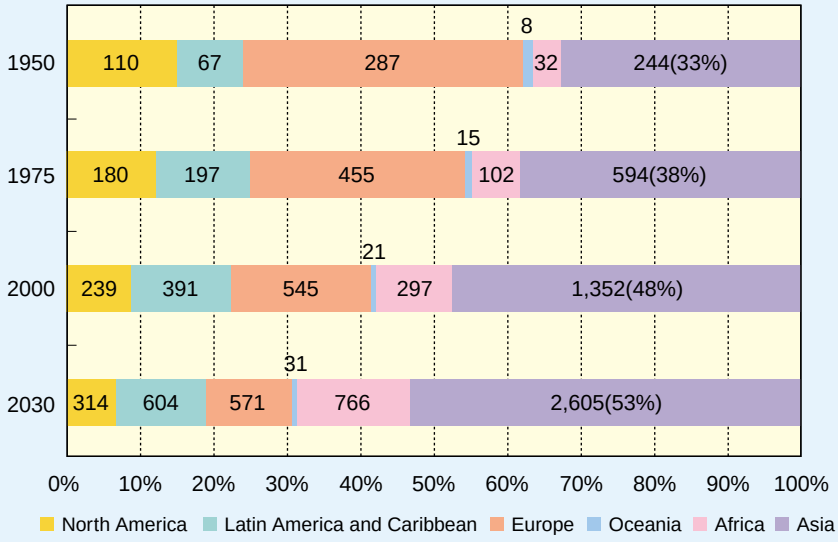
In short, Asian cities are concurrently facing various environmental challenges arising from rapid economic growth and urbanization. It is therefore no exaggeration to state that these cities will pave the road to sustainable development in Asia.

Urbanization and Economic Development in Asia

The region covered by ECO-ASIA has a population close to 3 billion people, which is still experiencing a growth in population coupled with urbanization. The Northeast Asia region including Japan, South Korea and the eastern coast of China have already undergone intensive urbanization. Urbanization in Japan and Korea has stabilized, but that in China will continue further. Southeast Asia including ASEAN countries and Southern Asia including India are undergoing urbanization at a remarkable speed, and they still have large potential for urban growth.

Although the scale and speed of urbanization in Asia varies from one country to another, the total number of urban dwellers in Asia increased at an annual rate of 3.4% from1950 to 2000, while that of the rural population was 1.4%. In 2000, nearly half of the world urban population lived in Asian cities; the proportion of urban dwellers in the total population is only 37% in Asia, much lower than other regions. If the current growth rate is maintained, however, the urban population will double in 20 years. Thus the urban population in Asia is expected to reach 2,605 million by 2030, exceeding twice the size of current Chinese population and accounting for 53% of the world's urban population as shown in Figure 3.2.1.

Another aspect of urbanization in Asia is that this



Note: Based on data from United Nations 2000.

Figure 3.2.1 Distribution of the Urban Population of Major Areas, 1950-2030 (in millions)

region has the largest number of mega-cities in the world. Eleven mega-cities with more than 10 million people are located in Asia out of nineteen such cities throughout the world. By 2015, three more cities are expected to reach a population of 10 million people. Figure 3.2.2 shows the geographical location of urban agglomerations with population of 5 million or more in Asia.

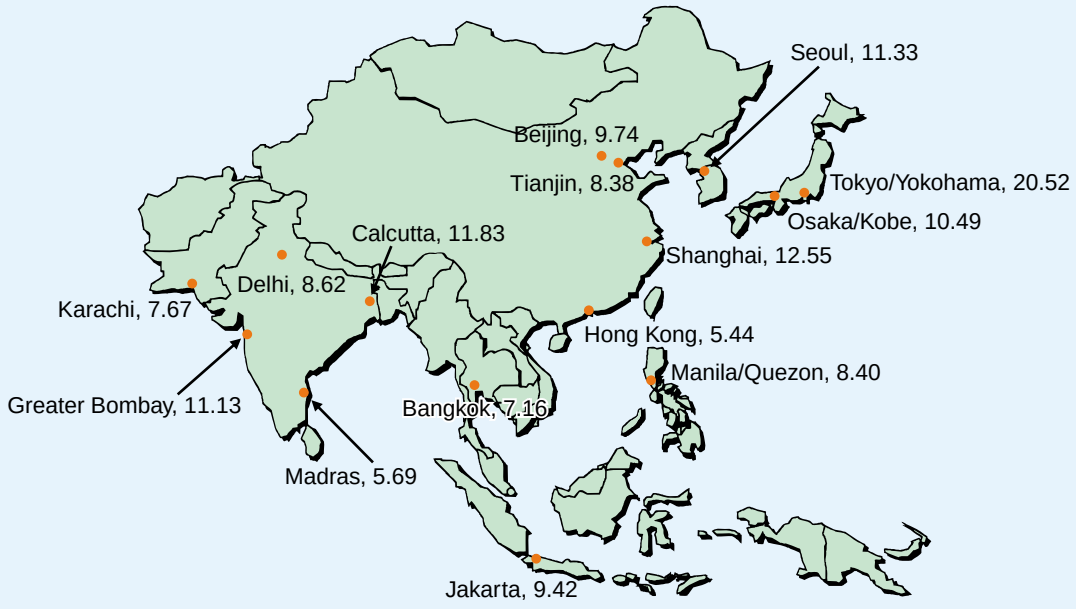
In response to such urban growth, Asian cities are facing a number of peculiar environmental problems. A few mega-cities in the region are under heavy environmental pressure due mainly to the overwhelming concentration of people and activities within limited areas. Yet in these large cities, the infrastructure necessary to sustain the functions of an expanding and advancing city and an ever-increasing population has not been fully established. In addition, many industrial cities, serving as a base for industrial production, face serious air and water pollution as a result of the policy priority given to production increases without relevant consideration of the environment, and a lack of financial and technical capabilities to solve the problems. Moreover, the compressed growth trajectory of the postwar Asian economy has resulted in severe deficits in the provision of infrastructure and institutional arrangements necessary for urban environmental management.

Current Environmental Problems Facing Cities in Asia

Urban Environmental Characteristics in Asia

Although there are an infinite variety of cities in Asia, five features can be identified as common characteristics of Asian cities (Bai, 2000).

- *Coexistence of commonalty and heterogeneity:* There are similarities in environmental profiles of cities in the same country, and a number of differences between countries.
- *Higher complexity in developing countries:* The urban environment in cities in developing countries reveals a much higher complexity than those in developed countries. This complexity can be found from the coexistence of issues with different causes and a different scale of impacts.
- *Expanding Spatial Context:* Due to the ecological features of city as an open system requiring a large amount of energy and material metabolism, in addition to rapidly expanding populations and economic activities of cities in the region, the scale of urban environmental issues in the region is expanding rapidly, from local to regional areas, and globally. Studies on the ecological footprint of Tokyo show the city requires 3.3 times the area of Japan. This suggests the necessity of considering the urban environment in a regional and global context.
- *Multi-dimensional and Social Aspects:* Urban environmental issues can easily cross the border of the environmental sector and become a social equity problem. A typical example would be the case of an incineration plant of municipal waste that comes from surrounding areas outside the city, yet city residents carry most of the health and economic risks.
- *Strong Influence of Political Regimes:* Different political regimes and institutional arrangements can have a significant impact on the urban environment. In China, the socialist political regime and planned



Note: Based on data from UNEP & WHO 1992.

Figure 3.2.2 Geographical Location of Urban Agglomeration with 5 Million or More in Asia (1990)

economy have defined in many ways the urban environmental profile as well as the countermeasures taken.

Urban Environmental Taxonomy in Relation to the Economic Development

Urban environmental problems in Asian cities are extremely diverse, yet if we look into the causes and scales of these problems, they can be categorized into three groups (Bai et al, 2000).

The first type includes environmental problems in relation to urban poverty. Inadequate housing and sanitation, high morality rates, and diseases such as diarrhea are several examples. These types of problems are common in developing country cities in Asia, and sometimes limited to the poorest group of residents. These problems are relatively noticeable, and the spatial impacts of these problems tend to be local.

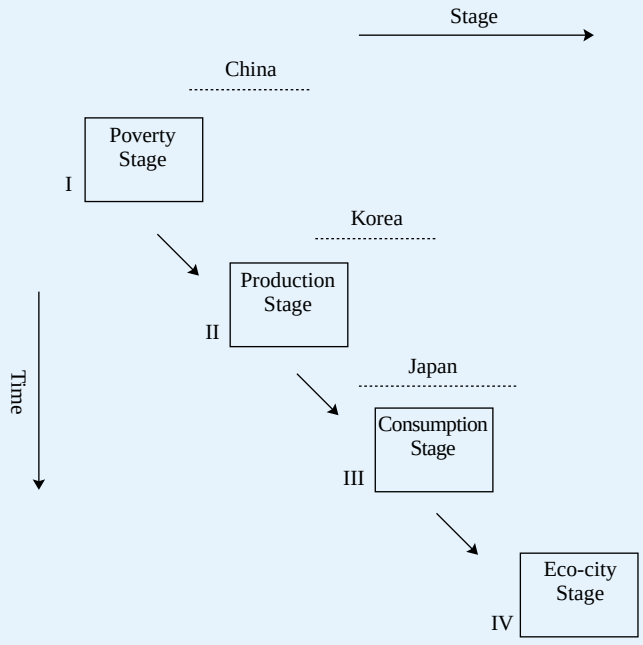
The second type includes environmental problems in relation to rapid economic development and industrialization. Typical environmental pollution of air, water, and soil caused by industrial emissions can be found in this type. While enjoying rapid economic development, many Asian cities have been or are still suffering from these types of environmental problems. In a dilemma as to tradeoffs between economic benefit and environmental risk, municipalities with lower income levels tend to choose economic benefit. The geographical range of impacts of these types of problems is usually local or regional.

The third type includes environmental problems related to high consumption lifestyles in wealthy cities. The large amount of per capita municipal solid waste generation, household consumption of water, and greenhouse gas emission are typical examples. While traditional urban environmental problems of the first and second types become less significant along with economic development, the third type becomes dominant. Unlike the previous two types, environmental risks of the third type cannot be managed by a single city, and are often transferred to other regions.

Stages of Urban Environmental Evolution and Economic Development

As mentioned above, cities in Asia are different from each other, in terms of economic development stage, social structure, political regime, and types of environmental problems, among others. In addition to this high diversity, these cities have been, and some still are, experiencing rapid transformations. In order to deepen the scientific understanding of these rapid dynamic changes of environmental problems in highly diversified Asian cities, the patterns and mechanisms behind environmental transformations should be studied. The study will allow us to identify the driving forces that govern the changes and present future scenarios for designing necessary policy measures.

In order to achieve a better understanding of the process of structural changes in relation to economic development, a conceptual model of urban environmental evolution is presented (Bai et al, 2000). Cities are facing different types of environmental problems, and according to the dominant problem types in relation to economic development levels, they can be generally categorized into



Source: Bai *et al*. 2000.

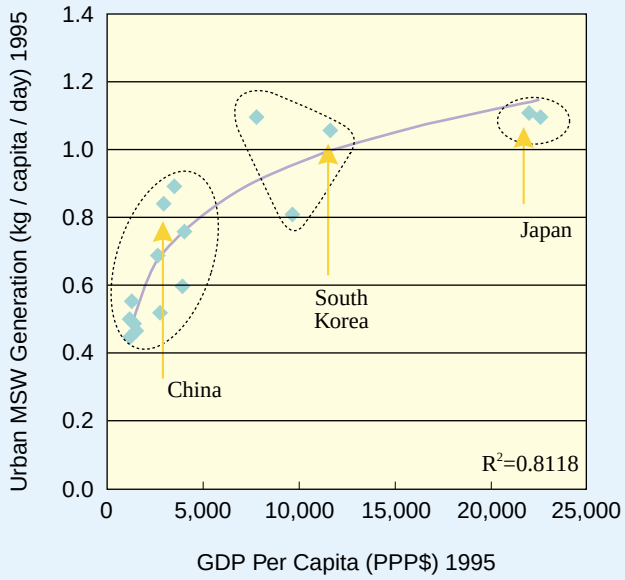
Figure 3.2.3 Current Stages of Urban Environmental Evolution in Asia

three stages. Based upon the assumption that development and structural changes in the economy may bring different sets of environmental problems, these stages can be described in chronological order as follows. The first stage includes environmental problems caused by an absolutely low economic standard in a city, such as poor sanitary conditions and slums. The second stage includes industrial pollution such as air pollution and water contamination caused by expanding industrial activities in a city. The third stage includes problems caused by lifestyles and consumption activities such as automobile exhaust gas and noise, household wastewater and garbage disposal.

Different cities are currently at different stages. In general, major urban environmental problems identified in cities in China are industrial-pollution problems with remaining poverty related problems; thus these cities are at Stage II. In Korean cities they are facing a combination of industrial-pollution issues and consumption-related problems, which means they are experiencing a transition from Stage II to Stage III. Japanese cities are typically facing consumption-related issues, which means they are at Stage III. In addition to these three stages, the final and ideal stage of a city can be defined as one that has neither poverty-related environmental problems nor production-related problems, and with minimal external environmental impacts caused by consumption. This stage can be defined as the "Eco-city Stage". Figure 3.2.3 shows current stages of urban environmental evolution in Asian cities. As indicated in the figure, a survey on the urban environmental change processes in several Asian cities reveal that these types of environmental problems occur sequentially. The most common sequence of occurrence is poverty-associated issues followed by industrial pollution, and then by consumption-related problems.

Increasing Volume of Municipal Solid Waste (MSW) Generation

It is a worldwide trend that the amount of municipal solid waste generated from our daily life increases in accordance with the increasing GDP per capita. This observation applies to Asian countries as shown in Figure 3.2.4. The figure can be used to predict the increasing volume of municipal solid waste in Asian cities in which rapid economic growth is taking place. It is notable that the elasticity of waste increase to economic growth is higher in lower income countries, while waste increase has been essentially stabilized in industrialized countries. In other words, a rapid increase of municipal solid waste is expected to take place in Asian cities for which rapid economic growth is predicted. Cities in such countries as Japan, Korea, and Malaysia have entered or will be entering a new realm of waste management. In these cities, the income level of citizens has increased rapidly and the quantity and quality of waste generated is similar to that of Western countries. Many of them, however, have not yet made sufficient investments in the development of advanced waste treatment and disposal facilities. They must develop a more effective and efficient system to manage the increasing volume and diversity of municipal solid waste generated from their extravagant lifestyles. Thus, there is quite a remarkable difference in the type and content of problems between industrialized and developing cities in East Asia. In industrialized cities with higher income levels, the amount of daily waste generation per person is about 1 kg, and the government and citizens have already started actions to stabilize or reduce waste generation. On the other hand, in developing cities with lower income levels, the amount of waste generation is lower than 0.5 kg/capita/day.



Note 1: Based on data from UNDP 1998; European Union 1995; United Nations 1995.
Note 2: Countries are categorized into three groups A (Indonesia / Mongolia / Sri Lanka / China / Philippines / Lao PDR / India / Bangladesh / Vietnam / Nepal / Myanmar), B (Malaysia / Thailand / South Korea) and C (Singapore / Japan) according to the GDP per capita.
Note 3: PPP/ Purchasing Power Parities.

Figure 3.2.4 Relationship between MSW Generation and GDP per Capita in Asian Countries

Countermeasures

Role of Municipalities in Environmental Management: Case of Kitakyushu

The experiences of Japanese cities that have been front-runners in the industrial race in Asia can provide useful insights for considering the problems that Asian cities now face and have to follow in the future.

A case study of Kitakyushu, a former industrial city, presents an example in which the concerted actions of regulators (municipal government) and polluters (private firms) achieved environmental improvement. With strong commitments from business executives in favor of environmental protection, companies implemented

comprehensive anti-pollution measures. As a result, they not only reduced the discharge of pollutants by changing fuels and adopting advanced technology (Cleaner Production: CP), but also saved energy by utilizing waste heat. With regard to pollution countermeasures, the city government's response to environmental pollution was quite effective and consistent. Main countermeasures included conducting scientific studies, the strict enforcement of environmental regulations, the expansion of monitoring and inspection of polluters and dialogues among the municipal government, business and citizens. Moreover, in the 1990s, the city embarked on a new challenge to develop a model of an "eco-industrial city", promoting environmental industries especially for resource recycling and waste treatment.

The United Nations ESCAP (Economic and Social Commission of Asia and the Pacific) held the "4th Ministerial Conference on Environment and Development in Asia and Pacific" in Kitakyushu in September 2000, at which the "Kitakyushu Initiative for a Clean Environment" was endorsed. The initiative aims to provide other cities throughout the region with benefits from the experience of Kitakyushu and strengthen local initiatives and inter-city cooperation beyond national borders for environmental management.

New Trend in Urban Environmental Governance

Two major trends of urban environmental governance observed in Asia are summarized as follows.

- *Mixed approaches to environmental governance:* Historically, Asian countries took initial responses to urban environmental problems by two approaches: bottom-up as experienced in Japan, and top-down as China, South Korea, Thailand, and the Philippines once followed. The bottom-up approach, which mainly originates from the motivation, consensus, and efforts of all social actors, normally proves to be more effective in environmental governance. In contrast, the top-down approach, which only results from governmental initiatives and efforts as well as international concerns, faces such difficulties as conflicts in stakeholders' cognizance about growth and environment, non-compliance problems of regulated parties, and low institutional capacities of regulators in environmental governance. Since the late 1980s and the 1990s in particular, however, citizens, NGOs, media, and civil society have increased their presence in environmental governance of East Asian developing countries, and consequently the mix of a top-down and bottom-up approach has emerged and gradually improved environmental performance.
- *Decentralization and deregulation:* Nowadays many Asian countries are experiencing their own political and economic movements. As a worldwide trend, globalization (including market globalization) and localization are common characteristics underlying these unique movements. They in turn bring about convergent innovations in environmental governance such as deregulation and decentralization. A number of new ideas such as soft guidelines, market-based instruments, voluntary approach, and full involvement of all stakeholders have been advocated. Asian cities can benefit from these new experiences experimented on elsewhere. In the case of Asia, however, care must be taken in decentralization and deregulation in environmental governance because many cities are placed in varying political and social conditions different from countries in Europe and North America.

Challenges for Asian Cities

The main environmental challenges for Asian cities include the following: First, several Asian cities have not benefited much from environmental initiatives of the central government. Greater attention and resources are provided to large cities and capital regions, while less care is given to smaller cities and rural communities. Facing public protests against polluting industries in large cities, the government often adopts measures to relocate polluting industries from city centers to remote, less populated areas. As a result, local cities around large metropolitan regions tend to be a target for the location or relocation of polluting industrial facilities. Therefore, greater priority should also be given to environmental control in smaller industrial cities in addition to large cities.

Second, unlike industrial pollution in the past, current environmental issues in some Asian cities are increasingly related to individual lifestyle changes. With economic growth, environmental problems arising from consumption-related activities such as vehicular air pollution and the increasing volume of municipal solid waste are drawing the increasing concern of the public and government. For example, air pollution caused by automobiles is most notable and serious in large cities in which the number of vehicles is increasing much faster than the pace of population growth. The comparison of ambient concentration of major air pollutants in these large cities confirms that NO_x concentrations, largely discharged from automobile exhaust gases, still remain at substantial levels, while other air pollutants have decreased to some extent over the past several decades. As compared to the industrial air pollution that has recently improved through air quality control measures focusing on stationary sources of air pollution, vehicle air pollution is caused by the changes in consumption behaviors or lifestyle including strong preference of private passenger car ownership. Yet, as seen in other environmental cases, the effectiveness of current policy measures is quite limited to inducing citizens to establish and adopt sustainable lifestyles.

Third, environmental problems are most severe where there is a lack of effective governance. Good governance is particularly critical for cities where local environmental

management capacity remains poor. The past experiences evident from the failures of urban environmental management in Asia clearly suggest the importance of governance in addressing environmental problems in cities. Such lessons guide policymakers in recognizing that how to implement environmental management in effective and efficient manner is as important as how to establish environmental policies. In the past China, for example, the appointed mayors or governors from the central government played only a limited role as managers of urban governance. As a result, the issue of environmental investment and management has been exclusively dealt with by central government, while the role of local government was often ignored. Furthermore, priorities and resources for environmental investment tend to benefit a few large cities, whereas the majority of local cities are ignored. Given the situation, special efforts should be put on securing good environmental governance.

Fourth, the improvement of environmental management is increasingly significant for local governments in Asia. Along with political progress and the growing awareness of governance, many developing countries are now practicing new sets of governance, particularly decentralization. As in other regions, many Asian developing countries have experienced a gradual shift of political power from the central to local government in recent years. As a result, apart from the previous decades, when the central government had strong command in regional development, the role of local government in Asian countries has become increasingly significant. However, the majority of local governments suffer adverse problems such as severe fiscal deficits, lack of professionals and experts, and insufficient transparency and accountability.

Of several problems that local governments face, the need for financial autonomy is further ahead of any other problems. In this regard, special efforts should be put on securing the following terms: revenue generation, expenditure assignments, local autonomy in budget and personnel, and transparent and rational systems for grants. Along with the need for financial autonomy, local governments should address the following three common institutional obstacles: the lack of effective coordination between interested parties (government, private sector, and NGOs); the absence of sufficient incentives to induce private sector's participation; and the absence of consistent political commitment to implement policies. Hence, it is critical to pay more attention to how the environmental governance of local governments can be enhanced further.

Finally, there is a need to better incorporate various stakeholders into environmental management through a new set of arrangements (i.e. eco-partnership) in Asia. The Asian experience so far demonstrates that government plays a key role in leading environmental management, while the role of market forces is largely ignored. However, neither governmental policies nor market forces can solely achieve sustainable urban environment or address environment-related problems. Instead, both should be complementary to alleviate environmental degradation. As seen in several cases of corporate environmental management, the role of private entrepreneurs can be more profound than any governmental policies in creating sustainable urban environments. Moreover, recent participation of the private sector can be a reliable alternative for securing the provision of infrastructure and service delivery that the urban regions need. From this viewpoint, an endeavor to promote eco-partnership among various environmental stakeholders, especially between the public and private sector, is increasingly significant in East Asia.

3.2.2. Recommendations

Eco-Consciousness

Consensus-Building in City Environmental Policymaking

Enhancing the eco-consciousness of citizens is critical in improving local incentives to achieve more efficient and effective policy implementation. In many Asian countries, increased eco-consciousness - e.g. the increase in the number of environmental NGOs in Korea and the Philippines, environment-related protest demonstrations in Thailand, and national environmental programs, actions and campaigns in China - has played a role as a driving force in promoting the development of local environmental policy.

Citizens, media, NGOs, and civil society can play individual roles in three aspects of environmental management: participation in policymaking processes at both national and local levels; monitoring environmental performances by governments and businesses; and shifting to a more environmentally friendly lifestyle. The third aspect depends heavily on the availability of environmental consciousness and social values. In comparison, the public roles in the first two aspects are more encouraged by institutional rules (Ren *et al*, 2000). City government is a basic management unit in many countries responsible for local affairs, and therefore public participation in the process of policymaking at the city level is critical for consensus building and concerted actions among all members of society.

At present, the most effective way to encourage public participation in local environmental policymaking through effective regulations and institutional development is a central concern in the environmental policy agenda in Asia. It is important to develop a multiple set of mechanisms to increase the presence of citizens, NGOs, and civil society in environmental policy making.

First, governments need to create specific institutions for representatives of the public to be involved in environmental policymaking. Environment councils under the Japanese national government and local governments, the National Environmental Board in Thailand, the Citizens' Committee for a Green Seoul, and The Philippine Council for Sustainable Development all provide good

Box 3.2.1 Weekly Air Quality Report System in China

Several Chinese cities started publicize air quality information weekly in local newspapers and on TV in 1997. To date the publicity of air quality, known as the weekly air quality report system in China, has spread dramatically to 46 cities nationwide. The system includes five air pollutants: SO_2, NOx, TSP, CO and O_3. In order to be easily understood by ordinary people, information on air quality is released in the form of a comprehensive index of air pollution, which is categorized into five quantitative grades. Since June 1998, Dalian, Shanghai, Nanjing, ChongQing, Beijing, and several other cities started to publicize the information on air quality daily through the local media. Moreover, in 1999 such cities with good monitoring capacities such as Dalian and initiated a system to forecast the air quality of the coming 24 hours. The Amendment of Air Pollution Prevention and Control Law oversees this system and requires major cities to make air quality data available to the public. Moreover, the State Environmental Protection Administration has released daily air quality information of 42 major Chinese cities on Chinese Central TV and nationwide newspapers since the middle of this year.

The weekly and daily release of air quality information in China has greatly aroused public interest in environmental problems and protection. The system in Nanjing City, for example, has produced several effects. Environmental quality has become a hot topic in mass media, and an increasingly important factor in the daily lives of citizens and business management. The daily publicity of air quality, therefore, puts pressure on the Nanjing Municipal Government to take more effective measures for improvement of environmental quality. As a result, the household gas connections have reached 96 percent, and concentrations of SO_2 and TSP have gradually decreased. In general, local citizens are satisfied with municipal efforts and the improvements in environmental quality, which in turn further encourage the interest of citizens in environmental protection *Source:* Feng *et al.* 2000.

institutional implications for other Asian countries.

Second, in order to monitor the environmental performance of government and business, the public should have formally institutionalized opportunities such as local elections or other forms of political participation, in which the public can express their environmental concerns. At the same time, informal opportunities are also very important. Media, for example, often acts as a critical venue for the public to voice opinions and as an agent to pressure government and business to respond to environmental issues.

Third, experiences in Japan and Korea prove that systems for environmental dispute resolution and compensation can inspire interest in participation.

Finally, the public must be informed before concrete actions in environmental management can take place. Information disclosure should cover not only environmental quality data but also information regarding policymaking and the environmental performance of government and business. Weekly report systems of environmental quality in China, for example, has produced significant effects on educating citizens and inspired interest in environmental protection (Box 3.2.1).

Municipal Waste Management: Eco-Conscious Lifestyles, Infrastructure and Risk Assessment

The examination on the current state of solid waste management in East Asia suggests that the following points should be considered further to address sustainable urban environments. First, there must be an effort to induce eco-conscious lifestyles at the individual level. In fact, it is expected that most East Asian countries will face a rapid increase in solid waste generation due to increasing consumption. Yet, as seen in other environmental cases, it is not easy to change individual values. From this perspective, it is increasingly critical for Asian countries to guide eco-conscious lifestyles in the future. To this end, there should be more innovative measures to reduce waste rather than depending on traditional approaches such as regulation and charges on waste generation. For example, the introduction of market-based instruments and the promotion of recycling and reusable products are methods worth emulating further.

Second, there is an urgent need to explore alternative ways for the improvement of environmental infrastructure, including waste treatment facilities. Thus far, most municipalities in Asia cannot afford appropriate environmental infrastructure due to limitations in financial resources and awareness. Yet, because the inadequate provision of environmental infrastructure is a threat to sustainable development in the long run, this issue should be placed on government agendas at both the central and local levels.

Third, there must be a comprehensive risk assessment of waste treatment prior to the construction of treatment facilities. The risks from waste treatment are far from being fully understood and available information and monitoring techniques are very limited. Such uncertainty compounds many cities' struggles to find a waste treatment site in their jurisdiction because of "NIMBY" and public opposition. Hence it is very critical for these cities to ensure that local residents have access to relevant information and that treatment facilities are accurately assessed.

Eco-Partnership: Inter-Regional, Inter- Sectoral and Stakeholder Cooperation

Partnerships are required in every aspect of society to achieve sound urban environmental management. The

importance of inter-regional and inter-sectoral partnerships can be illustrated by taking water resource issues as an example. Water is becoming a problem in an increasing number of cities in the world. Some of them are facing water resource scarcity, others water quality degradation due to pollution, while some are facing both quantity and quality problems. The urban sector in a city shares limited water resources with other sectors in the same city and other cities in the same watershed. From the viewpoint of water quality, urban areas are becoming the largest polluters of many rivers. The increasing demand of urban water use and its pollution problems can only be solved by close cooperation among regions that share the same watershed or even between different watersheds, and among different users.

Studies on urban water resource management suggest that: 1) urban water management cannot be carried out within a single city, but rather requires a comprehensive systematic approach including natural hydrological cycles and socio-economic aspects in a greater regional context. Water pollution control, water resource management, and inter-city and inter-regional cooperation for water resource allocation are three major issues that need to be addressed in a systematic approach; 2) While it is important to set up a strategic framework for sustainable water resource management, the establishment of effective monitoring and assessment systems to ensure the implementation of policies is inevitable; 3) In addition to traditional measures taken by cities such as the exploration of additional water resources, changes in social economic systems of the city and lifestyles of citizens are indispensable to achieve sustainable water resource management in cities (Bai *et al*, 2000).

Cooperation among stakeholders for environmental management has become increasingly significant in Asia. In the past, environmental issues were handled solely by the public sector, especially the central government. In countries such as China, the government possessed exclusive authority and power over all environmental matters, from policy planning to implementation. Yet, as many Asian countries have achieved economic growth along with progress in political autonomy, environmental governance has widely been devolved from the central to the local government. Furthermore, as the living standards of citizens improve as a result of economic growth, there have been growing concerns on environmental issues and a rising interest in participating in the decision-making process of environmental policy.

Along with such institutional changes, there is a growing recognition that more effective measures could be worked out in cooperation with the government, businesses and citizens if stakeholders develop mutual partnerships on environmental matters. The underlying reasons are due to ineffective environmental governance and the conflicts between interested parties. In this regard, it is believed that voluntary actions can supplement command-and-control methods and form the basis of more effective environmental management.

A wide variety of eco-partnerships are experimental, focusing on broader participation between public and private sectors, government and non-government organizations, businesses and citizens. Several examples indicate that this mutual partnership has been widely regarded as quite effective to implement environmental measures.

Another development in eco-partnership concerns the increasing interaction of socio-economic activities at the global level. Currently, major environmental issues are no longer confined to sub-national levels, but expand beyond national boundaries. Given recent changes in environmental issues in terms of geographical scope, the need for effective eco-partnerships at both local and international levels becomes apparent. There is a substantial expectation that environmental initiatives through international cooperation, such as bilateral and multilateral inter-city cooperation projects, are able to encourage the transfer of the knowledge and know-how of city to another. In addition, the practice of eco-partnership

Box 3.2.2 Kitakyushu Initiative for a Clean Environment

Adopted at the "4th Ministerial Conference on Environment and Development in Asia and the Pacific, 2000 (MCED)" organized by the United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP), the "Kitakyushu Initiative for a Clean Environment" is designed to act as a mechanism for the promotion of programs in the field of "environmental quality and human health", a priority area in the Regional Action Programme, 2001-2005 (endorsed at MCED 2000). In considering Kitakyushu's rich experience in the field of environmental improvement, the Kitakyushu Initiative looks to achieve measurable progress and strengthen actions at the local level to improve the environment in urban areas in Asia and the Pacific, and promote intercity cooperation. To accomplish this and to implement the Kitakyushu Initiative in the region, the Kitakyushu Initiative Network will be established, quantitative indicators to assess urban environmental improvement will be identified, and pilot programs for improvements in the urban environment will be implemented.

The Kitakyushu Initiative Network will be a permanent forum to exchange information, technology and ideas on urban environmental improvement. Special features of the Initiative include support from the national government, linkages with donor communities, the promotion of policies through local initiatives, technological and knowledge-based support through intercity cooperation.

can be further extended into academic cooperation at regional and international levels.

In regard to eco-partnerships in urban environmental management, the "Kitakyushu Initiative for a Clean Environment" (hereafter referred to as the "Kitakyushu Initiative") is particularly relevant. The "Kitakyushu Initiative" identifies examples about how a city's rich experience in environmental management can be transferred to other cities through a well-designed partnership through intercity cooperation. This special program aims to strengthen urban environmental capacity at the local level to improve the urban environment in Asia and the Pacific, and promote cooperation among cities in the regions (UN/ESCAP/MCED, 2000).

Eco-Investment: Financing Urban Environmental Infrastructure

Explosions in urban populations in conjunction with poor development of Urban Environmental Infrastructure (UEI) are a major cause of environmental deterioration in cities in developing countries of Asia. It is feared that the poor financial capacities of cities and nations might make it more difficult to improve UEI. On the other hand, increasing initiatives by private sectors have become a new trend in the development and management of UEI. The development of effective ways to enhance governmental capacities in financing UEI and mobilize private sector funds to release governmental financial difficulties for UEI development will be two crucial inter-linked strategies for the improvement of UEI in Asia (Chang *et al*, 2001). Major problems, challenges and strategies for financing urban environmental infrastructure in East Asia are summarized in Table 3.2.1.

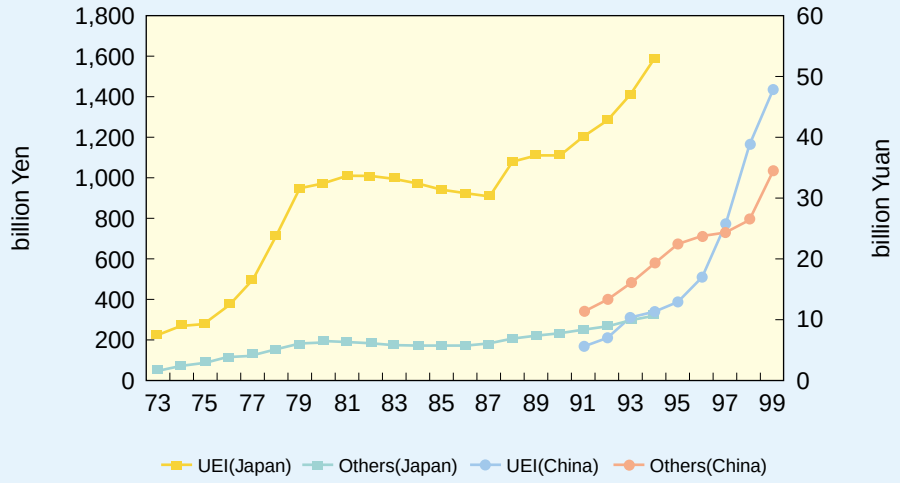
Enhance Priority of UEI in Governmental Agenda

The experience of developed countries lends an important lesson to Asian developing countries that they should raise the priority given to UEI in the governmental agenda to sustain the investment of UEI along with economic development and urbanization. In the 1990s, cases from Japan manifest that more than 80% of the environmental expenditures of the central government and 90% of that of local governments are spent on environmental infrastructure construction. In particular, the costs of sewage treatment take up 60%-70% of the environmental expenditures, about five times the cost of air pollution control. It implies that environmental investment in Asia will have to concentrate more on UEI construction, maintenance and operation, and it requires large-scaled initial investment with long-term planning and commitment (see Figure 3.2.5). In this regard, Asian countries should not only mobilize available funds by tax reform and other social capital procurement, but also secure UEI investment from other alternative financial sources such as local government, private sectors and foreign capital.

Develop Public-and-Private Partnership in Promotion of UEI

Development of public-private partnerships (PPP) for promoting UEI will be a critical strategic issue in Asia. Asian governments are considering ways to shift the role of government to joint-efforts with private sectors in UEI construction and management.

- *Government roles:* Government must be responsible for the construction and management of UEI facilities, providing services to citizens, and formulating relevant laws and policies to encourage



Note 1: Based on data from Japan Environmental Agency 1975-1997; China State Statistical Bureau 1996-1999.
Note 2: UEI (Japan): Sewerage treatment, garbage disposal services, and other environmental infrastructure; UEI (China): Sewerage treatment, garbage disposal services, and improving the energy structure, *et al*.

Figure 3.2.5 Urban Environmental Infrastructure Investment in Japan and China

Table 3.2.1 Problems, Challenges and Strategies for UEI Financing

Major Problems	Challenges
◆ Heavy dependence on central governmental budget and ODA ◆ No alternative resources for UEI except public sectors ◆ Lower priority given to UEI in governmental agenda ◆ Increasing role of local government with limited financial capacities ◆ Lower level of private sector's participation in UEI	◆ How to enhance governmental capacities in financing UEI? ◆ How to mobilize private sector funds to release governmental financial difficulties for UEI development?

Strategies

- ◆ Raise priority given to UEI in governmental agenda
- ◆ Develop public-and private partnership (PPP) in promotion of UEI: Diversify financing sources for UEI investment
- ◆ Use financial and tax measures and economic instruments for enhancing local financial capacities
- ◆ Identify possible roles of private finance initiatives (PFI) in UEI (Centralized /dispersal facilities, garbage disposal)
- ◆ Create new policies and institutional arrangements promoting PFI and PPP in UEI projects

the involvement of private sector in UEI-related activities. To diversify financing sources for UEI investment, government should play a key role in providing equal services, keep a watch on the balance of reasonable earnings by private sectors and acceptable prices of services for users, and monitor contractors' work.

- *Joint-efforts with private sectors:* Asian governments must make joint-efforts with private sectors in UEI construction and management to cope with problems of financial difficulties and to improve efficiency of environmental investments. In Asia, private sectors are becoming involved in the construction and operation of UEI facilities in two forms: concession contracts and lease contracts. In the establishment of new UEI projects, BOT (build-operate-transfer) based on foreign capital has been widely adopted. Manila and Jakarta, for example, have introduced a number of PFI projects by concession contracts in water supply and sewage treatment since the late 1990s. The garbage related business in Malaysia, the Philippines, Thailand, Hong Kong, Macao and Singapore has been transferred to several private companies by lease and concession contracts. Private sectors could also be greatly encouraged in the areas of garbage collection, delivery, reuse, and recycling. Government should encourage their active participation and organize them effectively by formulating relative policies.

New Policies and Institutional Arrangement Promoting PPP in UEI Projects: PFI as an Example

At present the critical limitations of private involvement for UEI projects such as PFI are financial risks that private sectors must take in the construction and operation of relevant facilities. The essence of financial risks is concerned with the legal basis of PFI projects and its profitability. Governmental policies and institutional arrangements can make these uncertainties clear, and thereby encourage private initiatives in UEI.

First, stipulation of related laws such as BOT laws are necessary to legalize ownership or concessions, rights, and duties of private sectors in public facilities and services. At the same time the laws and other necessary policies need to specify the entrance and exit rules of private sectors in the provision of public facilities and services, and in particular, provide preferential measures to private sectors for reasonable economic and social profit from PFI projects in UEI.

Second, referential policies for the promotion of private initiatives in UEI can create a favorable market based on national conditions, in which private sectors have both economic and social interests in UEI construction and service provisions with small risks or risks that could be controlled. Governmental financial assistance including grant subsidies and low-interest loans; increase of depreciation rate of fixed assets and tax breaks or exemptions in income tax and value-added tax; access to overseas funds such as ODA and low-interest loans; permission of long-term contracts of lease and concessions according to contractors' requests; provision of public land free or at low prices for sites of PFI projects. In some cases when PFI projects cannot gain profits, government can even offer contractors sites for running other businesses so as to make up for losses in the UEI business.

Third, the government should provide institutional supports. On the administrative side, special governmental organizations like the BOT Center in the Philippines are

Box 3.2.3 BOT Center in the Philippines

The BOT Center was established in 1993 as the Technical Secretariat for the Coordinating Council for Private Sector Participation (CCPSP). The main functions initially focused on promoting the BOT Program and conducting BOT training to infrastructure agencies, local governments, the private sector, and coordinating and monitoring the implementation of BOT projects. The BOT Center is organized in four departments: National Projects, Environmental Projects, Local Government Unit, and Training & Promotions.

Much of the success of the Philippine BOT Program was helped considerably by the marketing, promotional, policy advocacy and technical assistance efforts of the BOT Center. To promote transparency and streamline the project approval process, the BOT Center implemented the following: 1) Prepared generic bidding documents for BOT projects to simplify and render transparent the bidding process; 2) Rendered technical assistance to improve the preparation of projects which were bid out; 3) Developed strategies to mobilize public support for the BOT program; and 4) Organized and participated in policy discussions. The BOT Center has developed a project database and together with the implementing agencies, conducts a detailed review of the project pipeline to assess the preparedness of individual projects.

necessary to implement relevant policies and provide services for private sectors in PFI activities (Box 3.2.3). On the other hand, the organizations have rights to regulate and monitor PFI activities so that any risks caused by PFI projects could be mitigated. Specialized financial institutions sponsored by government and public financial institutions can help private sectors extend their credit in loan borrowing from commercial banks. The Thai Guaranty Facility and the Indonesia RDA (Regional Development Account) are relevant for other Asian countries that can play an important role in raising investment abilities and business credit of private sectors in the UEI field.

Eco-Policy Linkage: Challenges to Mitigate Traffic Air Pollution

The case of automobile air pollution control demonstrates how policies should be linked to achieve a single task in environmental improvement. Automobiles play an important role in advanced cities by supporting both production and consumption activities, and fulfill the desire of urban dwellers for mobility. Furthermore, governments in many Asian countries, where the automobile industry plays a key role in their national economies, have to pay attention to the growth of the domestic automobile market. All these things make it clear

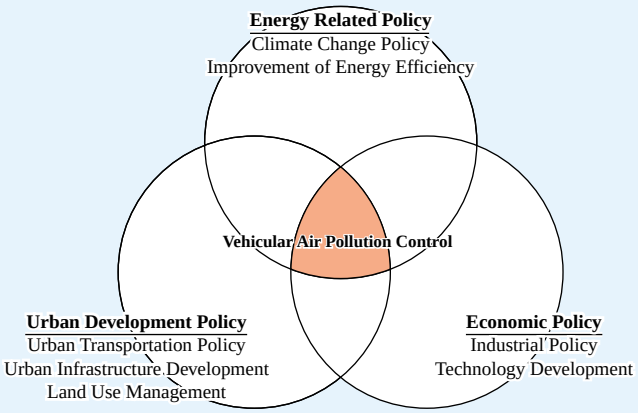


Figure 3.2.6 Jurisdiction and Possible Policy Linkages of Mobile Air Pollution Mitigation with Three Related Policies

that since the vicious cycle toward the development of an auto dependent society can not easily stopped, the linkage of related policies is necessary to place special focus on mitigation of traffic air pollution unless zero-emission vehicles are developed and used. As shown in Figure 3.2.6, there are at least three policies that have links to vehicular air pollution control, e.g. energy-related policies, urban development policies and economic policies.

The benefit of links with energy-related policies lies in the co-benefits of mitigating global warming and urban air pollution through the improvement of energy efficiency and energy substitution. Fuel substitution of motor vehicles to cleaner energy is one of the examples for policy integration to improve energy efficiency. In Beijing, where buses are the most important public transportation mode, substitution of the fuel of large-size buses from gasoline or diesel to natural gas has started. Considering some favorable conditions such as well-developed circular roads and domestic supply of the abundant natural gas channeled from the western part of China, this strategy is appropriate since the immediate effects in Beijing are large compared to other cities where similar attempts can be seen.

Although the development of advanced railway networks is dealt with by urban development policy, the promotion of modal shifts from motor vehicles to railway transits is an agenda of energy-related policies to improve energy efficiency in the transportation sector. To save overall transportation energy consumption, the commuting behavior of citizens should be encouraged to change to become more environmentally friendly.

In general, while high population density in small areas is advantageous to mass transportation systems, low population density in large areas is accelerating urban sprawl driven by motorization. In this point, urban development policies including transportation infrastructure development policies and land use planning

can play a key role in reducing vehicular emissions while promoting the intensive use of mass transportation systems and, at the same time, discouraging the use of motor vehicles (OECD, 1995). In reality, however, these measures are not effective enough. It is obvious particularly in developing cities that the most critical question here is how to effectively construct mass transportation systems such as railways and subways. However, it requires a large amount of initial costs that often leads to tightening the financial condition of local government. In this regard, the experience of Tokyo on how to develop mass transit effectively in cooperation with the private sector can act as a good reference. Thanks to the participation of the private sector since the early stage of urban development, the surface trains in the Tokyo ward area kept more than 50% of the total share from 1968 to 1997 (Kaneko, 2001). When Tokyo experienced urban sprawl, many private rail companies constructed railways from the city center to the peripheral area. The government allowed them to make profits on the sale of real estate in order to recover the huge initial investments of railway construction; accordingly the government usually formulated corporate groups with constructors and real estate agencies. They newly constructed shopping centers and residential areas around each station, and contributed to the development of satellite cities and suburb areas. This enables them to provide better services with lower fares.

On the assumption that new vehicles are supplied into the market continuously and large amounts of used car stocks remain on the road, securing the technological capacity of domestic auto industry is crucial for the use of vehicles under cleaner conditions. Based on this, the auto industry including vehicle producers and maintenance businesses should be able to respond and achieve stricter standards for vehicle exhaust emissions. Excessively strict mandatory standards may fail because of the lack of incentives for vehicle manufacturers to pursue reductions in pollutant emissions compared to the financial risk. To supplement this, proving economic incentives including governmental subsidies for R&D investment is necessary. Therefore, the third policy linkage between economic policy and vehicle emission control is effective particularly where the auto industry is not mature.

The twentieth-century can be epitomized as the century of automobiles powered by oil. Eliminating the current vicious cycle towards an automobile dependent society is one of the most challenging issues for the 21st century. For vehicular air pollution that is so far one of the unsolved urban issues in most of Asian cities, turning related policies in the same direction to maximize the synergy effects is important. More attention should be paid on the linkage of related policies including energy policies, urban development policies and economic policies.

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3.3. FRESHWATER IN ASIA AND THE PACIFIC

3.3.1. Current Status

Status of Issues

Freshwater Issues of the World

We depend for our basic vital needs on freshwater. Less than 1 percent of the earth's freshwater is accessible in lakes, rivers, and groundwater aquifers. That vital 1 percent of available freshwater is constantly in motion, either flowing in rivers, evaporating and moving around the globe as water vapor, falling from the sky as rain or snow, or filtering slowly through the earth to emerge somewhere else. We can call this a sound hydrological cycle. However, this sound hydrological cycle is experiencing a crisis now due to various water issues occurring in the world.

Traditionally seen as limitless bounty, water has only recently been recognized as a scarce resource, and only since the 1950s have policymakers begun to espouse the economic and environmental values of water. Since the 1970s, a series of international meetings addressed water issues, starting with the First UN Water Conference at Mar del Plata, Argentina, in March 1977.

In 1992 at the International Conference on Water and the Environment in Dublin, freshwater was recognized as an input to which every human has the right to claim an essential minimum amount-the amount necessary to sustain life and meet basic sanitation needs. At the Earth Summit, which was held in Rio de Janeiro in 1992 also, the rights of all human beings to basic daily water requirements were expanded to include environmental water needs.

Since authority over the management of the world's freshwater was fragmented among the nations of the world, local governments, and NGOs and private organizations; as well as a large number of international bodies, the issue of management has been subjected to numerous studies and debates in the international arena. In considering this situation, global demand for a common umbrella to unite the disparate, fragmented, and ineffectual efforts on global water management became very high in the middle of the twentieth century and the World Water Council (WWC) was established in 1996 as think tank responsible for review of international policies concerning water, while Global Water Partnership (GWP) was launched in the same year to attempt to promote linkage among water-related organizations and to carry out effective international development assistance.

However, despite concerted efforts made during the 1980s (the International Drinking Water and Sanitation Decade) and the following 1990s, the situation concerning world water still has large room for improvement. "The Global Water Supply and Sanitation Assessment 2000" (WHO & UNCF, 2000) said that the situation of water supply and sanitation of the world is that:

- Around a quarter of the 4.8 billion people in developing countries are without access to improved sources of water, while half of them are without access to improved sanitation services.
- Of the 4.9 billion people worldwide who have access

Box 3.3.1 History of the World Water Events

1977 The Mar del Plata United Nations Conference on Water was the first and only intergovernmental conference devoted exclusively to water; a milestone in the history of water development.

1980 It led the UN General Assembly to proclaim the Declaration of the International Drinking Water Supply and Sanitation Decade.

1992 - The idea of forming a world water council was first proposed in 1992 at the International Conference on Water and the Environment in Dublin.
- Freshwater conservation and management was incorporated into Agenda 21 as Chapter 18 at the Rio de Janeiro Earth Summit.

1994 The International Water Resources Association (IWRA) organized a special session on the topic in its Eighth World Water Congress held in Cairo in November 1994. The result was the passing of a resolution to create the World Water Council and to charge a committee to carry out the preparatory work for this task.
The consensus was established around the need for the creation of a common umbrella to unite the disparate, fragmented, and ineffectual efforts on global water management.

1997 The success of the First World Water Forum in Marrakech, Morocco, and the issuing of the Marrakech Declaration firmly established the leadership of the Council in water affairs. The World Water Council received the mandate to develop the World Water Vision for Life and Environment for the 21st Century.

1998 International Conference on Water and Sustainable Development Paris, France.

2000 The Second World Water Forum, was successfully held by The Netherlands. The results of the Vision were presented to some 5,700 participants from all parts of the world. The Ministerial Conference gathered 120 Ministers and resulted in the Declaration of The Hague on Water Security in the 21st Century.

to water supply services, around 3 billion have the convenience of access through house connections or yard taps.
- There are 4 billion cases of diarrhoea in the world every year, with 2.2 million deaths, mostly among children under five. Safe water, adequate sanitation and hygiene can reduce cases of diarrhoeal disease by between one-quarter and one-third.
- Rural services still lag far behind urban ones, but delivering affordable services to the rapidly growing numbers of urban poor remains a formidable challenge.
- There are huge inequities in the amounts invested in improving services to the better-off sections of urban society compared with investments in providing basic services for the unserved poor.

Freshwater Issues in Asia and the Pacific

The water issues in this region differ according to season. In the dry season, water scarcity occurs throughout the region, and increased rainfall variability as a result of global climate change will worsen this problem. Consequently, food security throughout this region is vulnerable.

Asia has the lowest per capita availability of freshwater resources among the world's continents. The contrasts within the region are stark. Annual freshwater resources (in m^3 per capita) reach as high as 200,000 in Papua New Guinea and as low as 2,000 in parts of South Asia and China, and are generally below 20,000 in Southeast Asia. The region's weather is largely governed by a monsoon climate, which creates large seasonal variations in addition to spatial variation.

The two most populous nations in the world, China and India, will have 1.5 billion and 1.4 billion people, respectively, by 2025, by which time the availability of freshwater will have dropped to 1,500 m^3 per capita in India and 1,800 m^3 in China.

Many countries in Asia depend heavily on groundwater exploitation to supplement scarce surface water resources. In Bangladesh, groundwater abstraction already represents 35 percent of total annual water withdrawals; in India, 32 percent; in Pakistan, 30 percent; and in China, 11 percent. Groundwater overuse and aquifer depletion are becoming serious problems in the intensively farmed areas of northern China, India, and Pakistan. For example, in India, as the population grew three times from 1950 to the present and the demands for water increased greatly, the necessary quantity of water is estimated to be two times the sustainable production of groundwater aquifers. As a consequence, many parts of India suffer from a lowering of the water table. International Water Management Institute (IWMI) calculates that grain production decreases by 25% due to the depletion of groundwater aquifers and subsequent reductions of the irrigation water. In heavily populated cities such as Bangkok, Jakarta, and Manila, land is subsiding as groundwater is withdrawn to serve the needs of their growing urban populations, and saltwater intrusion is rendering much of the groundwater unusable.

Another aspect of Asian water issues is inter-basin water management. For instance, Azerbaijan is situated on the western coast of the Caspian Sea. It borders Russia in the North, Georgia in the North-West, Armenia in the West, Turkey in the South-West, and Iran in the South. And, Azerbaijan is a land of ancient irrigation farming. 85-90% of the cultivated land is irrigated land. The basic mass flow of internal rivers in the republic comes in spring. As the majority of this is not regulated, it is not possible to use the water fully and advantageously and it runs into the Caspian Sea. Due to this and other reasons, a water deficit is apparent in many regions of the republic.

In 1995, 1.1 billion people in South East and East Asia already lived in areas experiencing high water stress. And the number will increase to 2.4 billion by 2025. High water stress and unsustainable rates of withdrawal are already being experienced in Central and South Asia, where annual water withdrawals compared with available water resources are 50 percent or more. Northern China and Mongolia have medium stress conditions with 25 percent water use. Although water stress computes at less than 10 percent in Southeast Asia and the Pacific and is therefore considered to be low, this measure is highly distorted by seasonally high river flows (Box 3.3.2).

In the Pacific, there are two main groups: (i) small atolls with severe water shortages and water quality problems and (ii) larger volcanic and high mountainous islands where water is generally abundant. Both have fragile natural resource bases, but suffer to different degrees from inefficiency of water use, overuse of limited groundwater, pollution of both surface water and groundwater bodies, and contamination due to inadequate sanitation and waste management.

The first group including the Cook Islands, Kiribati, Marshall Islands, Nauru, Tonga, and Tuvalu is deficient in surface water and prone to prolonged periods of water shortage. Rainwater collection and storage, supplemented where possible by extracting groundwater from shallow freshwater lenses, present the only real choice. Desalination has been proposed in cases of extreme need, and seawater is sometimes used for sanitation. People generally conserve water and use it sparingly. However, because surface water supplies are highly unreliable and groundwater resources limited, conflicts over ownership and access are increasing. Saltwater intrusion and pollution by human waste are reducing the availability of usable water.

The larger volcanic islands include the Fiji Islands, Papua New Guinea, Samoa, Solomon Islands, and Vanuatu. Rainfall and surface runoff are adequate to meet needs, but pollution is a serious problem in urban areas. Villages in riverine and estuarine environments often have poor water quality. Competition for water is intensifying among domestic and industrial uses, irrigation, hydropower, tourism, and recreational uses.

Box 3.3.2 Water Stress in Asia

In South and East Asia irrigated area under the business as usual scenario grows only slightly between 1995 and 2025, while irrigation efficiency improves. The effect is a decrease in water used for irrigation from 1,359 to 1,266 cubic kilometres a year. At the same time, strong economic growth leads to more material possessions and greater water use by households, increasing water withdrawals for domestic use from 114 to 471 cubic kilometres a year. This economic growth also requires larger quantities of water for Asian industry, increasing from 153 to 263 cubic kilometres a year.

The sum of these trends is an overall increase in water withdrawals between 1995 and 2025. Thus the pressure on water resources will become even greater than was experienced in 1995, when about 6.5 million square kilometres of river basin area were under high water stress. That area increases to 7.9 million square kilometres in 2025. The number of people living in these areas also grows tremendously – from 1.1 billion to 2.4 billion.

Source: Cosgrove W. J. and F. R. Rijsberman 2000.

Countries in the Pacific are hampered by inefficient water utilities that operate in a monopoly regime and do not fully recover costs, depending instead on government and external financing to meet operation and maintenance costs.

The summary of major water issues in several sub-regions of Asia and the Pacific is as follows;

- *South Asia: Water and Poverty*
  Poor residents have few options but to live in squalid, unsafe environments which are vulnerable to flood disasters. The circumstances of poor residents contribute to environmental deterioration such as water pollution and floods in neighboring areas. More than 800 million people in the region do not have access to a safe water supply, while more than 2 billion people do not have adequate sanitation facilities. Asia has the lowest per capita availability of freshwater resources among the world's continents. Water services need to be delivered more efficiently with participation of customers, and ensuring access to water services by the poor.
- *Pacific Islands: Water in Small Islands States*
  Small island states have a unique vulnerability, which will affect their water resources. An integrated approach to water resources management must be considered for Small Island States. These territories are too small for a sectoral approach to water resources and must utilize Integrated Water Resource Management (IWRM). The need for greater institutional collaboration, because of inadequate technical and management skills, and a lack of information gathering and analytical skills.
- *Central Asia: Inter-basin Water Management*
  Inter-basin water transfer is the technical (structural) tool; the real issue is the sharing water resources between the receiving basin and the area of origin of the water. The physical linkage between hitherto separated water basins can become a facilitating element of shared water management in the interest of both basins. The shared management should promote sustainability, respond to common ethical values, generate mutual benefits and be administered by suitable institutions.
- *South East Asia: Water in Mega Cities*
  Eighty percent of the world's so-called mega-cities are located in developing countries. In most of these mega-cities, the majority of the inhabitants are urban poor with little or no access to services. Currently, both the management and end-use of water is inefficient and wasteful, with expensive supply-side solutions continuing to dominate the agenda. Water pollution is also one of the most serious environmental problems.
- *All sub regions: Water and Climate Change*
  El Nino effects caused by global warming provoke large-scale floods and drought not only in Asia and the Pacific but all over the world. It is also feared that global warming could cause sea level rise. Especially in the countries whose populations are concentrated in the coastal lowlands, such as Bangladesh and China, land erosion and consequent expansion of flood plains due to sea level rise could have a great

Box 3.3.3 Definition of Water Stress

Water stress for a river basin is defined in degree of annual water use (that is, water withdrawn from a surface or groundwater source for human purposes) as a percentage of the total water resources available in that basin. Water stress for a country is the summation of water stress for all its river basins. Water stress begins when withdrawals of freshwater rise above 10 percent of renewable resources. Medium to high stress translates as water use that exceeds 20 percent of available water supply. Countries experience high water stress when the ratio of water use to supply exceeds 40 percent. At such levels, their patterns of use may not be sustainable, and water scarcity is likely to become a limiting factor on economic growth.

impact on people and their lives. In order to tackle these issues from the perspective of water, emergency readiness and efficient means of land use management are perquisite.

Countermeasures

Conventional

The Asian freshwater resources are under increasing pressure. Growth in population, increased economic activity and improved standards of living lead to increased competition for and conflicts over limited freshwater resources. A combination of social inequity, economic marginalization and a lack of poverty alleviation programmes also force people living in extreme poverty to overexploit soil and forestry resources, which often results in negative impacts on water resources. A lack of pollution control measures further degrades water resources.

Pollution of water is inherently connected with human activities. In addition to serving the basic requirement of biotic life and industrial processes, water also acts as a sink and transport mechanism for domestic, agricultural and industrial waste causing pollution. Deteriorating water quality caused by pollution influences water usability downstream, threatens human health and the functioning of aquatic ecosystems so reducing effective availability and increasing competition for water of adequate quality.

The above problems are aggravated by shortcomings in the management of water. Sectoral approaches to water resources management have dominated and are still prevailing; this leads to fragmented and uncoordinated development and management of the resource. Moreover, water management is usually left to top-down institutions, the legitimacy and effectiveness of which have increasingly been questioned.

The traditional sectoral and fragmented approach to water resources management has often led to governing bodies representing conflicting interests. Policy objectives have been set without consideration of the implications for other water users and without consultation across sectoral and institutional boundaries. As a result available financial and physical resources (including water) have not been employed to maximize total social welfare.

From the point of view of technological transfer in the water management field, many projects in the water sector have failed due to the uncritical application in developing countries of technologies that have worked in industrialized nations but in totally different physical, social and economic settings.

Thus, the overall problem is caused both by inefficient governance and increased competition for the finite resource.

Latest Trends

To achieve water security, we are facing the following main challenges;

Securing water for people: Although most countries give first priority to satisfaction of basic human needs for water, one fifth of the world's population is without access to safe drinking water and half of the population is without access to adequate sanitation. Particularly in developing countries, water supply and sanitation for urban and rural areas represents one of the most serious challenges in the years ahead.

Securing water for food production: Water is increasingly seen as a key constraint on food production. Irrigated agriculture is already responsible for more than 70% of all water withdrawals in the world. Even with an estimated need for an additional 15-20% of irrigation water over the next 25 years, serious conflicts are likely to arise between water for irrigated agriculture and water for other human and ecosystem uses.

Protecting vital ecosystems: Terrestrial ecosystems in the upstream areas of a basin are important for rainwater infiltration, groundwater recharge and river flow regimes. Aquatic ecosystems produce a range of economic benefits and also provide wildlife habitats and spawning grounds. The ecosystems depend on water flows, seasonality and water table fluctuations and have water quality as a fundamental determinant. Land and water resources management must ensure that vital ecosystems are maintained.

Dealing with variability of water in time and space: Almost all the freshwater available for human use originates from precipitation, which varies immensely over time and space. Tropical and sub-tropical regions are characterized by huge seasonal and annual variations in rainfall. Such variability increases the demand for infrastructure development and the need to manage water demand and supply. The effects of global climate change may add further to this challenge.

Managing risks: Variations in water flows and groundwater recharge can add to drought and flood events, which can have catastrophic effects in terms of large scale loss of human life and damage to economic, social and environmental systems. Water pollution creates another set of risks, affecting human health, economic development and ecosystem functions.

Creating popular awareness and understanding: Public awareness is needed in order to mobilize effective support for sustainable water management and induce the changes in behaviour and action required to achieve this. Additionally, public awareness and subsequent pressure for action may be vital in fostering the political will to act.

Forging the political will to act: In a world of scarce resources – financial as well as natural – political attention and commitment are vital to ensure good decision-making and the necessary investments in the development and management of water resources.

Ensuring collaboration across sectors and boundaries: There is a need to find appropriate ways to co-ordinate policy-making, planning and implementation in an integrated manner across sectoral, institutional and professional boundaries and to take into account the even

Box 3.3.4 Definition of IWRM

IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner compromising the sustainability of vital ecosystems.

more complex co-ordination issues arising over the management of international watercourses.

The concept of Integrated Water Resource Management (IWRM) is a key approach to tackle these main challenges in water management. GWP recently formulated a definition of IWRM to provide a common framework (see Box3.3.4), but the concept of IWRM is still widely debated and the definition remains ambiguous. Therefore, regional and national institutions must develop their own IWRM practices using the collaborative framework emerging globally and regionally.

The importance of IWRM in promoting the sustainable use of freshwater was also recognized by the ESCAP Ministerial Conference in 2000. The need for collaboration and partnership at all levels, from individual citizens to international organizations is emphasized for realizing IWRM in the Action Plan the Conference adopted.

In light of the need for comprehensive assessment of the world's freshwater as the basis for more integrated water management, the World Water Assessment Program was launched in 2000 as an "umbrella" for coordination of existing UN initiatives within the freshwater assessment sphere under UNESCO's initiative. The program focuses on assessing the developing situation as regards freshwater throughout the world, with strong link with UN bodies such as UNEP, FAO, WMO, WHO, UNICEF, and World Bank. The first edition of the "World Water Development Report", an outcome of that program, will be launched on the occasion of the 3rd World Water Forum in 2002.

As for ground water assessment, WMO's Commission for Hydrology recommends the establishment of an International Groundwater Resources Assessment Center in its 11th session in 2000. Such international assessment efforts will provide solid foundation for formulation of more effective water management policy.

3.3.2. Recommendations

To meet the increasing challenges of water scarcity, pollution, and degradation of watersheds and ecosystems, water and related resources need to be managed in an integrated manner. IWRM is a process to improve the planning, conservation, development, and management of water, forest, land, and aquatic resources in a river basin context, to maximize economic benefits and social welfare in an equitable manner without compromising the sustainability of vital environmental systems.

Application of 4 Key Concepts

Eco-Consciousness

Public awareness and education: Wide-ranging public awareness and community education programs are important especially among women, youth, and farmer groups. In particular, education that helps communities understand the linkages between water, sanitation, health, and productivity will be encouraged.

Exchange and share experiences and ideas: A multilateral interdisciplinary forum at global or regional level should be established to develop general principles and minimum standards for the sustainable management of water. All relevant actors, including states, international organizations and non-state actors, such as NGOs and other interest groups, should be enabled to participate in the discussions. The aim of the forum should be to exchange and share experiences and ideas on the management of international river basins.

As mentioned in the previous section, the main objectives of the WWC are to raise public awareness of critical water issues at all levels, including the highest decision-making level, to facilitate efficient conservation, protection, development, planning, management and use of water in all its dimensions on an environmentally sustainable basis for the benefit of all life on the earth.

Eco-Partnership

Public participation: Public participation and empowerment are necessary conditions for achieving sustainable development. To ensure effective public participation, independent of the goodwill of the authorities, rights of access to information, active participation in decision-making processes, and access to justice need to be legally established. Resources should be made available for the implementation of the outcomes of the public participation process.

Effective approaches and methods for public participation need to be devised that can be applied in different cultures and may help to overcome reluctance on the part of the authorities.

Public-private partnership and inter-sectoral dialogue: Private sector initiatives and market-oriented behavior are expected to improve performance and efficiency, particularly in service delivery. While governments will be primarily responsible for water resource management, several management functions will attract private investments. Others may be contracted out. Global experience indicates that public responsibility and ownership is often best blended with private management. Water supply and wastewater treatment services in urban areas can be leased to the private sector, or concessions made against agreed performance parameters. In most DMCs, a significant increase is needed in the level of public sector investment in water resource management, including physical infrastructure, institutions, and capacity building. These investments will be targeted at the

development, management, and conservation of water resources in river basins, mainly through package programs and multipurpose projects, in a river basin context. The private sector will need to share the burden of investments if the capital intensive programs are to be implemented in a reasonable period of time, and if efficiency gains are to be realized.

The 3rd World Water Forum will promote dialogue among all stakeholders from the preparation stage by using the Virtual World Water Forum on the web and at various pre-conferences. For example, as one of the post Second World Water Forum actions, a workshop entitled "Dialogue on Water for Food and Environmental Security" was held in Sri Lanka in December 2000. The point of this workshop was to promote inter-sectoral discussion between two parties whose interests have been considered to be inimical to one another.

Though there are many water-related web sites in the world, there is no single site which integrates all databases including information, past discussion on each issue and various data. The 3rd World Water Forum launched the Virtual World Water Forum web site in June 2001 to provide the people of the world with a place to discuss, exchange their views, present their activities, get information, etc.

Eco-Technology and Eco-Investment

Importance of water resources assessment: Management of water resources requires an understanding of the nature and scope of the problem to be managed. How are all relevant water resources problems identified? How can we make sure that we acquire useful information, which enables us to identify and assess existing and potential future water resource problems and solutions? Carrying out water resource assessments is a useful way of acquiring such information as a basis for management. Without adequate access to scientific information concerning the hydrological cycle and the associated ecosystems it is not possible to evaluate the resource or to balance its availability and quality against demands. Hence, the development of a water resources knowledge base is a precondition for effective water management. The objective of the assessment is not to solve the problems but to identify and list the problems and identify priority areas within which more detailed investigations may be carried out.

Monitoring and evaluation: The assessment of water resource availability and quality, and their possible long-term changes through consumptive water use, climate or land use change, are highly dependent on reliable data from monitoring and gauging systems. Collection and processing of relevant data, easy accessibility and broad dissemination are eminent tasks.

To increase policy relevance, data should be aggregated into meaningful information, for example in the form of indicators and systems for benchmarking. Compliance monitoring (reporting, reviewing and evaluating) is very important for promoting the implementation of plans.

Monitoring and analysis methods should be harmonised nationally and, in case of international basins, internationally.

Environmental impact assessment (EIA): EIA plays a central role in acquiring information on the social and environmental implications – including water resources implications – of development programmes and projects, identifying the measures necessary to protect resources and related ecosystems and then ensuring that such measures are implemented. The EIA touches the heart of the need for cross-sectoral integration involving project developers, water managers, decision-makers and the public, and provides a mechanism or tool to achieve this.

Comprehensive analytical model: To support IWRM, a new analytical model should be developed that can aggregate socio-economic, political, institutional and technological potentials and hydrological constraints. This model should furthermore be capable of evaluating the actual management capacity.

Research and development: Technological innovation and adaptation are key components of many efforts within the water sector. At the conceptual level models and forecasting systems are being improved to allow better predictions of temporal and spatial variations in the quantity and quality of available water resources. This may help to reduce uncertainties and risks in the use and management of resources. Water saving technologies in irrigation (e.g. drip irrigation), improved and cost-effective methods for the treatment and reuse of wastewater in industries and domestic systems, aquifer recharge technologies, human waste disposal systems that require no or extremely small quantities of water, and cheap but effective water purification systems for villages are other examples of promising innovations which can promote the sustainability of future water resources.

For practical purposes, however, it has to be realized that technological choices must take account of specific conditions prevailing at the location of use. This means that the most advanced and modern technology is not necessarily the optimal choice in all cases. If the system cannot be sustained because of lack of spare parts, skilled manpower or economic resources for operation, it is not the most appropriate solution. Moreover, high-cost technologies can prevent community and household involvement in water management.

Eco-Policy Linkage

Stakeholder involvement and communication: The principle of stakeholder participation in water resources management requires a serious effort of awareness raising among politicians, decision-makers in the water sector, professionals, interest groups and the public at large. In order to encourage stakeholder participation in water resources management, and in order for the participatory process to be effective, the availability of timely and relevant information to all concerned is an essential precondition. Therefore, adequate official surveys and inventories of water

sources and supplies, up-to-date registers and records of water uses and dischargers, water rights, and the beneficiaries of such rights, with their respective water allocations, should be made available to the public.

Especially when dealing with international watercourses, openness and sharing of information are key to the achievement of IWRM since all involved riparian countries have "natural monopolies" in data collection and dissemination within their national territories.

Some water authorities have long employed land use controls to protect their supply sources; for example, land uses may be regulated in upstream recharge areas and around reservoirs to prevent pollution, siltation and changed run-off regimes. The management of land use is as important as managing the water resource itself since it will affect flows, patterns of demand and pollution loads.

Sectoral and inter-sectoral strategic plan: For international river basins and national basins located in several jurisdictions, strategic *water management* plans should be prepared that preferably cover the complete basin. The main function should be to co-ordinate water management between the different jurisdictions and offer a framework for negotiation. The planning process should be open to linkage with issues outside of the water sector, since this may result in win-win solutions for upstream-downstream conflicts, which otherwise would have a win-lose character.

Strategic (water management or inter-sectoral) plans should typically include or reflect, *inter alia:*

(i) Institutional arrangements
(ii) Capacity building policy
(iii) Public participation
(iv) Transparency of decision making
(v) Legitimacy
(vi) Structural and non-structural measures
(vii) Economic aspects and efficiency
(viii) Compliance

Recommendations

Water security is a rapidly growing issue in the Asian and Pacific Region. The threat of inadequate safe water is real. At the same time, water is a key development ingredient that impacts on a variety of factors that sustain and enhance life. As a critical natural resource, the issues connected with managing it are inherently diverse and complex. They involve questions of allocation and distribution, equity, conservation, pricing, regulation, education, participation, and sustainable use. With the region's rapid population growth, rising industrialization, increasing environmental degradation and pollution, and the specter of a dwindling resource, stakeholders are now emphasizing the need to address issues relating to integrated water resource management in a comprehensive and holistic manner. Policies for the sustainable use of water need to be developed in consultation with all stakeholders.

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3.4. FOREST CONSERVATION : STEPS TOWARD SUSTAINABLE FOREST MANAGEMENT

3.4.1. Necessary Measures for the Participatory Forest Management

Forest Loss in the Asia–Pacific

The forest area in the Asia - Pacific region (APR) accounts for a quarter of the world's forest. In the region there are various types of forests ranging from tropical and temperate to boreal forests, which include rich forest resources and bio-diversity.

The forests in the region are facing a serious crisis with accelerated forest loss (deforestation and the degradation of forest) since World War II. Consequently the region has lost almost 95 percents of its frontier forests. The amount of deforestation in the region during the 1980s was smaller than that in Africa and Latin America. However, the region lost almost million hectares in the period and had the highest rate of annual changes of forest and other wooded land (-0.6 percent per year from 1990 to 1995). This rate is similar to that of Latin America (-0.5 percent per year). Degradation of boreal forests has rapidly worsened.

Underlying Causes

Forest loss is caused by natural factors. However, the forest loss caused by human activities has been outstanding during the last 30 years.

As for the proximate causes of recent forest loss in the region, such various means as logging, conversion, planting, direct destruction and no management have modified / replaced forests into degraded forests and other land use are recognized. And these means of forest development often conducted on the purpose of commercial logging, conversion to cash cropping / plantation, industrial plantation, land clearance for rice self-sufficiency, shifting cultivation, land opening for migration, hydropower development, etc. In those activities related leading forest loss there are various kind of domestic agents such as central and local government, domestic logging industries, military authorities and local people. At the same time such foreign agents/actors as importing countries, foreign capital from importing countries and foreign aid institutions played a very crucial role.

Five key underlying causes of forest loss (UCFL), which are closely related to recent major proximate causes of forest loss in the region, are addressed. The first UCFL is "the lack of recognition of the real value of forests". There are many observations that actors related to forest development ignored the real value of forests including environmental functions and the livelihood base of the local community, as they aimed to maximize economic profits from the development not paying sufficient conservation cost of real value of forests exploited. The lack of appropriate knowledge / measures of forest biodiversity, ecosystem management and traditional forest use among the parties concerned seems to have encouraged narrow-minded resource use policies. The second UCFL is "the impacts of market forces under incomplete market system." It was very often observed in several studies that the forest developments in the Asia-Pacific region were driven in unsustainable ways that centered on monetary benefits, in particular foreign exchange, and on market forces. These are caused by the strong consumer demand for products, especially in importing countries. The studies also indicated that "economic and forest development policies with industrial emphasis" has been leading to forest loss in the region. So far forest relevant policies were strongly intended to exploit the benefits from timber extraction and forest conversion as a means of obtaining foreign exchange or financial source of powerful peoples. Moreover "an insufficient political will and shortages of compliance" to stop destructive forest development was recognized as a key UCLF of ongoing forest loss. Many institutional causes, such as an insufficient legal and administrative base for sustainable forest management, incomplete public forestland policy and insufficient attention to local people's right can be extracted from this UCLF. A lot of studies indicate that many direct or indirect causes of forest loss were strongly affected by "political disorder and economic difficulties". This UCLF has brought about many causes of forest loss such as inability of forest governance, the expansion of rule violation and corruption, the increase of poverty and the consequent rise of non-traditional shifting cultivators. Moreover, various impacts of forest loss themselves have often brought on more political, social and economic instability. In this sense, the progress of forest loss itself is an UCLF.

Directions to Overcome Forest Loss

Many forest developments in the region have brought not only economic impacts but also impacts on environment and livelihood, land conflicts and land alienation. In many cases the negative impacts of forest loss exceeded the economic profits from the development. Many forest developments in APR have conducted aiming to maximize monetary benefit for specific actors ignoring real value of forests and rarely paying a cost to recover the impact. In order to stop such shortsighted way of forest resource use, all kind of forest development should be planed, implemented and evaluated taking accounts into the real value of forests. For this direction, developing methodologies to evaluate multi-function and the mechanism of internalization of real forest values, introducing an environment / social impact assessment (EIA / SIA) and local people oriented land allocation should be promoted urgently.

It is widely observed in the region that unsustainable forest development has accelerated on the background of strong demand of natural resources both from forests and forest-converted land. Illegal or uncontrolled forest extractions are also originated in this causes coupled with

Box 3.4.1 Recent Major Proximate Causes of Forest Loss in Selected Areas/Countries

Area	Recent Major Causes
Philippines	Export-oriented unsustainable commercial logging, the failure of industrial plantations, frequent forest fire caused by local people, mining operations, forest conversion for agricultural expansion, upland farming, and government projects such as dams, land clearing for the landless.
Indonesia	Export-oriented unsustainable commercial logging, logging for domestic plywood industry, transmigration projects and paddy field development projects, non-traditional shifting cultivation, industrial tree plantations, frequent large-scale forest fires and oil-palm plantation development.
Thailand	Logging, forest clearance for cash crops, shifting cultivation, rubber plantations, shrimp farming, land zoning and expansion of protected areas.
Lao PDR	Direct and indirect impacts of the Second Indochina War, land clearance for rice self-sufficiency, shifting cultivation, hydropower development and commercial logging.
Vietnam	Direct and indirect impacts of the Second Indochina War, land clearance for rice self-sufficiency, in-country migration, coffee plantations, shifting cultivation, financial resources for the military from logging.
Cambodia	Land clearing for crops, logging under the protection of powerful people and the military.
Southern Russian Far East	Export-oriented unsustainable commercial logging and large-scale forest fires.

Source: IGES 2001.

an inability of forest governance in supplier countries. Thus, the consuming forest-goods produced in sustainable way shall be facilitated as a precondition of forest conservation. Introducing economic instruments, rising public awareness, exerting proper trade monitoring and adequate pricing of forest products are key actions.

Forest loss in the region has prompted directly or indirectly through top-down forest development ignoring the local people's rights and customary use of forests with insufficient governance. Thus economic and forest policy reforming shall be considered policy options with special emphasis on participatory approach under strong political will to forest conservation. This direction shall be realized coupled with effective legal and administrative base with concrete measures of local people's participation to the all-kind activities of forest management. Moreover, recognizing the significant impacts of large-scale forest fires on forest loss both in tropical and boreal forest, legal and administrative base for effective fire control, including proper resource allocation and regional cooperation, shall be strengthen urgently.

Finally, many forest developments leading to forest loss have been caused by foreign intervention along with the absence of appropriate coordination on tarns-boundary issues. In that respect, regional coordination among the Asia-Pacific countries can be a key direction in order to realize forest conservation. For achieving this goal, the international community should support an increased emphasis on participatory (or bottom-up) approaches to forest conservation as well as information / experience sharing on forest issues as well as an active collaboration on urgent issues such as large-scale fire prevention, mitigation of trade liberalization on forest products, etc.

Emphasis on Local Forest Management

In the late 1970s, professional foresters in the tropics noticed that they could not manage the forest sustainably under the principles of conventional and industrial forestry, whereby the local people have been considered to be obstacles or constraints on forest management. "Social forestry" was recognized as an important norm or principle to produce successful sustainable forest management, even though industrial forestry has been dominant in practice. Originally, social forestry and community forestry were defined similarly as any situation that intimately involves local people in forestry activity for the purpose of rural development. These days, however, it seems that the term "social forestry" involves a wider range participatory activities, and the term "community forestry" implies collective activities rather than individual activities such as farm forestry.

In general, social forestry consists of two major components. One of them is participatory forest management (PFM) in the forestry sector. The other

includes 1) development of infrastructure such as roads, meeting places, schools, and clinics; 2) agricultural extension; and 3) generation of income sources for rural development, etc. If the latter activities prevail without the component of PFM, however, the activities are not necessarily called "social forestry" but the more general term "rural development."

In order to examine the current state of forest policy, we should grasp not only the national land/forest policy but also the actual state of forest utilization by the local people. Moreover, identification of internal constraints for PFM that present in the local communities in terms of economic, social, and cultural aspects is indispensable for elaborate desirable policies for PFM.

Current Status of LFM

Two concepts can be applied as an analytical framework or valuation basis: "legal status of land" and "main actors of forest management." In terms of "legal status of land", provisionally, we recognize land with differing legal status to be "individual land," "organizational land," "village land" (owned by both of formal village or indigenous people's community), "outsiders' land," and "national land" (owned by the local and national government). In terms of "main actors of forest management", the main actors are classified as follows: 1) individuals or peasants living in the village and their households (their forest management can be called "peasant forestry" or "farm forestry"); 2) functional groups such as forest users' groups, cooperatives, schools, temples, women's unions and elder's groups ("functional group forestry[1]"); 3) fundamental groups such as groups of relatives, natural villages, and indigenous cultural communities ("fundamental group forestry"); 4) an executive body of the formal village ("village forestry" that includes centralized community forestry); 5) outsiders and corporations ("private forestry"); and 6) local and national governments ("public forestry").

Identified characteristics of the PFM systems are: 1) in most of the PFM systems, the land still belongs to the state and the right to use the land is granted to the local people. 2) Protected areas are mainly controlled by the government. 3) Harvesting and conservation activities are mainly managed collectively. 4) It is ascertained that most of the collective management by the local people is not implemented by fundamental groups but by functional groups, except for the management by indigenous cultural communities and indigenous peoples in the Philippines. Also, fundamental groups may manage village forestry activities in Laos. 5) It is interesting that several programs assume that collective management can be suitable for planting activities consisting of reforestation and afforestation, even though individual management seems to be suitable for planting activities rather than collective management in terms of economic incentives. Diversification of the actors seems to be advantageous for forest management in order to achieve ecological sustainability and social justice. The government of each country should devise and improve tenure arrangements, where various types of actors can be involved in all the processes of forest management such as planning, decision-making, implementation, and profiting.

However, there are external constraints for PFM by means of clarifying the gaps and contradictions between the national land/forest policy and the actual state of forest utilization by the local people. Besides, it can be found out internal constraints for PFM that present in the local communities in terms of economic, social, and cultural aspects. There are several studies to clarify constraints in several countries[2]. These constraints can be described as the followings:

Constraints of Participatory Forest Management

In many cases, the local people are confronted with obstacles originating in national policy and development projects. O important external constraint is "inappropriate land tenure system". The land ownership of the local people is usually not approved by the government even though the people manage the forest in a sustainable manner, in accordance with their customary law. Governments often grant land usage rights, without conferring other rights such as commercial logging and industrial plantation. Furthermore, "centralized and paternalistic forest management" is also an important external constraint. Top-down decision making processes ignore the actual state of land utilization, which results in ineffective demarcation of forest land use and forest management plans as a result of neglecting local needs.

On the other hand, there are some "internal constraints", relating to the local communities. An alarming example of "internal technical constraints" is that TFRK (traditional forest-related knowledge) is going to fade out even in the communities of indigenous people. A typical "internal economic constraint" is the lack of incentive for forest related activities compared to other activities. Indeed, conservation activities generate no monetary benefit. Even plantation forestry takes a long time to generate benefits.

"Internal social constraints" are disagreements among the members of local community and weakening of the bonds of human relation, which hamper the collective activities to manage forests. Moreover, some of the people hesitate to change their life style, which is considered to be an "internal cultural constraint". Case studies conducted on some countries have revealed "External" and "Internal" constraints. Such studies are useful in order to grasp the

[1] Functional group forestry, fundamental group forestry, and village forestry are included in the concept of “community forestry,” since they are based on collective management. Public forestry in cooperation with the local people is called “joint forest management.”

[2] The Philippines, Indonesia, Vietnam and Lao PDR.

current situation and actual method of forest management on the ground. In this report, the results of field research in Indonesia, the Philippines, Vietnam and Lao P.D.R are shown as examples of these constraints.

Indonesia

- External constraints on local participation

"External constraints on local participation" in Indonesia are as follows: 1) The rights of the local people to utilize and manage the forests have been neglected by the government. 2) Logging or timber companies, including the national Forestry Corporation (Perum Perhutani), usually apply top-down decision-making, and local needs are often neglected. 3) The government classifies forestland into five functional categories, but the actual state of land utilization and socio-economic aspects are totally neglected in this classification, because the main criteria for the classification used are the degree of slope, fragility to soil erosion, and strength of rainfall. 4) In Central Java the recent economic crisis triggered many young migrant workers to return to their home village because they had lost their jobs in Jakarta. Since then, some may have started illegal logging and illegal cultivation. 5) Especially in Java, organized illegal logging can be a great obstacle to sustainable forest management by local people as well as by the national forest corporation.

- Internal constraints on local participation

"Internal constraints on local participation" in Indonesia are as follows: 1) In a village where a customary forest management system does not exist in East Kalimantan, loose norms cannot function as a sound basis for enforcing observance, and as a protective wall against external pressures. 2) In such a village, weak collaboration makes it difficult to develop any form of village-wide forestry program, and high competition for forest products, particularly timber, has caused the people to be more careless about sustainability of the forests. 3) In two villages of East Kalimantan, the village leadership based on the law of village government does not generate local participation and tends to disintegrate the communities by serving the governmental interests. 4) In Southeast Maluku, the younger generation tends to cut trees in the customary forests to get money for commodities and frivolities. 5) In Central Java, illegal logging can be seen in the national forests (managed by national forestry corporation, Perum Perhutani) probably conducted by local people who own little or no farmland and cannot work outside the village. They may log to obtain firewood to be used to produce brown sugar from the coconut palm.

The Philippines

- External constraints on local participation

"External Constraints on local participation" in the Philippines are as follows: 1) A major external constraint on PFM appears to be an attitude that imposes government-designed forest projects on upland communities, where local people are requested to follow them, to act as tools of the government. 2) In most cases, these projects do not consider local conditions such as land use, people's dependence on forest resources for their livelihood and the local value systems. 3) Requiring local people to participate in the government-designed reforestation projects brings about adverse effects, including resistance and conflicts between the government and local people, as well as among the local people themselves. 4) NGOs may be expected to play substantial roles, not as instruments of the government, but as catalysts to empower the local people in formulating solutions on their own to existing problems. 5) Most small-scale loggers think the forests are still controlled by the government, because logging in all CBFM sites was suspended in 1988.

- Internal constraints on local participation

"Internal constraints on local participation" in the Philippines are as follows: 1) In Banaue, few internal constraints of social and cultural aspects towards forest management can be identified. 2) In Banaue, even though the people have a desire to improve the stand quality in private forests by planting trees, particularly trees for woodcarving, they do not intend to do so if they have to pay for seedlings. 3) In Banaue, planting seedlings for woodcarving materials in the community forests is hardly expected, because it may be difficult to find witnesses of the plantation activities in the community forest since they are necessary in order to claim one's ownership on planted trees. 4) In Sierra Madre, there are some conflicts between the cooperative or an executive body of CBFM program and illegal loggers, and between the cooperatives and new migrants. Even the members of the cooperative expect benefits from the cooperative rather than self-sacrifice, because the cooperative is a kind of a functional group. 5) In Sierra Madre, the policies of the cooperative sometimes fluctuate, because the requests of the government and the villagers contradict each other.

Vietnam

- External constraints on local participation

"External Constraints on local participation" in Vietnam are as follows: 1) Bureaucracy and centralized top-down decision making at the local level can be obstacles to participation of the local people. 2) Although forest should be classified into three categories, there are no authentic criteria and indicators for forest classification. 3) The budget and human resources to implement the program of land/forest allocation are limited. As a result, the local authorities can not conduct this work effectively. 4) Local authorities have not paid attention to the fact that for local people swidden agriculture has been

essential during transitional periods. 5) Arrangements and agreements on jurisdiction between the local authorities and national government seem to be insufficient. 6) There is no effective system or program to promote PFM by fundamental groups and villages, even though villages can undertake contracts to protect natural forest in national parks. 7) The national park system conflicts fundamentally with the livelihoods of local people.

- Internal constraints on local participation

"Internal constraints on local participation" in Vietnam are as follows: 1) People believe that the collection of forest products is legal even though it is illegal in ecological rehabilitation zones of special-use forests and critical protection forests. 2) The custom of exchanging ideas and experiences is not mature, which makes it difficult for people to acquire new ways of thinking and doing, such as legitimate PFM. 3) The linkages among households have been very loose and group of households have not worked together to accomplish common goals.

Lao P.D.R.

- External constraints on local participation

" External constraints on local participation" of Lao P.D.R are as follows: 1) Decrees or implementation ordinances to enforce the Forestry Law have not yet been issued. According to the government officer who participated in the workshop, the government has issued the Decree No. 198 in 1998. But we have not examined the decree. 2) When converting from an existing land classification allowing use by the local people to official land under the Land Law and Forestry Law, important points are whether the present land/forest utilization and ownership are officially approved or not. 3) Application of the official land use classification to the land, such as swidden land, customary conservation forestland and dense forestland, is said to be difficult. 4) The swidden land at present includes the land under cultivation, fallow, and grassland. Officially, however, the land regarded as degraded at present is classified into degraded forest land, the land regarded as young bush fallow into regeneration forest, and the land regarded as old forest fallow into village-managed protection forest, conservation forest or production forest. 5) The problem concerning the land to be classified into degraded forestland is high possibility of afforestation on degraded forestland, although the local people are harvesting NWFP even from grassland. 6) The problem concerning the land to be classified into regeneration forest (village-managed) is every probability to neglect the fact that the local people have customary tenure rights for all swidden areas, including the fallow land. 7) Classification of swidden land into degraded and regenerated forest land, has been planned on the presupposition that swidden agriculture should be abandoned, even though most of the local people make their livelihood by swidden agriculture. 8) The problem arisen from classification of felling-prohibited forestland and dense forestland into protection, conservation, and production forest is every probability that customary forest utilization is not permitted, even though the local people harvest forest products from the forestland covered with every vegetation. 9) Criteria for demarcating the core zone and buffer zone in NBCAs are not clearly defined. The local people do not understand the restrictions of forest utilization in core and buffer zones. 10) In reality, production forests, agricultural land, and even house lots are included in the buffer zone of NBCAs. This fact is inconsistent with the purpose of NBCAs to conserve biodiversity.

- Internal constraints on local participation

" Internal constraints on local participation" of Lao P.D.R are found out as the followings; 1) A lack of flat land suitable for sedentary agriculture and it's the land's low productivity force the local people to practice swidden agriculture on the degraded uplands. 2) The non-agricultural economic sectors are not developed enough to provide adequate income sources, and the market system is also not well developed. As a result, local people are forced to depend on the forest products. 3) The local people do not understand their rights and duties in managing forest in the village territory. As a result they sometimes do not enrich or regenerate the forest areas after land or forest allocation has occurred. 4) Actual forest utilization by the local people does not change even after establishing NBCAs. 5) Customary forest utilization cannot automatically be regarded as sustainable.

Measures for Sustainable Forest Management and Participation of Local People

Sustainable forest management is a common goal of international society in achieving sustainable development. However, the current situation of local forest management is far from reaching this goal due to many obstacles. One of the major obstacles is a gap between the legal and administrative system relating to forest management and the actual situation of forest and land use. In order to fill the gap, an appropriate legal and administrative mechanism, based on a flexible and decentralized approach and adapted to the actual situation of forest and land use, is essential. In addition, it also requires participation of local people in order to adapt existing laws and systems to the actual local situation of forest and land use and ensure effectiveness of the system.

Towards this aim, the following legal and administrative measures should be taken for the effective participation of local people, as the basis for realizing sustainable forest management.

First of all, local participation in forest management

Box 3.4.2 Characteristics of PFM Systems in Selected Countries

List of Participatory Forest Management (PFM) system characteristics

- In most of the PFM systems, the land still belongs to the state, and the right to use the land is granted to the local people.
- Protected areas are mainly controlled by the government.
- Harvesting and conservation activities are mainly managed collectively.
- Most collective management by local people is not implemented by fundamental groups but by functional groups, except for management by indigenous cultural communities and indigenous peoples in the Philippines. Also, fundamental groups may manage village forestry activities in Laos.
- Several programs assume that collective management can be suitable for planting activities consisting of reforestation and afforestation, even though individual management seems to be suitable for planting activities, rather than collective management, in terms of economic incentives.

Source: IGES 2001.

should be set in legal terms. In addition, appropriate administrative measures should be taken by the governments to ensure effective participation of local people in the process of forest management such as the decision making process, the management process of the protected area, the planning and implementation process of the international aid programs and the process of granting forest concessions. Developing an administrative program is another important measure. The program should be revised periodically and coordinated with other relevant programs. In addition, it should give opportunities for local people to express their views. These views should be taken account of seriously. In the process of formulating such a program, sufficient advice from experts should be provided. Moreover, national governments are required to support, instruct and encourage local government to take necessary measures to ensure participation of local people.

Box 3.4.3 Main Actors of Forest Management

Main actors of forest management, who have management responsibility and take initiatives, are indicators of local participation. Main actors and their forest management are classified as follows:

- Peasant forestry / Farm forestry management
  Individuals or peasants living in the village and their households
- Functional group forestry management
  Functional groups such as forest users' groups, cooperatives, schools, temples, women's union and elders' groups
- Fundamental group forestry management
  Fundamental groups such as groups of relatives, natural villages, and indigenous cultural communities
- Village forestry management
  An executive body of the formal village
- Private forestry management
  Outsiders and corporations
- Public forestry management
  Local and national governments

Source: IGES 2001.

With respect to developing countries, international assistance is necessary for developing and implementing the program in a participatory approach.

In order to enhance implementation of the legal and administrative system on forest management, training programs for such key actors as government officers, members of NGOs, journalists and local people should be organized with special emphasis on the value of forest and the necessity of participation of local people.

Ensuring the benefit of local people is also a key requisite for sustainable forest management under the participatory approach. To that aim, first a legally authorized collective forest management by local people should be encouraged and supported and given priority over large-scale forest management by corporations. For that purpose, the necessary technical supports should be provided. Where appropriate, the collective forest management bodies should be authorized by the relevant government to enforce the necessary regulations. In developing forest plans, coordination among relevant ministries and authorities is necessary. Secondly, individual-based forest management should be supported through legal assurances that guarantee the rights of local people over the forest. A plan for supporting the tree plantation and benefit sharing should be established.

In order to secure the rights of local people, a "dispute settlement system" including independent informal mechanisms or an ombudsman should be established. The mechanism should include procedures for objection or appeal. For the purpose of efficiency, an option to chose/agree with a dispute settlement mechanism, through legal forum or out of court should be ensured. Recourse to traditional conflict resolution mechanisms should be considered deciding which mechanism is appropriate for the resolution. In addition, information disclosure and such support as necessary expert's advice and appropriate financial assistance can be essential for proper operation.

Necessity of Further Research

As mentioned above, several measures are clarified for realizing participation of local people. This can be a part of strategy for desirable forest conservation and sustainable forest management. However, further researches are

necessary for ensuring effectiveness of these measures. Many approaches should be taken into consideration to ensure implementation of the measures. One of ways is to develop local guidelines and national guidelines (for meaningful participation in forest management at the local and national level. The local guidelines will be utilized in local activities, to compose an important part of national guidelines together with other fields related to forest management. The attempts to clarify the local guidelines should take an approach where a viewpoint shifts from local level to national and international level.

In addition, the local guidelines may be base of developing recommendations to ensure the effective application of international treaties on local participation in forest management at national level for participation in forest management. This approach should take the viewpoint shifting from international level to national and local level.

Those two approaches should be intersected, blended, and synthesized at national level discussion, especially in the process to elaborate the national guidelines.

These guidelines will show concrete procedures of participation including measures of enhancing implementation of existing systems related to forest management and encouraging improvement of the existing systems. It will be useful and is indispensable for effective implementation of national policies and international treaties related to forest management.

3.4.2. The 4 Key Concepts in Forest Conservation in Asia and the Pacific

Eco-Consciousness

In the arena of discussion on forest conservation, raising eco-conciousness for appropriate knowledge of and measures for forest biodiversity ecosystem management and traditional forest use and the real value of forests, among the parties concerned, can be recognized as a key strategy. Insufficient integration and dissemination of existing information relevant to the multi-functions of forest and the methodologies to apply in the forest use is a serious obstacle for effective solution. Moreover changing the consciousness of forest use / development with industrial emphasis to a sound environment is an urgent request for all stakeholders in order to halt forest loss in the APR. In particular, the government needs to change the concept of forest policy from timber production to ecosystem management, from top-down decision making to bottom-up decision making, and from corporate-oriented management to people-oriented management. On the contrary, the bulk of local people possess "traditional forest related knowledge (TFRK)". There is concern that the retainment of TFRK, or precious human wisdom, is threatened by forest loss. Therefore, it is of primary importance that TFRK be reexamined and that policy makers evaluate TFRK appropriately. It is important that all the actors and stakeholders should be conscious of the significance of others' role with mutual respect as well as of forest ecosystem itself.

Halting the stereotypical reporting on causes of forest loss is also a key action in facilitating eco-consciousness of forest conservation. The blaming of forest loss solely on shifting cultivators is a simplistic approach, which does not consider the many forces causing forest loss. Certainly one of these forces is increasing population pressure on land and conversion of forest for cultivation. Not only the shifting cultivation but also many proximate and underlying causes are mutually connected with recent forest loss in the APR. The definition of "degraded forest" is also subject to contestation. Such discursive domination may allow the culprits of deforestation to evade their responsibility for solving or avoiding forest loss. More generally, the "politics of blame" around deforestation makes it particularly difficult to establish the climate of trust necessary for cooperative approaches to sustainable forest management. Thus it might be effective to encourage journalists to learn more about forest-related issues, especially the underlying causes as key subjects to be considered.

There is no doubt that forest resource is unlimited and sustainable resource use is a consensus among human beings. However, wasteful forest resource use is frequently observed both in supplier and consumer countries. Our researched reconfirmed that unsustainable forest development in the region has accelerated against a background of strong demand for natural resources both from forests and forest-converted land. It seems that illegal or uncontrolled forest extractions originated also in many cases in strong demand from consumer countries coupled with an inability of forest governance of supplier countries. According to the recent report of FAO, the raw material deficit will be widening in the next decade, as log availability declines and the gap between supply and demand will put greater pressure on forest sustainability, particularly in the Asia. Therefore consumer countries shall encourage sustainable resource use through such concepts as the reduction of resource use, promotion of recycling. For such changes more efficient techniques of resource use shall be developed and employed positively coupled with consumer awareness and environmental education.

Eco-Partnership

It is necessary for a variety of actors such as local people, private corporations, local authorities, national authorities and NGOs to cooperate with each other equally under the universal value of sustainable management and conservation of forests. In accordance with this principle, professional foresters should conquer the "foresters syndrome" where they love trees but hate people, and should play the role of facilitators for the development of forest regions. Socially acceptable and environmentally sustainable forest management will be realized by way of equal eco-partnership.

Equal partnership among all stakeholders is required, but power of local people is not equal to other stakeholders such as government officials and companies. Hence, rights of local people are vulnerable compared with the other parties. Therefore, mechanisms to ensure rights of local people are necessary in order to realize equal eco-partnership. One of the mechanisms is conflict resolution mechanism. The conflict resolution mechanism can provide opportunities to redress right of local people when their rights are violated. The mechanism should include not only courts but also informal resolution mechanism. Beside, information related to use of the mechanism should be disseminated and appropriate support from experts should be provided for local people.

Forest certification scheme is also one of measures of realizing equal " eco-partnership" in resource use through economic intensive by bridging between consumers and local people. In order to introduce the forest certification scheme to South Asian Countries, market research is necessary. Beside, In South Eastern Asia, national and local governments and environmental NGO's should take initial steps. It is needed to investigate preferable measures for forest certification and trade of certified products. In Europe and America buyers groups play an important role.

Eco-Technology Investment

Technologies for sustainable management and conservation of forests should be based on the zoning of forest use. As for forest and land management in residential areas for local people, the zoning should be done with combinations of food crops, fodder, and trees (agroforestry) rather than clearly dividing land into forest and farmland. And outside residential areas, technologies aiming for sustainable use of the entire forest ecosystem, including biodiversity, instead of concentration on timber production, should be established. In order to develop such "appropriate technologies", interpretation of local TFRK in terms of scientific knowledge, effective application of TFRK into modern technology are indeed necessary.

Eco-Policy Linkage

There are many findings and recommendations relevant the concept of "eco-policy linkage" in forest conservation. Many observations indicated that multi-function of forests is a source of forest value. In this paper the project gives stress aspects of the linkage with a viewpoint of international cooperation on forest conservation: regional policy coordination and coordination of international treaties relevant to forest issues.

In terms of regional policy coordination, strengthening an appropriate mitigation on trans-boundary impacts of newly established or revised forest / economic policy, especially in the side of importing countries is necessary. Experiences in APR showed that there are many so called exporting forest deforestation or forest loss due to the shortage of the viewpoints. The most typical example of the events is the impact of logging ban or restriction on regional trade. The latest China's new forest policy reforming has caused the rapid increase of timber trade from Russia to China since 1998 due to logging ban or restriction of natural forest in China and consequent strong timber demands to neighboring Russia. As a result, unsustainable export-oriented commercial logging has activated and the forest loss in Russia has accelerated furthermore. It is certain that the forest loss in several countries in Southeast Asia such as the Philippines and Indonesia was originated in the development and resource policies in post-War Japan. Thus enacting appropriate necessary measures by the central government in order to mitigate the impact to the forest management of neighboring countries / areas can be essential when the government will reform / establish a policy relevant to forest use.

Regarding coordination on the mutual linkage among existing international treaties related to sustainable forest management, solving contradictions among treaties through cooperation and constructive discussion in the international society is urgent request. There are many international treaties that are connected with forest management and have different aims brought conflicts among the treaties. For example, it has been pointed out that there is possibility of conflict between the Kyoto Protocol to the United Nations Framework Convention on Climate Change (the Kyoto Protocol) and the Convention on Biological Diversity (CBD) due to difference between two treaties' aims. As known, it is contradiction between biodiversity and carbon sequestration. The contradiction should be coordinated. Moreover, measures related to trade restriction could be contradicted to provisions in the GATT. The Committee of Trade and Environment (CTE) established in the WTO in order to seek coordination between measures related to trade in order to conserve environment and the provisions in the GATT. Labeling scheme including the forest certification scheme is one of the issues discussed in the CTE. However, the discussion has not been concluded in the twenty-century even through such intensive efforts as IPF, IFF and other international forest meetings after the 1990's. Therefore achieving consistency among relevant existing treaties should be urgently promoted in the international society.

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3.5. BIODIVERSITY

3.5.1. Current Status

Status of Issues

The Asia-Pacific is recognized as the richest of the global biodiversity regions, with the second largest rain forest complex, the world's highest mountain system (Himalayas), more than 50 percent of the world's coral reefs and a great number of small island systems. Seven of the countries in this region are of 17 megadiversity countries, which hold 70 percent of the world's animal and plant species (Mittermeier *et al*., 1997). Those are China, Indonesia, Australia, the Philippines, India, Papua New Guinea as well as Malaysia. Although Indonesia covers only 1.3 percent of the Earth's surface, for example, it contains a great variety of wildlife species: 10 percent of flowering plants, 12 percent of mammals, 16 percent of reptiles and amphibians and 17 percent of birds of the listed species of the world (Ministry of National Development Planning/National Development Planning Agency, 1993). In the Philippines, the 18,000 kilometers of coastline of the 7,106 islands are fringed by approximately 33,000 square kilometers of highly productive coral reef with 381 species of corals and 1,030 species of fish. This ranks the country as second to the Great Barrier Reef in Australia (Claveria and Cruz, 1998).

For almost all groups of organisms, species diversity increases toward the tropics, and this trend is observed also in the Asia-Pacific region. For example, the number of mammal species per 10,000 square kilometers is 95 in Malaysia, while the number is 23 in Korea (UNDP/UNEP/WB/WRI, 2000). Pattern of species richness is also affected by the annual amount of rainfall. This contrast is particularly apparent in the case of trees and flowering plants: the number of plant species per 10,000 square kilometers is 533 in Mongolia, while the number is 2,871 in Nepal (UNDP/UNEP/WB/WRI, 2000).

Threats to Biodiversity

Resulting from human activities, however, the diversity of life in the Asia-Pacific region has been continuously damaged and lost over recent decades. Of the 640 species listed for protection under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 156 are found in China and approximately 15 to 20 percent of wildlife species of the country are endangered (UNEP, 1999).

However the true extent of biodiversity loss in the region has not been enough understood since current data are inadequate or unavailable. However, the major threats to biodiversity are considered to be habitat degradation, overexploitation and species invasion.

Habitat degradation

The most critical direct cause of biodiversity loss is habitat destruction. In many parts of the Asia-Pacific region, particularly where human population density is high, most original habitats have been destroyed. Clearing and burning forests, draining and filling wetlands, urban developing in coastal areas are all primary threats to the majority of vertebrate species currently facing extinction. This is also true for most of the threatened invertebrate and plant species. Between 1948 and 1987, the estimated forest cover in the Philippines decreased from 50.5 percent to between 22.2 percent and 23.7 percent (DENR and UNDP, 1997). Ninety six percent of primary forest habitat has been lost in Bangladesh (WRI/UNEP/UNDP, 1994). The remaining mangrove forests in Peninsular Malaysia total 88,731 hectares in 1994, while the estimation was 113,348 ha in 1978 (Latiff and Zakri, 1998).

Habitats that originally occupied large areas are often fragmented into small pieces by roads, human settlements, agricultural land and a variety of other human interventions. This habitat fragmentation is also the major reason for the decline of biodiversity, due to the following two reasons: (1) each fragment has a greater amount of edge per area of habitat; and (2) the distance from the center of each fragment to an edge is shorter (Primack, 1995). These differences lead to reduction of originally vegetated areas for foraging and breeding. A species' potential for dispersal and colonization may also be limited because wildlife will not cross even very short stretches of open area. Indeed, the fragments are vulnerable to invasion by exotic species and native pest species.

Overexploitation

Since ancient times, humans have been taking a wide variety of wildlife for food, medicines, raw materials, pets and other reasons. As far as human populations were small and their harvesting methods were primitive, people could use wildlife in a sustainable way without driving species to extinction. Over-exploitation, however, has been observed as human populations have increased and their use of natural resources has escalated. It is estimated that overexploitation is responsible for about a third of the currently endangered, vulnerable and rare species of vertebrate (Groombridge, 1992).

Species especially vulnerable to exploitation include large and visible species living in exposed environment, such as spider conchs *Lambis* spp. and the Giant Clams *Tridacna gigas* living on shallow reef flats in the tropical ocean. Wildlife species for which a commercial market exists are also at risk of overexploitation. Although the Short-tailed Albatrosses *Diomedea albatrus* used to breed in huge numbers on islands in the Izu-Ogasawara Islands of Japan, exploitation for feathers from the nineteenth century caused the critical decline of the population by 1930 and they now only breed on a few islands, almost exclusively on Torishima island (Stattersfield *et al*., 1998)[1].

[1] A recovering program has been implementing very successfully on Torishima Island and the number receached abut 400 in 1991 (Environment Agency 1991).

Species invasion

Humans have purposely and accidentally moved wildlife or livestock species to new regions of the world. Those exotic species often impose negative impacts on native species by being a predator or competitor. The impacts are generally greatest on small islands. The Small Indian Mongoose *Herpestes javanicus*, introduced to control rats in the sugar-cane plantations of the Fijian Islands in 1883, have contributed to the serious decline of three species of rails and the Fiji Snake *Ogmodon vitianus* (Roots, 1976). Enclosed waters, such as lakes, streams, and rivers are also vulnerable to species invasion. Ecosystems in those situations tend to be developed with a unique assemblage of endemic species in an isolated situation, which make species vulnerable toward depredations by invading species.

Problems to Representative Ecosystems in the Asia-Pacific Region

Forests

Forests, woodlands, and scattered trees are significant sources of food, fuel, medicines, construction materials, industrial materials, recreational opportunities and clean water. In particullar, rainforests sustain the highest species diversity and endemism of any ecosystem on earth.

The total area of natural forest in Asia declined from 394,877,000 hectares in 1990 to 375,606,000 hectares in 1995, with 1 percent of average annual change. Countries with the highest annual change in decline are the Philippines (3.65 percent), Pakistan (3.21 percent), and Bangladesh (3.14 percent) (UNDP/UNEP/WB/WRI, 2000). The greatest threats to forest ecosystem are conversion to other forms of land uses, habitat fragmentation by agriculture, logging and road construction, and human-caused fires. Many of the remaining forests in the Mekong basin countries have been increasingly deforested and, as a result, the quality of timbers becomes critically low (MRC/UNEP, 1997).

As deforestation has expanded, many forest dwelling large mammals, especially primates, are at great risk of extinction. The majority of the habitat in those primates' original range has been destroyed, and very little of the remaining habitat is designated as protected areas. As of 1986, the Orangutan *Pongo pygmaeus*, a large ape that inhabits Sumatra and Borneo, had lost 63 percent of its habitat and only 2.1 percent of that remaining was protected (IUCN, 1986).

Grasslands

Grasslands are used as important habitats by a number of species, including breeding, migratory and wintering birds and grazing wildlife. Ranching also relies on grasslands as a food source for livestock. The economic value of tourism and recreation on grasslands are often high because there is great potential for safari tours, camping, hiking and game hunting.

Major threats to natural grassland ecosystems in the Asia-Pacific region are overgrazing by livestock and conversion to agricultural land. Grazers (domestic animals) in high densities can destroy vegetation, alter the equilibrium of plant species, decline biodiversity, and hasten soil erosion and compaction.

Wetlands and Freshwater systems

Wetlands include a variety of highly productive habitat types from flood plains and flooded forests to shallow lakes and marshes as well as rivers. Those serve as significant habitats for fish, aquatic invertebrates, birds and other wildlife. In the Philippine wetlands, covering approximately 569,600 hectares, 1,616 species of flora and 3,675 species of fauna are found, including 1,177 algal species, 439 species of aquatic macrophytes, 728 species of molluscs, 1,764 species of insects, 498 species of arthropods, 208 species of fishes and 110 species of birds (Claveria and Cruz, 1998). People also depend on wetlands as a valuable source for food and drinking water or as a tourism resource. Indeed, natural services provided by wetlands, such as flood control, maintenance of chemical cycles and improving water quality, are important benefits to all living things.

Since wetlands have critical value as potential agricultural land, massive conversion occurs all over the

Box 3.5.1 Loss of Coral Reef

South Asia contains 30% of the world's coral reefs, and coral reefs provide marine habitats. However, reef has been already destroyed and will be destroyed more in next 40 years. The loss of the reefs is mainly due to increased sedimentation, over-exploitation by dynamite and chemical fishing and by sewage pollution. These resulted in a decline of coral covers as well as destruction of coral reefs.

The rate of coral cover decline varies between countries. The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) reported that 37% of species are at some risk of regional extinction and 29% are at substantial risk of extinction based on an analysis of data on coral reefs in Japan. The annual decreasing rates of reef covers in Sri Lanka and Gulf of Thailand are 10% and 20 %, respectively. In the Philippines, studies show that almost 70% of 735 studied reefs are seriously damaged, and dynamite fishing has damaged 80% of the eastern Indonesian reef.

Source: GESAMP 2001.

world. Physical alterations of wetlands also include dredging, waste disposal, land fill, impounding and draining. River upstream alterations, such as the construction of dams, diversion of rivers and groundwater withdrawals lower the amount of freshwater, nutrients and suspended sediment input to estuaries. Construction of impoundment on rivers may result in a decrease in suspended load and lead to the land loss problem in delta while the sediments fill up the upstream reservoirs, and they also block or impede the movement of migratory organisms. Channelization of streams causes more rapid pulses of water to estuaries. Sewage from industry, agricultural chemicals (fertilizers and pesticides) and household drainage increase the concentration levels of nitrates and phosphorous. As a result, it is not surprising that the biodiversity of wetland and freshwater ecosystems is generally at much more risk than that of terrestrial ecosystems.

Overfishing also threatens biodiversity in some rivers like the Mekong River basin (FAO, 1999). The Malayan Bonytongue *Scleropages formosus*, a fish species distributed from southern Vietnam, Cambodia to southeast and Peninsular Thailand, Malaya, Sumatra, Bangka, Borneo and the Philippines, is extensively fished, because it is very popular among aquarists and trades at high market prices. In addition, this species is bothered by habitat deterioration caused by human activities, such as mining for gems and forest clearance that result in soil erosion (Thailand Institute of Scientific and Technological Research, 1991).

Coastal areas

Marine species diversity, as on land, is considerably higher in tropical regions, except for some groups, such as starfishes and kelps, which are most diverse in cold temperate Northeast Pacific waters. Indeed, highest species diversity is observed in the Indo-West Pacific Ocean, especially in the area of the Philippines, Indonesia and northeast Australia.

The number of people settling on or near seashore has globally increased – more than one-thirds of the world's population lives within 100 kilometers of a shoreline (Cohen *et al*., 1997). In addition to this population growth, the number of people whose activities impose impacts on the coastal ecosystems is much greater than the inhabiting population. This is because rivers transfer pollutants from upstream to estuaries and surrounding coastal waters.

The most serious threat to biodiversity in coastal areas is, again, habitat destruction. The causes of this destruction include: conversion of natural habitats for other uses, such as ports, settlements, agriculture and aquaculture; pollution from industries and households; solid waste dumping; dredging; removal of materials such as gravel, stones and vegetation; erosion and siltation; and the effect of human construction such as jetties and channels. As their food sources and nesting or spawning sites have degraded or disappeared, populations of many wildlife species have dramatically declined (Norse, 1993).

Commercial fishing, including fishing in destructive methods, has increasingly depleted coastal biological resources also. About 85 percent of aquarium fish on international markets are harvested in the Indo-West Pacific Ocean, and the using of cyanide is a preferred method for capturing such fish (Barber and Pratt, 1998). Using dynamite also still continues on some coral reefs of the Philippines, despite strict prohibition by Philippine fishery laws.

Countermeasures

Conventional Approach

Frameworks for Biodiversity Conservation

A number of multilateral agreements that demand ratifying nations to act in ways that conserve biodiversity have been opened for signature, and some of them have already entered into force. These international agreements provide some mechanisms for identifying and conserving sites of global biodiversity importance. The major existing biodiversity conservation related agreements are the Convention on Biological Diversity, the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar), the Convention Concerning the Protection of the World Cultural and Natural Heritage, UNESCO Man and the Biosphare Programme, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of Migratory Species of Wild Animals, and the United Nations Convention on Law of the Sea.

The Convention on Biological Diversity (CBD) is the first global, comprehensive agreement to address all aspects of biological diversity: genetic resources, species, and ecosystems. It recognizes that the conservation of biological diversity is "a common concern of humankind" and an integral part of the development process. The three fundamental objectives of the convention are the protection of biological diversity; its sustainable use; and equitable sharing of the benefits of new products made using wildlife. It was drafted by international working groups, signed mostly at the United Nations Conference on Environment and Development (UNCED) in 1992, and ratified by 179 parties (178 countries and the European Community). Many nations in the Asia-Pacific region have also ratified CBD, although capacity to implement scientific research and administrative capability to execute appropriate means are generally insufficient yet.

In addition to multilateral agreements, there are efforts to facilitate biodiversity conservation worldwide. The *Global Biodiversity Strategy: A Policy makers' Guide* was published in 1992 by the World Resources Institute (WRI), the World Conservation Union (IUCN) and the United Nations Environment Programme (UNEP) in consultation with Food and Agriculture Organization (FAO) and the United Nations Education, Scientific and Cultural

Box 3.5.2 Protected Areas in Asia and the Pacific Region

The Asia-Pacific region includes the world's highest mountain system, Himalayas, the second largest rain forest complex, and more than half the world's coral reefs. These rich biological resources have been increasingly exploited due to international trade and human activities to sustain growing populations. Establishment of protected area is one of the most critical strategies in order to conserve biodiversity.

The United Nations Environment Programme (UNEP) reported that protected areas in this region had been dramatically increased in last 30 years (see figure 3.5.1). In the 1960s, the protected area was less than 50 million hectares in this region, however, it dramatically increased to 125 hectares in the mid '70s. By 1995, the size of protected area skyrocketed to more than 300 million hectares in Asia and the Pacific region.

The number of protected areas is increasing as well. For example, in Australia and the Pacific region, less than 500 protected areas were designated in 1960. However, the number of protected areas reached 3500 by 1995. Four other regions - Southeast Asia, Northwest Pacific and East Asia, South Asia, and Greater Mekong – have also increased their numbers of protected areas.

Although protected areas have been established, problems still remain. Lack of resources, weak policy enforcement, weak institutional capacity and poor interagency cooperation within the region are limiting their effectiveness. In addition, a better understanding of existing biodiversity is needed in order to conserve and manage it.

Source: UNEP 1999.

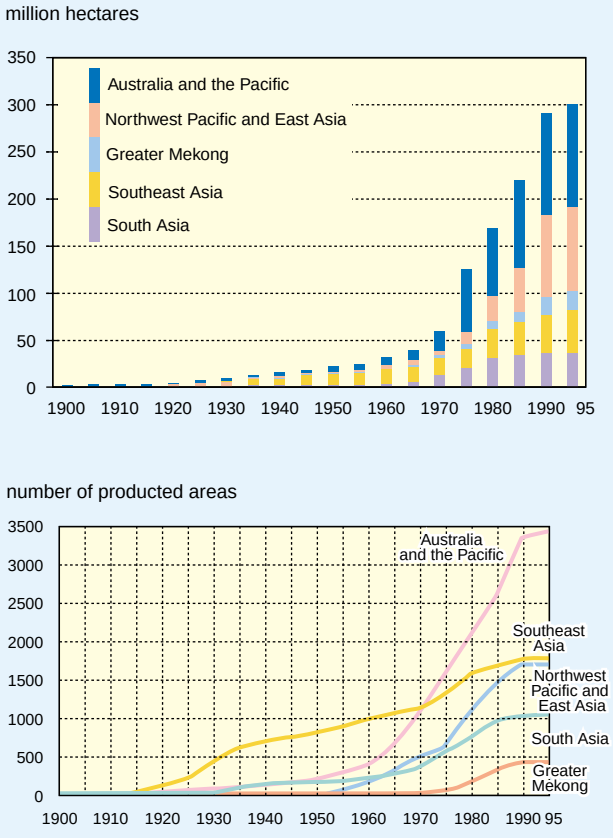
Organization (UNESCO). The Strategy was prepared as a complementary initiative to CBD. In short, the document clarified some basic questions regarding biodiversity: how much biodiversity should be conserved; where it should be conserved; and what alternatives should be pursued. The Strategy indicates that the goal of biodiversity conservation is to support sustainable development by protecting and using biological resources in ways that do not diminish the world's variety of genes and species or destroy important habitats and ecosystems. In order to achieve this goal for the benefit of present and future generations, the Strategy called on all nations and peoples to take actions at national, international and local levels. At the national level, for example, it urges national biodiversity action plans, policy reforms, better management, and additional investment in biodiversity conservation.

Instruments for biodiversity conservation

Preserving entire biological communities is the most effective way to conserve overall biodiversity. In order to do so, the three major instruments are establishing protected areas, implementing conservation countermeasures outside protected areas, and restoring biological communities in degraded habitats.

Protected areas

One of the most critical strategies for conservation of biodiversity is establishment of legally designated protected areas, such as national parks, wildlife sanctuaries and other kinds of natural reserves. Given the high pressure by human activities, most wildlife species and ecosystems would not have persisted without protected areas. Protected areas also help to promote study of the natural environment, the use of natural resources in a sustainable way and increased public awareness on the importance of



Source: UNEP 2000.
Note: Includes all nationally-designated protected areas as well as IUCN categories I-VI.

Figure 3.5.1 Size and Number of Protected Areas

ecosystems.

In the Asia-Pacific region, most countries have protected areas for biodiversity conservation. The total area of the protected areas in this region is 209,476,000 hectares[2] (UNDP/UNEP/WB/WRI, 2000). The countries with the highest percentage of land registered for protected areas are Bhutan (21.2 percent), Cambodia (15.8 percent), Thailand (13.8 percent), Sri Lanka (13.3 percent), Mongolia (11.5 percent) and Indonesia (10.1 percent) (UNDP/UNEP/WB/WRI, 2000). On the other hand, some countries, such as Lao P.D.R., Bangladesh and Myanmar, have established no protected area or have less than 1 percent of their total land area as protected areas (UNDP/UNEP/WB/WRI, 2000).

In reality, many of the listed important habitats have not been designated as protected areas yet, although there are expanding endeavors in the region. For example, Fiji currently has 20,000 hectares of protected areas which is only 1.1 percent of its land. A representative national parks and reserves system for Fiji's tropical forests is proposed in Vanu Levu and Viti Levu islands to conserve the largest remaining area of undisturbed lowland forest in the country (Cabaniuk, 1995).

Protected areas must be planned and managed within the context of national, regional and international networks. Any single site cannot achieve all the objectives of conservation. One suggestion for managing a system of nature reserves is to link isolated protected areas into one large system through the use of ecological corridors. Such ecological corridors can allow plants and animals to disperse from one protected area to another, promoting gene flow and colonization appropriate sites. Ecological corridors also help to conserve animals that migrate seasonally among a series of different habitats to obtain food and breed.

Protected areas are also effective in conserving marine biodiversity, and they provide great benefit to fisheries too. In the Asia-Pacific region, 1,350 marine protected areas (IUCN categories I-VI) have been established (UNDP/UNEP/WB/WRI, 2000). The total number of the wetlands of international importance (Ramsar sites) is 119 in this region (UNDP/UNEP/WB/WRI, 2000). The countries that contain the largest areas of wetlands as protected areas are Mongolia (631,000 hectares), Bangladesh (596,000 hectares), Papua New Guinea (595,000 hectares) and China (588,000 hectares).

Conservation countermeasures outside protected areas - ex-situ conservation

When populations have been depleted, manipulation through botanical gardens and zoos can be an option for recovering them. International networks among botanical gardens and zoological parks can facilitate cooperation in *ex-situ* conservation. Coordinated conservation efforts include creating databases on species kept in botanical gardens/zoos and exchanging individual animals for breeding. Methods available to recover declined populations include head starting and transplanting to augment existing populations or establish new ones.

However, *ex-situ* conservation is not always successful because maintenance cost per species is often high; the number of species maintained in captivity is limited by the size of the facilities; this might be ineffective if the original threats to their habitats are not removed; unforeseen harmful complications, such as disturbance of the genetic balance, might occur; and the solution of the real problem might be prevented by creating a false sense of security. For marine species, *ex-situ* conservation options are more limited, because many marine species cannot be maintained for a long period in tanks or bred in captivity (Norse, 1993).

Restoring biological communities in degraded habitats

Damaged or degraded ecosystems might be restored to indigenous or historic ecosystems through the process of intentionally altering and duplicating the structure, function, diversity and dynamics of the ecosystems. Restoration technology is valuable in the conservation of biodiversity, since restored ecosystems could restore productivity and economic value to the nation. Efforts to restore ecosystems have more focused on lakes, prairies, wetlands and forests, since these ecosystems have seriously suffered from human activities.

Restoration, however, is unlikely when many of the original species have already been eliminated from a large area. Also, it is very difficult to restore entire ecosystems, when they are degraded by human activities and their capacity to recover is seriously limited.

Latest Trends

Integrated management

Management framework

Governments' traditional response to environmental degradation has been to treat each economic or social sector's activities separately. There might be one law and a set of regulations that deals with agriculture, another for pollution from industries, and another still for timber production from natural forests, all administrated by different agencies. This sector-by-sector approach results in partial decisions that are often at cross-purposes, as each agency applies its particular tools to its particular problem. In the absence of some authority stating that their purpose is the conservation of biodiversity, nations will continue to lose significant natural resources, and options for ecologically sustainable use of resources will be further reduced.

As an alternative to the sector-by-sector approach,

[2] National areas of at least 1,000 hectares in five of the six management categories defined by the World Conservation Union (IUCN).

integrated area management, an approach that applies a coherent set of resource management policies across sectors to particular ecologically important areas, has been focused on. One of the keys to integrated area management is ensuring that all uses and activities in the target area in question are coordinated according to an agreed set of policies. This requires a coordinating mechanism that applies policies to the actions of individuals and institutions that can affect the management area and its resources. The mechanism can be organized by an inter-ministerial council or a commission, and the managing authority facilitates the diverse interest groups to agree on what kinds of protection or use should be prioritized in the management area.

Participatory approach

As awareness of complex links between poverty and degradation of the environment increases, there has been a growing recognition that reconciling the management of natural resources with the social and economic needs of local people is the key to successfully achieve conservation objectives.

Protected area management can be an example. People in communities around protected areas are often poor, politically weak and lack access to public services. When those people historically depend on natural resources within the protected area, they might perceive that the protected area further limits their livelihood and they might have no incentive to cooperate with the park management. This negative perception and attitude may result in rapid exploitation of resources in that area before the park management takes effect. The participation of people at the local level has the great merit of providing a mechanism for biodiversity conservation, gaining the cooperation and support of the local community. Traditional knowledge and resource management practices of indigenous people and local communities should also be incorporated into the management as appropriate. The San Salvador Islands Marine Park in the Philippines is a case of a successfully established protected area where community based decision-making was employed (Buhat, 1994).

Economic incentives

Unless local people receive economic benefits from conservation policies or measures, it is unlikely to secure effective long-term biodiversity conservation. Thus, giving economic incentives to the local community is significant for sustainable development as well as integration of local social issues into the policy making process.

One of the options for economic benefits is eco-tourism within or adjacent to the protected area. Tourists, mostly from foreign countries, visit a site and spend money wholly or in part to enjoy its biodiversity. If this tourism is integrated into the overall conservation management plan, it can provide the country and local community with one of the most immediate justifications for protecting biodiversity. However, it should be noted that eco-tourism itself could damage the ecosystem and contribute to the degradation of sensitive areas, if tourism developments are not consciously planned.

3.5.2. Recommendations

Application of 4 Key Concepts

Eco-Consciousness

Understanding of different cultural and social values

The region has one of the highest diversified biological resources in the world and it also has incredibly diversified cultural and social groups and/or countries.

Local people often conserve their natural environment in traditional ways based on their own cultural and social values. In the last decade, it has been recognized that their knowledge and customs are sometimes very valuable in conserving the natural environment and using natural resources in a sustainable manner. For example, in the case

Box 3.5.3 Collaborative Management of Protected Areas in the Asian Region

In the Asian region, protected areas such as national parks and nature reserves have been established to conserve biodiversity. However, policies related to protected areas do not yet recognise that biodiversity conservation and people's livelihoods could co-exist for mutual benefit. Centralized and top-down approaches to conserve biodiversity often ignore local community rights, traditional beliefs and knowledge.

New approaches, which reinforce building partnerships among local communities, government agencies and other stakeholders, have been developed. Good examples of collaborative management are the emergence of the internationally known Joint Forest Management Concept (JFM) in India in the 1970s, the promulgation of the more recent Buffer Zone Management Regulations of Nepal, and ecological surveys, monitoring and the involvement of local people in protected areas of Lao PDR.

Despite these efforts, there remains a significant lack of basic understanding about the process of participatory management in Asia. Local capacity in terms of knowledge, skills and institutions is inadequate to support collaborative management methods. There is an urgent need to develop local capacity to formulate, implement, monitor and evaluate effective collaborative management approaches. *Source:* IUCN Nepal 1999; Steinmetz 2000.

of utilization of biodiversity, although their knowledge is not established as a science, local people know which plant is effective for which illness, which may eventually solve global problems such as the HIV epidemic.

However, ignorance of different cultural and social values often prevents the integration of local and traditional knowledge into the current social structure. It sometimes happens that decision makers misunderstand and do not pay attention to opinions from local people because of their ignorance of traditional knowledge. Although these opinions need to be properly examined, they should be respected and be taken into consideration for evaluation.

In international collaboration, attention should also be paid to this aspect, and each country should respect the cultural and social values of other countries.

Environmental education

It is a concern that people do not know or do not understand that what they are doing in their daily lives may destroy their surrounding environment and eventually affect the global environment. In recent years, environmental education has been recognized as one of the most important and effective tools to encourage local people to act appropriately in the current social and environmental contexts. It is also valuable for governmental officials to understand how conservation of their biodiversity is important for developing their countries in a sustainable way.

In order to promote environmental education at all levels, it is critical to train leaders who can evaluate current educational programs, plan environmental education programs and implement them.

Research and monitoring

Although everyone knows that the biodiversity in the region has been degraded, the exact situations are still little known and basic information is lacking. For example, we still do not know how many species and which species exist in the region, and under CBD, the Global Taxonomy Initiative (GTI) has been launched to enhance this fundamental science. In order to take appropriate actions and to make plans to conserve them, it is important to know and to understand well the current biodiversity situation in each country. This is because, there being limited resources and time, the data obtained by research and monitoring are utilized to allocated available resources to conserve natural environment in the most effective way.

It is also important to collect and study social and cultural assets related to biodiversity in the region. These assets are likely to contain valuable information on biodiversity conservation.

Eco-Partnership

Involvement of local people

Local people are usually the direct beneficiariesof, and are often knowledgeable about their biological resources, and it has been recognized that without their help and consensus, conservation and/or development programs are not feasible in a sustainable way.

Governments at all levels need to have mutually constructive relationship with local people in order to share and transfer knowledge for the biodiversity conservation and for planing sustainable development programs.

Mutual collaborations amongst NGOs and governmental organizations (GOs)

Mutually constructive relationships of NGOs with governments are important in order to fulfill the gaps caused by weak points of both parties. In order to construct realistic and feasible relationships, it is critical to share each role in the biodiversity conservation activities.

Interdisciplinary and intersectoral collaborations

In order to conserve the biodiversity of the region, it is necessary to have interdisciplinary and intersectoral (industries) collaborations. This is because the issues are spread widely throughout all sciences and all sectors of industry. Without efforts by all, it is extremely difficult to achieve this goal.

International collaborations

Sharing experiences and information amongst countries is valuable for biodiversity conservation. This exercise has already been implemented through international conventions and bilateral treaties. For example, at the sixth Conference of the Contracting Parties of Ramsar Convention in Brisbane, Australia, 1996, the “Asia Pacific Migratory Waterbird Conservation Strategy” was initiated, and since then three different programs on shorebirds, cranes and Anatidae of the region have been planed and implemented. In these programs, NGOs and GOs have been working together to achieve a common goal.

Promotion of sub-regional collaboration is encouraged. This concept makes it easy for the people in the region to understand why it is important to collaborate witheach other to conserve certain groups of species or ecosystems. The people can easily imagine the relationships between their geographical position, their responsibilities and conservation goals. For example, migratory shorebirds mainly breed in the northern part of the Palearctic, and winter in the southern hemisphere, stopping in various countries on their way between breeding and wintering areas. In order to promote their conservation, it is absolutely necessary for all concerned parties and countries in these areas (a sub-region) to collaborate with each other.

Eco-Technology and Eco-Investment

Ex-situ conservation

Since the natural population of endangered species and their natural habitats are dramatically decreasing, extensive efforts and resources have been utilized to conserve them outside their natural habitats in for example botanical

gardens/zoos and laboratories, and some of these are successful.

It should, however, be noted that in-situ conservation must come first and these two conservation measures are implemented simultaneously. Considering that these endangered species are part of their ecosystems, their extinction in their natural habitats may have disastrous effects. *Ex-situ* conservation should only be regarded as the last resort in preventing extinction of certain species.

Sustainable use of genetic diversity

Genetic technology has greatly advanced in the last decade, which gives human beings incredible benefits including medicines for epidemics. Great efforts have being made to collect useful genetic resources and raw materials all over the world, and to study them and develop useful materials such as new medicines. It is believed that many of these raw materials exist in developing countries, in tropical and subtropical climates.

As stated in CBD, it is necessary to use these genetic resources in a sustainable way and, more importantly, to distribute benefits from these resources evenly between concerned parties and people.

Prevention of destruction of habitats

BirdLife International, international bird conservation NGO, indicates that the biggest threat to endemic bird species of the world is destruction of their habitats (Stattersfield *et al*., 1998).

Modern technology could prevent destruction of these habitats. For example, in the process of making a development plan, the Geographic Information System (GIS) is able to identify crucial habitats for endangered species/ecosystems and to suggest most appropriate zoning plan for the conservation of the species/ecosystems. For road construction, there is a concept called "eco-road" which gives many constructive suggestions to prevent habitat destruction. Although they are still at the early stages of preventing it, in many cases, especially in developing countries, it is worthwhile to promote improvement of these ideas and technologies with contributions from the developing countries.

Establishing and improving protected areas is one of the most effective and fastest *in-situ* conservation methods to conserve natural environment. In this case, the latest technologies such as GIS can be an effective tool to identify critical areas and demarcate boundaries of protected areas.

Some technologies have been developed and others in different fields have been applied to restore deteriorated ecosystems, and there are a few successful cases. It should be noted that prevention of habitat destruction must come first. It is considered that, once an ecosystem is destroyed, some part of it will never be restored and it will take many years for other parts to recover. However, it is a useful idea to promote developing restoration technologies.

Investment in development programs with nature conservation components

Development programs with nature conservation components have been implemented and many of these achieve the same goals as programs which do not have these components and have difficulties in terms of sustainable development. It has been realized that without conserving natural environments it is very difficult for development programs to be sustainable in a long term. Increasingly, donor countries and institutes support nature conservation and/or research programs in developing countries financially and technically.

All programs in fragile ecosystems need to be scrutinized by a set of "environmental guidelines", which should be prepared by each country or investing country. This can be done by implementing Environmental Impact Assessment (EIA). For example, the Japan Bank of International Cooperation (JBIC) has a set of environmental guidelines for its loans (JBIC, 1999).

Investment in genetic research and development has been growing. It is noted that there are two main issues, both of which are closely related. One is the issue on "intellectual property right" and the other is the one on fair distribution of benefits from these genetic resources. There are statements in CBD, and these issues need more discussions.

Eco-Policy Linkage

National conservation strategy

Contracting parties of CBD are required to prepare national strategies for conserving biodiversity in their territories. In Japan, the first strategy was published in 1996 and its contents are as follows. The Environment Ministry has a plan to revise the strategy.

(i) Current status of biodiversity
(ii) Common policy on conservation of biodiversity and its sustainable utilization
(iii) Action plans
- *in-situ* conservation
- *ex-situ* conservation
- sustainable utilization
- research and monitoring
- implementation of common biodiversity policy in other sectors
- international cooperation

(iv) Implementation of the strategy

The most important point is that the strategy must be taken into consideration not only in policies for environmental issues but also in policies for other sectors of each country. It is also noted that, although eco-tourism has recently attracted very high attention because of its positive effects on nature conservation and its economic values, it should be recognized not as a "magic wand" but as one effective tool for achieving sustainable development.

National laws and international conventions

This issue closely relates to the point developed in the previous section. In order to implement the strategy effectively, national laws need to be established and it is suggested that appropriate international conventions, including bilateral treaties, be ratified. For example, Japan has the following national laws and has ratified international conventions related to biodiversity conservation[3].

(i) National laws
- Nature Conservation Law
- Natural Parks Law
- Wildlife Protection and Hunting Law
- Law for the Conservation of Endangered Species of Wild Fauna and Flora
- Environmental Impact Assessment Law

(ii) International conventions including bilateral treaties
- Convention on Biological Diversity (CBD)
- Convention n Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- United Nations Convention on Law of the Sea
- Bilateral Treaties on Conservation of Migratory Birds (with China, Russia, USA and Australia)

Recommendations

Promotion of Eco-Consciousness

For the conservation and sustainable utilization of biodiversity, it is critical for each person and each country in the region to consider how to manage their natural resources and to act appropriately. In order to achieve this in the region, the four components under the heading of Eco-Consciousness need to be strongly promoted. The most important one is recognition of the diversity of social and cultural groups and/or countries in the region, and then the people and the countries will respect for these differences each other. Based on recognition and respect, the following activities will be enhanced and integrated, which will lead to the sustainable management of natural resources.
- Smooth communication amongst countries;
- Comprehensive environmental education adapted in each cultural and social structure and,
- Involvement of local people.

Sub-Regional Framework

People who share a common consciousness of their environment can easily work together to manage their natural resources. They are able to have a shared consciousness on natural resources and work together to conserve their common natural resources. The concept of "sub-region" could be introduced. The sub-region means an area in which people who live there can have a shared consciousness. The concept could be developed to conserve common natural resources such as widespread species, migratory species and international ecosystems. Since different groups of species cover different sub-regions, a sub-region does not need to be fixed and should be flexible.

Compilation of Basic Information

Comprehending the current status of biodiversity of the region is the first step in its conservation. There are two activities for this exercise; 1) to organize the existing data and 2) to collect basic information on the biodiversity. Mutual collaboration amongst developed and developing countries is critical in order to accomplish these activities, and the latest technologies can be applied to enhance and promote them.

[3] It is not a complete list.

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3.6. EDUCATION FOR SUSTAINABILITY[1]

With a view to promote eco-consciousness in the Asia and Pacific region, this section focussed on the activities of four sectors: (1) formal education, (2) non-governmental organizations, (3) media, and (4) business and industry. These four areas were selected because they have unique role to play in the effective development of environmental education (EE). For example, these sectors can combine (1) the government's access to core budget and ability to introduce and initiate changes to policies and legislation without undue delay, (2) NGO's ability to work with the community, their flexibility to change programs to reflect the desires of the community, (3) the media's capability to disseminate information to the local community, and (4) private sector's ability to develop industrial operations and generate resources.

The section attempts to give a bird-eye view of environmental education – overall status, successful practices, major issues, and general findings in four specific sectors. Then the application of the four concepts (eco-consciousness, eco-partnership, eco-technology/eco-investment, and eco-policy linkage) in the area of EE is examined, along with four major suggestions to promote these concepts.

3.6.1. Overall Status, Trends and Patterns

The overall situation of environmental education in the Asia-Pacific can be characterized with the prevalence of different educational systems and philosophies, over-crowded curriculum, adequate infrastructures, chalk-and-talk method of teaching and learning, examination-oriented education system, book-based rote learning, stereotyped method of schooling, newly emerging environmental problems and issues mostly caused by geographical diversity. On the other hands, the region houses highly successful practices, innovation and indigenous ideas of environmentally friendly practices and skills. The overall status of environmental education in the region can be summarized as follows.

Progression towards greener curricula and programs:Countries of the region have begun to "green" their curricula by incorporating environmental concerns and have emphasized the use of local resources in teaching and learning processes. This involves the integration of environmental principles, problems and solutions into other disciplines. Both the natural environment and the man-made environment are involved. Composite courses such as *Environmental Studies, The Environment Around Us, The World Around Us, Environmental Science, Man and the Environment, Nature Science and Life Experiences* have been adopted at the primary level, and environmental themes are either integrated into existing subjects or developed as compulsory courses at the secondary level. Some countries have introduced environmental courses as optional courses at the secondary school. Separate degree courses are offered at the tertiary level. Generally cross-curriculum approaches have been adopted to integrate environmental themes into curricula. Some countries have placed more emphasis on formal education because they envision that children will help educate their parents and can more easily influence their parents' actions. In turn, these parents will have a greater impact on environmental resources. This approach has been quite successful in some countries of the Pacific region. However, there is less emphasis on non-formal environmental education.

Perception of EE as a new approach to education: EE is seen as an integrated approach to education. While some countries see it as values education (concerning respect for nature and life, stewardship over natural resources, simple living, personal responsibility and gratitude for the lavish gifts of nature), others think that it provides a new perspective on education (concerning education in, about and for the environment). All these suggest that environmental education should not be an independent subject in its own right. Rather, it should be a holistic approach to education that takes into consideration the environment that surrounds and affects people. As a result, the Supreme Court has issued orders to include environmental course in universities; model schools and honor schools have been established; eco-polis center for environmental information, education and hands-on activities in the community have been established; special economic incentives such as subsidies and tax-exemptions are provided to schools that offer EE courses; and green consumerism, strong collaboration between ministries and state universities (for education, research and community services), eco-clubs, eco-farming and eco-harvesting are in place.

Expanding environmental concerns into social science courses as well: The trend shows that there has been a shift from incorporating environmental matters only in physical science courses to social science and humanities courses. Subsequently, environmental concerns can now be found in courses such as in *Moral Education, Hygiene, Religion and Civic Education.* The importance of social science has been recognized in the protection of the environment. In order to elaborate this point let us take the example of the Asiatic wild water buffalo, which is found in Nepal. This animal is on the verge of extinction and is found only in the eastern part of Nepal. In order to understand its status, we must analyze the current social situation as well as the physical situation. An understanding of the destruction of the buffalo's habitat is possible only by understanding the social science aspects of the situation - for example, the norms and values of the people destroying their habitats, the dynamics of human actions, population pressure,

[1] Based on the Report prepared by the Environmental Education Project of IGES. For detail information, readers are advised to refer to the article entitled "Environmental Education in the Asia-Pacific Region: Some Problems and Prospects" by Bishnu B. Bhandari and Osamu Abe. In International Review for Environmental Strategies, Col. 1, No.1, pp. 57-77, 2000.

poverty and socio-economic conditions.

Emergence of new co-curricular activities: In addition to conventional ways of conducting theoretical and practical classes, various innovative ways are undertaken to provide opportunities for students to acquire knowledge, attitudes and skills in school as well as out of school. These activities include eco-clubs, green clubs, nature clubs, camp and outdoor education, intra-mural competition, project work, street theatre, internships, mock congresses and junior eco-clubs. These activities provide students with a first-hand opportunity to relate their knowledge they have learned in the classroom into practice and obtain direct experience about the local environment. Also, in some countries, forums like environmental educator association have been set up for sharing and exchanging knowledge, expertise and experiences in environmental education.

High level of awareness and interests: On the basis of rising public awareness, greening of the educational programs, adoption of innovative programs, growing level of deterioration and so forth, it safe to say that there is a rising level of public awareness on the protection of the environment. In order to investigate the environmental knowledge, attitude and actions, Griffith University of Australia surveyed some 10,000 students of the age group of 16-17 from 11 countries of the region. A set of concepts such as sustainable development, biodiversity, carrying capacity, greenhouse effect, ozone layer, renewable resources, etc. were tested. It was found that percentage of students participating currently in regular discussion of environmental matters ranged from 11 to 44%. Those desiring to do more ranges from 27 to 88%. It was also reported that 34-87% have heard of sustainable development, whereas some 86 to 99% reported that they have heard of greenhouse effects.

Commitment from governments: Evidences show that countries are trying their best to integrate their environmental concerns into the curriculum. The development of new course incorporating new environmental ideas and the revision of the curricula are at play. Teachers are encouraged to be receptive to the issues and ideas of the environment. They have extended their hands for new and symbiotic partnership in the region. All these are the good examples of promising leadership and commitments toward promoting environmental education in the region.

3.6.2. Successful Practices

Some successful examples of environmental education practices found in the region are briefly summarized below.

Cambodia: The Government has formed the Inter-Ministerial Steering Committee for Environmental Education (IMSCEE) to coordinate environmental education at the national level.

China: China shows how a school promotes environmental education activities among children. For example, under the project "Hand in Hand in the Earth Village" students with support from the teachers set up an earth village, which includes a waste recycling station and a small bank. The recycled products (from cans, papers, newspapers, batteries and plastic bags) are sold and the proceeds are collected in the bank and then sent to rural areas for development activities. The Project has already been successful in building two primary schools in Jiangxi Province. The Project was initiated by Ms. Lu Qin of Yucai Primary School in collaboration with the China *Children Newspaper* in 1996. This Project is becoming popular in many Chinese primary schools especially in rural areas. Villages in the province now have a recycling station run by children.

Fiji: Fiji National Training Council has undertaken a program called Levy Grant Scheme whereby private organizations submit 1% of their gross salaries to the Council to fund environmental courses for their employees at a subsidized rate.

India: In India, the Supreme Court of India has passed a judgement whereby the University Grant Commission is required to include environmental courses in the universities. The Ministry of Environment and Forests has set up two centers for excellence in environmental education and awareness. The National Environmental Education Program in Schools is a good example of linkages between NGOs and educational institutions through 'cluster program' and EE resource center.

Indonesia: The Ministry of Environment and the Ministry of Education have jointly established Environmental Study Centers (ESC) in all state universities. These Ministries are jointly responsible for the capacity development of the ESC as the University's executive units for implementing the *Tridharma* missions (education and training, research and community service in the field of the living environment).

Japan: In order to promote environmental education among children, the Ministry of Environment earstwhile Environment Agency has initiated Junior Eco-Club, a nationwide "green" club activity. In this program, children are encouraged to set up a group up to 20 and carry out environmental activities, which are supported by the Ministry. The Japan Environment Association serves as the national secretariat to the Junior Eco-Club. It publishes a bimonthly newsletter and conducts exchange programs to share their experiences and successes.

Kiribati: In Kiribati, a customary law bans the catching of particular fish species during certain times and sets aside some areas reserved strictly for the use of the high chiefs.

Korea: Every two years, the Ministry of Environment designates Environmental Conservation Model Schools in cooperation with regional boards of education. In the model schools, teachers revise environment-related contents of the textbook and help students to learn about environmental conservation systematically. The schools organize field trips and conservation events of students in off time. They also practice conservation activities at school, home and community. The Ministry also, in

partnership with municipal offices and local offices of education, designates honor schools for environmental education to (1) nurture students' values and attitudes toward environmental conservation, (2) facilitate sharing and disseminating of exemplary teaching modules, (3) establish a sound value system for the environment, and (4) practice environmental conservation in daily life. These honor schools emphasize activities both in school as well as out-of-school.

Lao: The Government has in place "The Project for the Promotion of Reading" to provide mobile libraries to primary schools and communities and reading centers for secondary school across the country. The Project has, to date, distributed some 4,700 sets of mobile libraries. The Mobile Library is a box containing about 150 cartoon books, stories, pictures, and books on the environment.

Malaysia: To educate schoolchildren about the environment and its conservation, the Department of Wildlife and National Parks holds camping and nature education courses for school children on weekend and holidays. Working closely with the Ministry of Education, the Department provides the programs, places, instructors and facilities. The Ministry chooses the schools and students to participate in the program. Likewise, the Department of Environment has initiated several successful community-based activities such as *Bangsar Green Spurs* and has given top priority to public awareness.

Myanmar: Every school student must plant three tree seedlings in the rainy season: the first tree to compensate for the previous use, the second one for present use and the third one for use by future generations.

Pakistan: A Pilot Project is underway at Sarhad Province to green religious and opinion leaders with intention that they develop environment friendly attitudes and behaviors and then include environmental themes in religious teaching and sermons.

Papua New Guinea: The development of close bonds between people and nature can be found in Papua New Guinea. For example, some clans are named after animal or plant, after which the named animals or plants are not used.

Philippines: In an effort to further promote and institutionalize environmental education at the tertiary level, the Philippine Association of Tertiary Level Education Institutions in Environmental Protection and Management (PATLEPAM) has been established in 1996. As of 1998, the institutional membership of PATLEPAM has reached 309.

Tonga: The Ministry of Education coordinates an extra-curricular project called Plant Project for primary school students. The Project emphasizes plant species that are of cultural and traditional importance.

3.6.3. Research on B&I, NGO, Media, and Higher Education

Studies on business and industry (B&I), non-governmental organization (NGO), media and higher education to determine practical mechanism to integrate their strength in a unified way to foster environmental education and public awareness in the region have been conducted. Brief summaries of their findings are presented below.

B&I: A case of studies of four countries (India, Indonesia, Korea and Japan) indicates that B&I sector has begun to include environmental education - not to mention their environmental friendly activities - in their programs. Some of the eco-business activities initiated are exemplary and outstanding in nature, particularly in developed countries. Data from developing countries show that educational activities are still in evolutionary stage. In order for B&I to promote environmental education in the region, the following suggestions have been made.

(i) Develop in-house capacity building.
(ii) Promote green consumerism.
(iii) Develop symbiotic partnership with other institutions.

NGO: Conclusions from case studies of two countries, Japan (a donor country) and Indonesia (recipient country) indicate that environmental NGOs are active in undertaking environmental education activities in these countries. In Indonesia, efforts are under way to promote environmental education, especially through the establishment of a nation-wide environmental NGO network called JPL (*Jaringan Pendidikan Lingkungan*). With contribution from Japan-US Common Agenda for Roundtable (CART), JPL network has been successful in communicating and sharing of resources, improving relations with external NGOs and improving social learning. The study emphasizes the needs of international assistance for the development of network of NGOs both in donor as well as recipient countries to promote environmental education activities.

Media: According to the research work on the relationship between journalism and public awareness, the mass media are active in, and responsible for, promoting activities that support and enhance environmental education, training and public awareness in spite of their cut-throat competition for survival. They are active in lobbying the government for effective implementation of environmental education programs. On the promotion of environmental education, the following has been suggested.

For donors

(i) Provide more funds for the development and promotion of environmentally friendly software and information technology.
(ii) Support environmental literacy programs in the developing countries.

For recipient countries

(i) Support environmental literacy and campaign.
(ii) Adapt information technology to specific situations.

Higher Education: Data from 11 countries were analyzed to study the general situation of environmental education at the tertiary level. Because of vast regional diversities, industrialized countries show a tendency to

improve industrial pollution and to incorporate environmental concerns in natural science as well as social science courses. On the other hand, in developing countries, more focus is given on natural resource management; environmental concerns were incorporated in 70's in natural science but now are expanded to social science course as well and an international (external) cooperation can be seen in operation. The report suggests the use of open education approach in promoting environmental education. Other specific suggestions include;

(i) Initiate policy setting including the establishment of steering committee.
(ii) Encourage collaboration such as internship with external organizations.
(iii) Establish facilities for providing training on sound environmental management practices.

3.6.4. Major Issues and Problems

Major Issues Faced at the Policy Level

Lack of national policy: With the exception of a few countries such as the Philippines, Australia and Thailand, no country has formulated a national policy on environmental education. No coherent plan provides a link from the kindergarten to university levels. As a result, environmental education receives no priority action on resources, budget and support and thus is marginalized from the national mainstream. Because of this, even those countries that have initiated environmental education programs show inconsistencies and discontinuities in implementing educational programs and activities. There is no evidence of serious efforts being made towards building institutional capacity in environmental education.

Bias towards natural science: Prior to the Rio Summit, environmental topics were taught only in natural science and geography courses. After the Summit, however, the focus has been gradually moving towards social science, liberal arts and the humanities. Yet explicit incorporation of environmental themes is still biased towards physical science courses. Nevertheless, because human activity is the primary factor responsible for the deterioration and destruction of the environment, social science aspects should be given the same level of attention as the sound management of environmental resources. For example, water pollution is the result of human actions. Therefore, in order to prevent it, it is not only necessary to understand its physical basis, but also to promote human awareness of the problem and encourage compliance with environmental laws. This can only be done through the integration of environmental themes into areas of education other than natural science.

Lack of whole-of-government commitment: Although environmental themes have been integrated into the formal education system, most of the EE initiatives come first from the sectoral ministries such as Environment, Fisheries, Agriculture, Forestry or Natural Resources, and not from the Ministries of Education. Their efforts are mostly related to specific issues and geared towards changing knowledge, attitudes and skills. They are not broad and comprehensive in terms of achieving sustainability. It is not possible to get the necessary full commitment from the government towards environmental education activities unless it is addressed in totality. Such a whole-of-government commitment is possible only through the involvement of the Ministry of Education.

Lack of institutional coordination: All the countries report a lack of coordination amongst responsible agencies in the region. Because of this, the agencies either duplicate activities or compete for resources. When the situation degrades further, mutual mud slinging becomes a common phenomenon resulting in no action or delayed action. Several ministries adopt individual policies and procedures to pursue their own mandates without any collective action or vision. Usually, there is no consultation among these groups and if there is any agreement, it is loose, vague and morally non-binding.

The Problems Prevalent in Education Programs

Inadequate manpower: There is a notable shortage of trained manpower, especially of environmental educators and facilitators, to teach integrated courses such as Environmental Studies, Man and *Environment and Nature Science*. No major efforts have been initiated to promote teachers' competency and capability. Conventional teaching methods, such as lecture methods, are applied to teach dynamic courses such as these. This reduces the quality of the education because there are no opportunities for students to observe directly the environment, or to be exposed to real-life situations.

Rigid curricula and teaching methods: Existing curricula are book-based and examination-oriented. Further, the curricula are not oriented toward nourishing a sustainable society. Because classroom instruction is geared towards examinations, students prepare to appear for their final examinations and achieve high scores rather than develop actual skills and competencies in the subject matter. Despite the fact that environmental concerns are integrated into the curricula, they are neither vertically integrated nor horizontally coordinated. There are no vertical links between educational activities in one level with other levels, nor are educational activities within the same level horizontally coordinated with other course activities. Activities are duplicated, and teachers are often unaware of what other teachers are doing in other subjects. Students do not learn about the environment in critical ways and fail to see the interconnections that contribute to the overall complexity of the environment. Curricula are centrally controlled, and their development process is quite bureaucratic in nature. Furthermore, existing courses are tightly arranged and do not allow additional subjects to be incorporated. The unavailability, inaccessibility and irrelevancy of textbooks, instructional materials, manuals and guides have further aggravated the problems of

effective curricular structure and processes. The pedagogy is mostly the "chalk-and-talk" method, and learning is based on the rote method and spoon-feeding. Because of this, students are encouraged to memorize rather than examine the problems critically.

Inadequate physical facilities: In many countries, especially in rural areas, school buildings are dilapidated and do not have even minimal facilities such as furniture, classrooms, laboratories, libraries, resources, tools and equipment. Due to space limitations in some areas, several classes are being run in shifts. For example, in mountainous areas of Nepal and India, more than two classes share the same classroom. In Cambodia, the number of students is as high as 100 to 150 in a single class.

Conceptual ambiguity: The concept of EE means many things to many people. In some countries, it is taken as another academic course without any relevance to, or bearing on, real-life situations, while in other countries, it is still in its infancy. Some believe that environmental education is a new perspective towards education and focuses more on values. There still exists confusion over its concepts and, therefore, its approach.

Unavailability of data and information: There is a great dearth of data and information on the problems of EE. Even when data and information are available, they are not necessarily accessible. The data and information should be designed so that they are both usable by, and easily accessible to, the general public. In many countries these days, data are stored in computer files. However, people who do not have access to computers, like many in Nepal, are virtually deprived of the use of such data. In such cases, these data should be reproduced in forms that are easily accessible to all.

3.6.5. Regional Strategy on Environmental Education

The world's environmental condition is deteriorating at an alarming rate due to changes in human activities triggered by inappropriate economic activities and rapidly changing demographic and socio-economic patterns.

The deterioration of the natural environment is linked inextricably with human actions and is the outcome of dynamic interaction of poverty, population growth and its changing distribution, and the misuse of resources, wasteful production, hyper-consumption, human greed and so forth. Paradoxically, underdevelopment as well as haphazard development processes are also responsible for this precarious situation. In order to address these issues, the Environmental Education Project of IGES has formulated a strategy. The strategy is a comprehensive framework of actions on environmental education for the Asia-Pacific region and takes account of Asia-Pacific perspectives on enhancing environmental education.

It is an outcome of a series of participatory processes including discussions, consultations and workshops with key players and stakeholders of the region and the analysis of data extracted from status reports of 36 countries. It primarily builds upon successful practices of environmental education from the region. Its main objective is to promote and foster eco-consciousness in relation to an environmentally sound and sustainable society in Asia and the Pacific region through the development of a regional mechanism for concerted action in environmental education.

Vision and Mission Statements: The vision of the IGES-EE Project is *"An active, better informed, capable and responsible network of environmental educators, facilitators and organizations, who actively work in their own community to achieve the goal of a sustainable society for the Asia-Pacific Region". Its mission statement is "To provide leadership in promoting, inspiring and fostering citizens to work towards achieving a sustainable future"*.

Target audience: The document is prepared for those institutions and organizations concerned with improving the quality of human life through environmental education. This includes a broad range of governments, schools, universities, business and industry, the media, research organizations, donors, NGOs, professional groups, international organizations, inter-governmental agencies and civil society in general. The IGES, in partnership with regional and sub-regional organizations, governments and other institutions, will be primarily involved in assisting/facilitating national partners in the implementation of the strategy.

Approach: The approach has focussed on bringing regional strengths together for promotion of environmental education in the region. The approaches include (1) building on success (learning from the past "success and mistake" and addressing present and future needs of the society); (2) developing smart partnership (bringing stakeholders together to collaborate and share knowledge, experiences, expertise and resources for a common purpose); and (3) seeking synergy (bringing additional strengths together by combining energy, strengths and ideas of more stakeholders in order to achieve a goal).

Action Agenda: Having considered the environmental issues, vision and mission statements, the strategy has presented the following framework of actions, called agenda for actions (see Box 3.6.1) to foster environmental education in the Asia and Pacific region.

The detailed actions for each agenda at regional, sub-regional and national levels are proposed in Table 1, which is annexed at the end of the paper.

3.6.6. Mitigation Measures

A preliminary review of these country reports indicates that countries of the region are aware of, and responsive to, the need of EE to improve the quality of human life. They have shown interest by incorporating environmental concerns into formal as well as non-formal education programs. Governments, non-governmental organizations, educational institutions, the media and other service

Box 3.6.1 Agenda for Actions at Regional, Sub-regional and National Level

Based on current studies, the agenda for actions on environmental education in Asia-Pacific region has been identified as follows:

Agenda 1: Strengthen the capacity of stakeholders
Agenda 2: Develop partnership for collaborative works
Agenda 3: Review/improve the curriculum and program development
Agenda 4: Facilitate the improved governance for environmental education
Agenda 5: Mobilize external assistance for educational activities

	Agenda 1	Agenda 2	Agenda 3	Agenda 4	Agenda 5
Regional Level	-Sponsor training/capacity building programs -Establish resource centers -Establish regional forums/organizations	-Support regional networks -Facilitate country focal points -Organize regional meetings/workshops regularly	-Develop networks & directory of educators & facilitators -Initiate stocktaking of activities -Develop professional development plan -Initiate recognition scheme	-Assist in policy formulation -Assist in continuity & consistency -Disseminate successful practicesx -Assist in improving governance for environmental education	-Establish environmental education trust -Assist countries to develop proposals and grant application -Coordinate activities of donors -Maintain database of donors
Sub-regional Level	-Support regional & national initiatives -Act as contact point for information -Assist in public awareness/colla-borative activities	-Establish linkages in the sub-region -Set up web sites/ database/ demonstration projects, etc -Support inter-sub-regional activities	-Support professional development plan -Strengthen networking of organizations	-Provide training/ workshops -Support in national policy formulation -Support/strengthen effective networking system	-Undertake environmental education needs assessment -Support sub-regional strategies -Develop information sharing mechanisms
National level	-Reorient education toward sustainability -Organize sensitization & awareness programs -Provide training to educators & facilitators -Encourage local teaching materials -Promote environmental advocacy -Promote pro-environmental production & consumption styles	-Maintain active linkages with relevant agencies -Involve policy-makers, researchers & stakeholders at all levels -Provide institutional support in capacity building & sharing data/ information -Disseminate successful examples and lessons -Undertake pilot/ demonstration projects	-Develop curriculum framework, teaching & learning activities -Promote greening of institutional activities -Provide professional development plan for educators & facilitators -Develop local curriculum materials and resources	-Formulate national policy and set up national steering committee -Develop institutional capacity and capability -Coordinate educational activities of interest groups at all levels -Encourage regular monitoring & evaluation -Maintain database -Provide incentives to educators & facilitators	-Undertake environmental education needs assessment -Focus on capacity building program -Refocus formal education towards a sustainable future

Source: IGES 2000.
Note 1: Regional organizations include UN Agencies (UNESCO, UNEP, ESCAP), IUCN, WWF, ADB, etc.
Note 2: Sub-regional organizations include ASEAN, SAARC, SACEP, SPREP, SASEANEE, ARNEE, ASPBAE, NEASPEC, ICIMOD, MCR, etc.

providers have also made concerted efforts to meet growing challenges of environmental education to the public. Many pioneering activities have been initiated and an enthusiastic leadership appears to be emerging regardless of great resource constraints, persistent poverty, rising population, conflict in resource use, inequity and faulty development project. Thus, environmental education has received momentum but not been able to make the quantum leap towards preventing, stopping and reversing environmental degradation in the region because of complexity of the problems, which have been erected as the stumbling blocks for its smooth implementation. In order to address this issue, a whole of the system approach should be adopted. In other words, problems of persistent poverty, population, and others should be addressed. Taking all these points into consideration, the Project has been undertaking the following activities to improve the condition of environmental education in the region.

(i) Establishment of a network: The Project has established a network of collaborators from 36 countries of the region. These collaborators are experts, educators and facilitators. The network of collaborators was involved in preparing and assessing status reports.

(ii) Conducting of research on different sectors: As mentioned elsewhere, the Project conducted case studies on B&I, NGO, media and higher education in order to find out their synergistic role to solve burning problems of environmental deterioration.

(iii) Development of the regional strategy: A comprehensive strategy has been formulated to implement environmental education in the region. It

has identified five action agenda, mentioned elsewhere in the paper.

(iv) Training of the NGOs: Field-oriented training programs are provided to NGO representatives from the developing countries.

(v) Collaborative work with other organizations: Collaborative works with organizations such as JICA, ACCU have been initiated to provide training to educators and facilitators from the developing countries.

(vi) Organization of interactive forums: Regional workshops and seminars are held regularly to bring regional talents together for the promotion of environmental education in the region.

3.6.7. Recommendations

Application of 4 Key Concepts in Environmental Education

Eco-Consciousness

The primary goal of this Project is to promote eco-consciousness in relation to a sustainable society. Because of this, its all activities are geared toward promoting eco-consciousness in the Asia-Pacific region. Some of the activities are summarized below.

(i) Assessment of situation of environmental education in the region

(ii) Compilation of successful practices related to eco-consciousness in the region.

(iii) Development of synergy to promote eco-consciousness through B&I, NGO, media, and higher education.

(iv) Collaborative formulation of a regional strategy on environmental education.

(v) Development of action agenda for the region.

Eco-Partnership

In order to promote the idea of eco-partnership in the region, a network of educational experts and facilitators from the region has been established by the Project. Likewise, in order to mobilize resources in an integrated way, the Project has coordinated in establishing JPL in Indonesia. Also, the Project collaborates with the Japanese Forum of Environmental Journalists (JFEJ) and Asia-Pacific Forum of Environmental Journalists (AFEJ) in promoting environmental journalism.

Eco-Technology/Eco-Investment

Some of the companies have begun to manufacture pollution control devices, decomposition machines, ozone-friendly refrigerator, sprays, solar energy system and so forth. In Japan, Toyota Company has provided back up support for "Eco-Mission, 99" with its Prius, a hybrid car to visit the front lines of environmental protection in the US and Canada. Programs such as those mentioned above have helped to raise general awareness of the public and employees of the factory on the need of protecting the environment. Also, advertisement of green technology on the billboard in developing countries has awakened the public to the need of protecting the environment.

Eco-Policy Linkage

"Regional Strategy of Environmental Education on the Asia-Pacific" (IGES-EE, 2000) is a consensus-based document and is expected to provide a comprehensive guidance in moving environmental education in the region in a integrated way so as to improve the human quality of life in the region.

Recommendations

The preliminary assessment of the studies introduced in this section suggests that in doing environmental education there is an urgency of field-base activities, not research on plans and policy formulation. That is the need of the time. Therefore, stakeholders in environmental education filed in the region are encouraged to share the following goals.

(i) Assist in the implementation of five action agenda mentioned in its regional strategy

(ii) Preparation of the teaching materials and its adoption to specific locales.

(iii) Consciousness-raising of environmentally illiterate people, especially at the apex level.

(iv) More emphasis on participatory action research.

(v) Training of environmental educators and facilitators.

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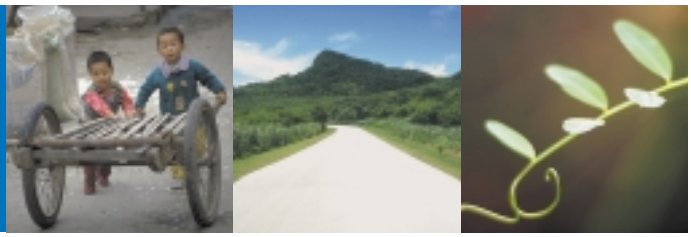
Institutions for Regional/Subregional Cooperation on Sustainable Development

Chapter 4



Institutions for Regional/Subregional Cooperation on Sustainable Development[1]

This chapter discusses regional and sub-regional cooperative initiatives aimed at achieving sustainable development in the region. The paper reviews the current status of cooperative initiatives and looks at possible actions for the future.

During the 1992 United Nations Conference on Environment and Development (UNCED), the world reached a global consensus that integration of environment and development is essential in responding to the threats of deterioration of ecosystem, worsening poverty, and perpetuation of social disparities. Since most environmental problems brought about at regional and global levels are rooted in human activities taking place at local and national levels, appropriate national strategies, policies, plans and processes are crucial in achieving the tasks. Nevertheless, as clearly stated in Agenda 21, no nation can achieve the tasks on its own, but only in close collaboration and good partnership with the United Nations, other international, regional and subregional organizations, local governments, and with broad public participation.

Since the adoption of Agenda 21, environmental governance structures in Asia and the Pacific have changed dramatically[2]. Among the major developments in environmental governance structure are the establishment of new environmental laws, programs and institutions in many countries, in particular developing countries, and increased participation by citizens, scientists, NGOs and enterprises in the environmental policy formation and implementation processes.

In addition to these developments at the domestic level, the 1990's also witnessed the growth of institutions for environmental cooperation at the regional and subregional level[3]. In Asia, which includes more than thirty geographically, economically and politically diverse countries, collaboration at the (smaller-scaled) subregional level has been emphasized by many international and regional organizations. The result has been activation of existing subregional environmental programs and plans, and the emergence of a multitude of new initiatives (See Figure 4.1).

However, activation of regional environmental cooperation does not ensure institutional effectiveness. In fact, in several cases, organizations for environmental cooperation have not yet been fully and satisfactorily developed. There are still gaps between the planning and the implementation stages. Insufficient capacity in terms of technical, personnel and financial resources are among the major obstacles for many developing countries to implement environmental governance programs and plans. Also, the effectiveness of the linkages between actors

[1] The Environmental Governance Project of the IGES, as a part of its major activities, has engaged in a comparative study of institutions and mechanisms of environmental cooperation in Asia, focusing on three subregions— Northeast Asia, Southeast Asia (ASEAN) and South Asia. This paper is written based on findings and conclusions of the studies. See Kato(2001), Takahashi (2000b, 2001a, 2001b) and Takahashi and Kato (2001) for detailed information.

[2] Environmental governance is the process through which domestic and international society deals with environmental problems. Environmental governance refers to "the interactions among formal and informal institutions and the actors within society that influence how environmental problems are identified and framed" (Schreurs, 1998).

[3] Here, "Institutions" means "persistent and connected sets of rules and practices that prescribe behavioral roles, constrain activity, and shape expectations" (Keohane, Haas and Levy, 1994). This paper use the word "institutions" to include "both organizations and sets of rules," codified in not only conventions and protocols but also in non-binding plans and programs that have been formally accepted by states.

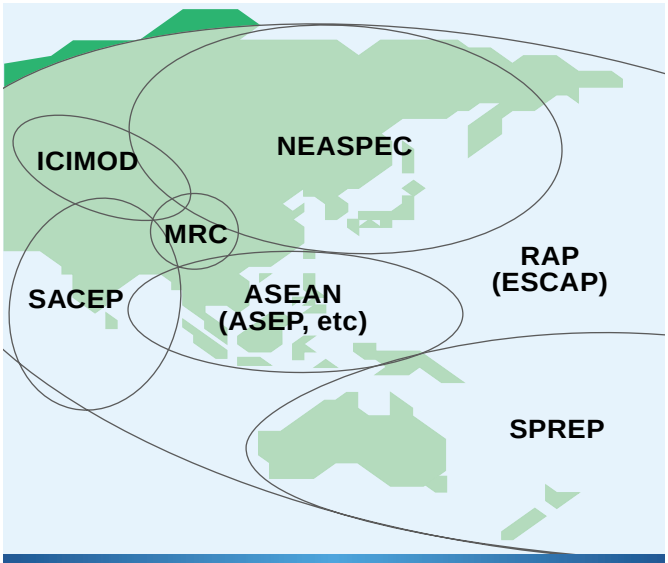


Figure 4.1 A Map of Major Environmental Cooperation Initiatives in Asia and the Pacific

within a state and actors operating internationally has been strongly hampered by domestic politics (Schreurs and Economy, 1997). In many cases, the outlook for accomplishing their tasks is unclear.

These problems raise the following questions: What are the main features that define environmental governance at the regional/subregional level in Asia and the Pacific? What are the similarities and differences between the cooperation mechanisms of subregions? Do/will they appropriately and effectively address the environmental problems threatening the region? What steps need to be taken to improve those institutions?

This chapter is an investigation of these questions. First, this paper outlines the existing multilateral initiatives in the three selected subregions, Northeast Asia, Southeast Asia (ASEAN) and South Asia. Next, it attempts to conduct a comparative analysis of the mechanisms and institutions for subregional environmental cooperation by discussing the actors in the regional environmental cooperation arena. Finally, this paper concludes by offering suggestions on how to promote environmental cooperation in the region.

4.1. Current Status and an Analysis

4.1.1. Overview

The central existence of environmental cooperation of Asia-Pacific region is ESCAP Ministerial Meeting on Environment and Development, held every five years since 1985, and the Regional Environmental Programmes (RAPs) adopted there. However, the Asia-Pacific region consists of politically, economically and environmentally various countries. Therefore, collaboration at the subregional level has been emphasized in practice.

This chapter, therefore, takes up multilateral environmental programmes/forums of three subregions of Northeast Asia, Southeast Asia and South Asia. It outlines also about the framework covering two or more subregions.

Northeast Asia[4]

The Northeast Asian subregion here refers to China, Japan, South Korea (ROK), North Korea, Mongolia, the Russian Far East and Chinese Taipei. There was not much cohesion between countries within this subregion until the latter part of the 1980's, and countries rarely cooperated on environmental issues, except for certain initiatives undertaken by countries on a bilateral basis. During the latter part of the 1980's, however, a tendency arose towards joint efforts at dealing with environmental problems associated with development. Agenda 21, adopted at Rio Summit in 1992 triggered multilateral cooperation on the environment, resulting in the establishment of several subregional programs, plans and regular conferences.

Among these initiatives, the North-East Asian Subregional Programme of Environmental Cooperation (NEASPEC) played a central role as a comprehensive intergovernmental program. The program was created at the first Meeting of Senior Officials on Environmental Cooperation in Northeast Asia in 1993, hosted by the United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP). The motivating force behind NEASPEC was the government of South Korea.

Since 1993, senior officials have held meetings every year or every two years, to decide on program activities, including project planning and implementation. The three priority areas identified by NEASPEC are energy and air pollution, ecosystem management and capacity building. Several fundamental projects on energy and air pollution—training workshops, technology demonstration projects, and monitoring-data collection projects—have been identified and implemented with the financial assistance of ADB. Although NEASPEC did not until quite recently have its own financial mechanisms, relying exclusively upon ad hoc project-based funding, the participating governments agreed in March 2000 to establish a core fund for NEASPEC.

The Northeast Asian Conference on Environmental Cooperation (NEAC), which also covers various environmental issues, is a forum for policy dialogue for government officials of environmental ministries and agencies from China, Japan, South Korea, Mongolia and Russia. Researchers, local government officials and representatives of NGOs have been also invited to conferences. NEAC conferences have been held annually, since 1992, and have provided participants with opportunities to exchange information, share experiences and discuss actions to be taken in the future. The conference itself does not create any projects or program-oriented activities.

[4] See Takahashi (2000b) for detailed information.

On the economic cooperation front, the Tumen River Area Development Programme (TRADP), which is promoted by UNDP and aims to promote regional economic cooperation between China, South Korea, North Korea, Mongolia and Russia, developed a Memorandum of Understanding on Environmental Principles governing the TRADP in 1995. The Tumen region has been threatened by severe environmental degradation, namely, inland and coastal water pollution, biodiversity loss, deforestation and air pollution. In response to the memorandum, it was decided to create a Strategic Action Programme (SAP) for the purpose of developing an effective long-term regional strategy for dealing with international water pollution and loss of biodiversity. The Global Environment Facility (GEF) decided to sponsor the SAP with 5 million US$ over a two-year period, and the program was launched in May 2000.

Collaboration focusing on a single subject also started following the Rio Summit. Problems related to the marine environment are under the purview of the Northwest Pacific Action Plan (NOWPAP). This sea plan was initially advocated by UNEP, rather than by countries within Northeast Asia. The participating countries are China, Japan, the South Korea, Russia and North Korea[5]. Those countries adopted action plans at the first intergovernmental meeting, held in Seoul, in 1994 (UNEP, 1997).

To protect migratory waterbirds, the North East Asian Crane Network Center was established in 1997, based on the "Asia-Pacific Migratory Waterbird Protection Strategy," which was adopted at the Seventh Meeting of the Conference of the Contracting Parties to the Convention on Wetlands (Ramsar). The network links eighteen important sites for the survival of cranes from six Northeast Asian countries, so that those who work at different sites can exchange information and share their experiences. The network also link researchers, conservationists, governmental officers and others concerned about crane protection, and provides a basis for joint research and conservation activities. The network is managed by the Wetlands International-Asia Pacific. The late 1990's also witnessed the establishment of two more waterbird network: the East Asian Australasian Shorebird Site Network, in which twenty-four sites from ten countries participate, and the East Asian Anatidae Site Network.

In addition to the founding of these networks, the late 1990's witnessed the emergence of collaborative efforts at the ministerial level. Following a proposal by the South Korea, the Tripartite Environment Ministers Meeting (TEMM) between China, Japan and Korea was held in Seoul in January 1999. The three countries recognized the need to cooperate and to improve the level and quality of environmental cooperation in the subregion. The TEMM is to be held on a yearly basis. The second TEMM was held in Beijing in February 2000, and the ministers agreed to develop and work on specific projects, focusing particularly on raising the consciousness of the environmental community, preventing freshwater pollution and land-based marine pollution and cooperating in the field of environmental industry. The three countries have already begin designing the project proposals, and steps have been taken toward implementation.

Southeast Asia (ASEAN)[6]

Southeast Asia, as referred here, embraces the ten countries of the Association of Southeast Asian Nations (ASEAN). Southeast Asia has a longer history of subregional environmental cooperation than the other subregions of Asia. Since its establishment in 1967, ASEAN has emphasized "functional cooperation" between member states on science and technology, culture and information, social development, and the environment (ASEAN Secretariat, 1995a).

The beginning of collaborative efforts on the environment can be traced back to 1977, when the ASEAN Sub-Regional Environment Programme (ASEP) was developed in collaboration with UNEP. ASEP I designated six priority areas and listed more than one hundred projects and activities. Thereafter, two similar programs were developed and implemented. In 1993, a new ASEAN Strategic Plan of Action on the Environment was agreed upon, consisting of ten strategic thrusts and twenty-seven supporting actions (ASEAN Secretariat, 1994). In addition, the ASEAN Cooperation Plan on Transboundary Pollution was agreed to in 1995 (ASEAN Secretariat, 1995b). In 2000, an Environmental Education and Training Action Plan was also developed, in collaboration with UNEP-ROAP (Pradham, 2000).

The organizational structure to support those plans consists of the ASEAN Senior Officials on the Environment (ASOEN) and its subsidiary working groups, the meeting of environmental ministers, and the ASEAN Secretariat. Ministerial meetings occur every three years, to ensure the implementation of the environmental decisions made by the heads of government, and to adopt action plans. ASOEN meets every year to review the implementation of the plans, and to provide operational policy guidance. The ASEAN Secretariat administers all those activities.

In addition to the plans mentioned above, more focused and intensive collaboration also started in the late 1990's. The haze experienced in Southeast Asia in 1997 resulted in the most serious challenge in the subregion, particularly in Indonesia, Malaysia, Singapore and Brunei Darussalam. Accordingly, a Haze Technical Task Force was set up in 1995, and the Regional Haze Action Plan was adopted by the ASEAN Senior Officials on the Environment (ASOEN) meeting in 1997 for the purpose of fighting land and forest fires. Major components of the

[5] North Korea is not an acting member, to date.

[6] See Takahashi (2001a) for detailed information.

Plan are to take preventive measures, to establish regional monitoring mechanisms, and to increase firefighting capacity. Furthermore, Environment Ministers from each country agreed to initiate the process of negotiating on the ASEAN Agreement on Transboundary Haze, in 2000. ASEAN, in close collaboration with UNEP, has conducted a feasibility study on a comprehensive assessment of legal, institutional and administrative arrangements, and has been drafting the agreement.

In parallel with these plans and programs, the Hanoi Plan of Action, the first in a series of comprehensive long-term ideas adopted at the ASEAN Summit in 1998, identified fifteen activities for environmental protection and sustainable development to be undertaken, with emphasis on transboundary haze control (ASEAN Secretariat, 1999).

Aside from those non-binding plans and programs, ASEAN developed an Agreement on the Conservation of Nature and Natural Resources, which is the only environmental treaty of ASEAN to date. The agreement was concluded and signed by foreign ministers from all six ASEAN countries in 1985. Of the six, Indonesia, the Philippines and Thailand ratified it in 1986, while Brunei Darussalam, Malaysia and Singapore have not. So, the agreement has not entered into force.

South Asia[7]

South Asia refers to seven countries—Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Although a number of bilateral agreements on environmental issues between South Asian countries had been reached, no multilateral initiative existed until the early 1980's when the South Asia Cooperative Environment Programme (SACEP) was adopted by environmental ministers from eight countries in 1982[8]. Covering broad priority subject areas, implementation of this program was poor. This does not, however, negate the significance of SACEP, since it provided a solid basis and justification for member states and collaborating agencies to initiate collaborative projects focused on single subjects identified by the SACEP.

SACEP has the characteristics of a modest-sized regional environmental organization, consisting of three major organs: the Governing Council, the Consultative Committee, and the Secretariat (Shihab, 1997). SACEP, as an organ, provided secretariat and administrative services for implementing its own programs together with other environmental initiatives, such as the Malé Declaration on air pollution endorsed by UNEP/EAP-AP.

The South Asian Association for Regional Cooperation (SAARC), which seeks to accelerate the economic and social development of its seven member states, has also pursued regional cooperation on the environment. SAARC has been particularly concerned with transboundary and global environmental issues such as natural disasters, climate change and transboundary movement of hazardous wastes, and developed an action plan.

In addition to these two major comprehensive initiatives, several plans focusing on single issues have been developed in South Asia. The launching of the Regional Sea Program was called for by SACEP member states at UNEP's Governing Council in 1982, resulting in the "designation of the region as a part of UNEP's Programme" in 1983 (Abeyegunawardene, 1997). The program involves the five marine states of South Asia—Bangladesh, India, the Maldives, Pakistan, and Sri Lanka. These countries adopted a South Asian Seas Action Plan at a meeting of plenipotentiaries, held in New Delhi in 1995. The Action Plan came into force in 1998. The SACEP secretariat has been designated as the secretariat for the implementation of the plan.

With regard to air pollution, the Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia was agreed upon during the 7th SACEP Governing Council Meeting, held in Maldives in April 1998. The declaration was signed by Bangladesh, Bhutan India, Iran, Maldives, Nepal, Pakistan and Sri Lanka. The implementation plan for the declaration consists of three phases, and Phase One—network establishment, baseline studies and development of action plans at national and regional levels—was carried out between May 1998 and March 2000. An institutional arrangement to support the implementation of Phase One consists of UNEP/EAP-AP, the Stockholm Environment Institute (SEI) and SACEP[9]. UNEP/EAP-AP has administered the implementation of the declaration, in collaboration with SACEP, and SEI has provided substantial technical support. SEI's contribution was a part of its Regional Air Pollution in Developing Countries Program, which is funded by the Swedish International Development Authority (SIDA).

An Environmental Education and Training Action Plan was also developed in 2000 by SACEP, in collaboration with UNEP-ROAP (Pradham, 2000). The action plan presents "an overall regional framework to educate and train people to deal with major environmental problems . . . and to sensitize people on the need to eliminate the root causes of environmental degradation such as poverty, population pressures, overpopulation, wasteful production, human greed and underdevelopment." (SACEP & UNEP, 2000).

Cross-Subregions

Other initiatives covering a broader geographical area have also been made. Among them is an effort made by an

[7] See Takahashi (2001b) for detailed information.

[8] The eight original members are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Iran also joined SACEP in the late 1990s.

[9] A Memorandum of Understanding (MoU) was agreed upon by UNEP/EAP-AP and SEI to implement Phase I of the Malé Declaration.

Asia-Pacific Economic Cooperation (APEC) forum. This forum was inaugurated in 1989, and includes eighteen countries and economies. The First Environmental Ministerial Meeting, held in 1994, developed an "APEC Environmental Vision Statement." Following this Statement and other declarations, APEC developed a three-pronged environmental work program, namely, 1) the integration of environmental and economic considerations into APEC working groups; 2) sustainable cities, clean technologies, and the marine environment; and 3) a long-term focus on food, energy, the environment, economic growth, and population.

On the scientific front, the Asia-Pacific Network for Global Change Research (APN) was established in 1995 for the purpose of strengthening links between the scientific community and policymakers in the Asia-Pacific region. APN is an inter-governmental network which seeks to promote, encourage and support research activities, focusing on long-term global changes in climate, ocean and terrestrial systems, and on related physical, chemical, biological and socioeconomic processes.[10]

The Environment Congress for Asia and Pacific (ECO ASIA) itself should also be mentioned. ECO ASIA was initiated by the Environment Agency of Japan, with the objective of fostering policy dialogue and cooperation on environmental and developmental issues among the environmental ministers of participating countries. While ECO ASIA was originally intended as an informal forum for information exchange between ministers, it has endorsed the "ECO ASIA Long-term Perspective Project," aimed at identifying options for environmental policies that promote long-term sustainable development of the Asia-Pacific region. This project will identify major environmental issues confronting the region; examining their links with socioeconomic issues; and forecasting the future social, economic, and environmental issues that may result from different regional development scenarios.

An example of focused collaboration covering cross subregions is the creation of the Acid Deposition Monitoring Network in East Asia (EANET)[11]. This network was created on the initiative of the government of Japan—all the operating costs are paid by the Japanese Government. Japan also provides financial and technical assistance on monitoring activities to developing member countries through its official development assistance (ODA) channel. The network links ten national governments and their monitoring sites. Using common guidelines and technical manuals, the network has been collecting, compiling and evaluating monitoring data on acid deposition. The network began its preparatory-phase activities in 1998, and started its monitoring activities on a regular basis from 2001, based on the decision at the Second Intergovernmental Meeting in October 2000. As of today, the network center is located in Japan, and Environment Agency (now the Ministry of Environment) of Japan administers and coordinates the network's activities as interim secretariat. The second intergovernmental meeting of the network, held in 2000, designated the UNEP as the Secretariat for the EANET after 2002.

[10] http://www2.rim.or.jp/apn/index.htm

[11] EANET is participated by ten countries form East Asia, namely, China, Indonesia, Japan, Malaysia, Mongolia, Philippine, Republic of Korea, Russia, Thailand, and Vietnam.

4.1.2. An Assessment: Actors in Regional Environmental Cooperation Arena

Regional Organizations

As in the case of Europe, regional organizations have played significant roles in addressing, identifying, coordinating and implementing joint environmental activities. This is demonstrated by a number of EC/EU efforts to unify environmental standards in connection with economic activity such as trade and manufacturing. In the case of long-range transboundary air pollution control, the Convention itself was facilitated and coordinated by the United Nations Economic Commission for Europe (UN/ECE). It is worth pointing out that EC/EU financial and technology transfer mechanisms have official and unofficial links with the LRTAP Convention. This apparently made it easier for the member states to comply with the LRTAP Convention and its protocols (Nordberg, 2000).

Because it does not have a strong central bureaucracy similar to that of the EC/EU, ASEAN has provided minimal, largely administrative support to member states through the ASEAN Secretariat (Tay, 2000). It has drafted many regional environmental action plans, three ASEAN environmental programs (1978-1992), two strategic action plans (1994-), and transboundary pollution action plans (1995-) (ASEAN Secretariat, 1994, 1995).

The institution supporting those plans and programs is well structured, consisting of summits, ministerial meetings on both foreign affairs and environment, senior officials meetings, working groups and ASEAN Secretariat. Consequently, ASEAN has managed to develop a comprehensive and strategic framework for environmental cooperation with few redundancies.

In South Asia, both SACEP and SAARC have played similar roles as ASEAN. SACEP was established for environmental protection, whereas SAARC aims for broad collaboration on economic and social development. The institutional arrangements of the latter include: summits, the Council of Ministers, the Standing Committee, technical committees for respective fields, and the SAARC Secretariat, while the structure of the former consists of the environment and forestry ministers meeting, senior officials meeting—the Consultative Committee—and the Secretariat, but without summits. With no formal link between the two major institutions for cooperation, the SACEP and the SAARC, the SACEP has had limited success in mobilizing resources and implementing regional

activities (Chatterjee, Mehra and Banerjee, 2000).

SACEP has apparently placed priority on broad areas of activity, including local and national environmental issues and training. SAARC, on the other hand, has given more attention to global and international issues, such as climate change and the transboundary movement of hazardous wastes, and has attempted to establish a common position for SAARC countries in global negotiations. There has been, nevertheless, some redundancy between the activities of two institutions.

Northeast Asia is characterized by the fact that no comprehensive regional organization equivalent to EC/EU, ASEAN, SAARC or SACEP exists, resulting in the emergence of several independent initiatives on environmental cooperation. The functions and activities of each subregional program, plan, and forum may overlap. In fact, redundancies seem inevitable in Northeast Asia.

The absence of a regional organization also affects the institutional and financial arrangements of each programs and its plans. For example, the location of the secretariat ranges from UN/ESCAP, to UNEP, to China, and to Japan, or on a rotating basis. Accordingly, the status of participating states differs from one initiative to another, depending on diplomatic relations between countries within the region, and the international membership of the host organizations[12].

International Organizations

UN organizations have conducted various activities underlining their catalytic and coordinating role in promoting regional and subregional cooperation in environmental fields. The most notable contribution of the UNEP in promoting subregional cooperation lies in its role in coordinating and initiating the Regional Seas Programme, which includes the Northwest Pacific Action Plan, East Asian Seas (EAS) Action Plan and South Asian Sea Action Plan.

Attaching high priority to subregional approaches, UNEP has also provided substantial support to draft various action plans in most subregions, together with technical and financial assistance for a number of projects developed under subregional environmental programs (Natori, 2000).

UNDP, which helps developing countries adopt integrated approaches to natural resource management to improve the lives of people living in poverty, has also provided financial and technical assistance to subregional environmental initiatives in the developing world. GEF has provided technical assistance grants to proposed biodiversity and climate change projects in Asia, including an emergency response project to prevent haze in Southeast Asia by fighting forest fires in Indonesia, and a project to prepare a Strategic Action Programme for the Tumen River Area Development Program.

International banks such as the Asian Development Bank and the World Bank have provided large amounts of financial assistance to environmental activities in the region. In particular, ADB's regional technical assistance grants have played a significant role in facilitating collaboration between countries. This is particularly true in the case of transboundary haze mitigation projects in Southeast Asia. It seems the grant led to a good start towards ASEAN's implementing the Regional Haze Action Plan (Pippinyo and Prasiddha, 1999).

UN/ESCAP, which holds ministerial meetings on environment and development every five years, develops regional action programs for sustainable development with five-year time frames, as a follow-up to UNCED. To ensure the implementation of the programs, ESCAP conducts consultations on a subregional basis. In keeping with this purpose, subregional efforts, including several plans endorsed by ASEAN, NEASPEC, and SACEP, were examined at the 4th ESCAP ministerial meeting, held in 2000 in Japan (Ichimura, 2000). ESCAP has also devoted itself to maintaining and facilitating subregional meetings, particularly in the case of Northeast Asia. Upon request from countries of the subregion, UN/ESCAP has acted as the interim secretariat of NEASPEC since 1997, and has coordinated its activities. Furthermore, ESCAP held a senior officials meeting in Central Asia, where no regional organizations for environmental cooperation exist, and initiated the process of formulating subregional environmental programs in the late 1990's (Karim, 1999).

There is, however, a limit to the role of international organizations. Due to their lack of financial resources, South Asia and Southeast Asia have mostly relied on external financial support from international organizations, together with bilateral donors, to implement their environmental activities. Funding has mainly been provided on a project-by-project basis. This has resulted in a large number of project proposals which did not attract donors' attention, and were simply not carried out.

Except bilateral financial and technical assistance to China and other developing countries, Northeast Asia receives less funding from international organizations, since the region contains two developed countries, Japan and South Korea. Instead, international organizations have given more attention and resources, to supplement the poor political relations in this region (Shrestha, 2000). This is true for the Northwest Pacific Action Plan and NEASPEC: the former is administered by UNEP, whereas the latter has been managed by UN/ESCAP. The Acid Deposition Monitoring Network will be a new addition to this list, since its secretariat will be located at UNEP after 2002. Although countries in the subregion want UN/ESCAP to continue to take responsibility, the UN/ESCAP wants to give up the position.

[12] For example, North Korea does not attend most subregional programs, except those hosted by UN Organizations. North Korea cannot receive assistance from the ADB, to which it does not belong. Taiwan has no access to many initiatives because its position in international politics is uncertain although it is a member of APEC and ADB.

National Governments

National governments are the most important actors among those involved in the process of environmental cooperation. Regional cooperation should be based on spontaneous initiatives between countries. Transboundary pollution, or even global environmental problems, are rooted in human activities taking place at the local and national levels, and are therefore best dealt with at the level closest to the source (Kato, 2001). Without the commitment of national governments, regional cooperation cannot be successful.

Most national governments state that they place great importance on environmental protection and sustainable development, in general. There are, however, gaps between words and action. When negotiating concrete commitments, different viewpoints are often expressed, which has hindered progress on regional cooperation.

The primary emphasis of any action plans developed by ASEAN is to develop national plans without binding commitment. Implementation of plans is left to the capabilities of each country.

In order to tackle transboundary environmental problems such as the recurrent episodes of transboundary haze pollution, ASEAN ministerial meetings have stressed that each government should consider the inclusion of presumptive provisions in their national laws to discourage landowners from allowing open burning to take place on their land.

Yet, the stringency of existing command-and control measures varies, as does compliance with the national laws and policies. In the case of Indonesia, it is unlikely that strict, zero-burning legislation will be introduced in the near future. Even if such legislation were to be introduced, compliance be another challenge.

In the case of Northeast Asia, countries have not reached the point of negotiating concrete commitments. Because of the great diversity in terms of their level of economic development and political systems, countries in Northeast Asia have expressed different views and approaches to environmental cooperation, especially China, Japan and South Korea.

China believes developed countries in the subregion should offer substantial financial support for the establishment and operation of environmental programs, as well as technical assistance for projects in their priority areas. Transboundary environmental problems have been sensitive issues. In 2000, however, when the environment ministers of three nations of China, Japan and South Korea, gathering in Beijing to hold a Tripartite Ministerial Meeting on Environment, paid a courtesy visit to Chinese Premier Zhu Rongji, the premier expressed his awareness that soil loss and acid rain are issues that transcend political boundaries. From this, it is admitted that the Chinese stance over transboundary environmental issue is changing little by little.

Japan has devoted efforts to regional cooperation initiatives such as EANET. Japan has contributed a huge amount of funds to the international organization including World Bank, Asian Development Bank, and ESCAP, some of which are earmarked to project implementation of the multilateral programs, although not recognized not much widely. Multilateral initiatives undertaken or endorsed by Japan target the wide region of East Asia, or the entire Asia-Pacific region, rather than focusing on Northeast Asia. They also tend to focus on monitoring the state of the environment and transboundary pollution. Japan has suggested that countries attending an initiative should share the burden to the extent possible under their present circumstances.

South Korea is keener to promote multilateral environmental cooperation focusing on Northeast Asia. It apparently believes that multilateral initiatives should include both technical projects as preferred by China and monitoring-type environmental management projects as preferred by Japan (Valencia, 1998). South Korea has tried to reconcile the approaches of both China and Japan by proposing that priority projects of NEASPEC be energy and air pollution (Valencia, 1998). It seems that South Korea prefers the presence of international organizations in such multilateral initiatives. It has suggested that coordinating mechanisms for environmental cooperation channel financial and technical assistance from international organizations including UNDP, UN/ESCAP and ADB.

International relations within Northeast Asia have been dominated by strong bilateral cooperation, particularly with the United States, rather than multilateral cooperation between countries of the subregion. As the political background, it is worth pointing out that following World War II, Northeast Asia was further divided into the east-and-west camp. It can be also pointed out that, due to lack of uniformity of economic level, the motion to tackle on equal terms with a common problem was hardly gained momentum in this region. Recent evidence, nevertheless, shows that China has begun to show its interest in multilateral relations. It might be safely said that it is time to enhance multilateral environmental cooperation in Northeast Asia. With the absence of regional organizations, and different and sometimes competing perspectives of national governments, and having had little expertise in multilateral diplomacy, countries in Northeast Asia is now facing new ground.

Bilateral relations with India as the predominant power, have dominated international relations within South Asia. Therefore, transboundary environmental issues, as seen in the case of Northern watersheds on the Indian subcontinent, being devastated by inappropriate cultivation, deforestation and water contamination, have been dealt with mostly on bilateral basis.

It can be safely said that countries, except for India, would choose multilateral collaboration. However, their multilateral initiatives have not been very strong. It was only during the late 1980's that countries have shown concern for environmental issues at the SAARC, mostly

due to the need to create a common position in global environmental negotiations.

Environmental cooperation based on the SACEP has become more active. Since it does not involve any meetings at the summit level, SACEP has been enjoying the freedom to make its own decisions. The evidence shows that implementation of the Malé Declaration is progressing in a positive and speedy manner, with participation by both India and Pakistan.

Furthermore, an attempt has been made to promote the sharing of water quality data in South Asia, involving scientists and researchers from Bangladesh, India, Nepal, Pakistan, and Sri Lanka. This project was proposed a research institute funded by the United States government, which hopes that "cooperative monitoring projects among neighboring countries in South Asia could build regional confidence, and, through gradual improvements in relations, reduce the threat of war and the proliferation of weapons of mass destruction." (Rajen, 1999).

NGOs, Citizens and Academics

International NGOs and NGO networks are among the newly emerging actors in environmental governance in Asia. Although most of them targeting single countries on single issues, several NGOs or networks have taken regional approaches to environmental protection.

Some NGOs are linked to regional institutions endorsed by international and regional organizations and national governments. One encouraging example is an IUCN regional aquatic ecosystems program in Asia. IUCN has maintained strong ties with the Mekong River Commission, and has conducted environmental assessments of developments in the lower river basin to create new protected wetlands areas, support national agencies, increase institutional capacity, assist governments with the implementation of the Ramsar convention, disseminate information and promote communication between various actors (IUCN, 2000).

Another example is migratory waterbird protection. The late 1990's witnessed the emergence of several waterbird networks, which are administratively managed by Wetlands International-Asia Pacific. The networks link a number of important sites for the survival of waterbird from several East and Northeast Asian countries. The networks also link researchers, conservationists, governmental officers and any other parties concerned about waterbird protection, in an open manner, and provide a basis for joint research and conservation activities.

Nevertheless, NGOs participation in multilateral environmental cooperation has thus far been limited in every subregion in Asia. A number of critics have suggested that regional initiatives to address environmental issues are often top-down, with little involvement by civil society, local government and NGOs, especially at the decision-making level (Nicro, 1999). Appropriate mechanisms for bringing the public and NGOs into play do not currently exist.

Academics—universities, research institutes and also individual technical and scientific specialists—are another newly emerging actor in the field of regional environmental cooperation in Asia. Academics play significant roles in identifying environmental threats, drafting action plans and agreements and monitoring the implementation of the agreements, in cooperation with officials of international organizations and national governments. In fact, decision-making processes of several action plans and agreements of ASEAN and SACEP/SAARC have involved a number of lawyers and scientific specialists from several academic institutes, such as the Asia-Pacific Center for Environmental Law (Singapore), ISEAS (Singapore), the Asian Institute for Technology (located in Thailand), Thailand Environment Institute, and Tata Energy Research Institute (India).

Although collaboration has been mostly on a single-project basis, some research institutes have started to deal with more comprehensive tasks, such as creating regional plans and institutions, and following up on their implementation. This is particularly true for the Stockholm Environmental Institute. Taking advantage of its well-developed expertise on the regional approach to long-range transboundary air pollution control in Europe, the Institute assisted UNEP/EAP-AP and SACEP in drawing up the Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia. The institute also has assisted UNEP/EAP-AP, SACEP and its member states with developing common monitoring guidelines, provided technical and financial assistance, and has been reviewed the implementation processes.

International joint research among academics has also been expanding since the 1990's. The creation of mechanisms to support such research efforts, such as APN and GEF, has accelerated the trend.

This is not to say that such efforts are sufficiently advanced to create transnational "epistemic communities," or communities of experts sharing common values and approaches to policy problems[13]. Haas (1990) attributes the success of the regional efforts to control marine pollution in the Mediterranean Sea to "the involvement of ecologists and marine scientists who set the international agenda and directed their own states' support to international efforts and toward the introduction of strong pollution control measures at home." It seems the time has not yet come for the emergence of such a community in Asia.

On the contrary, the evidence shows that most links between international and national governmental

[13] According to Haas (1990), an "epistemic community" is "a professional group that believes in the same cause-and-effect relationships, tests to assess them, and shares common values. As well as sharing an acceptance of a common body of facts, its members share a common interpretive framework, or 'consensual knowledge,' from which they convert facts or observations to policy-relevant conclusions."

organizations and academics, or between academics and other academics are on an ad-hoc basis. These insufficient links sometimes cause friction between scientists, between scientists and policymakers, and also between policymakers from different countries. In several cases, some have criticized the fact that scientists from only a single country consulted with decision-makers on regional initiatives, and took over the decision-making process.

4.2. Recommendations for Furthering Cooperation

This paper has examined the institutions for environmental cooperation of three subregions in Asia, Northeast Asia, Southeast Asia and South Asia. The analysis indicates that the mechanisms of environmental cooperation vary from one subregion to another. This concluding section provides a summary of major features of environmental cooperation mechanisms, together with some recommendations, for each subregion.

Northeast Asia

The characteristic features of existing programmes and mechanisms for environmental cooperation in the subregion may be summarized as follows:

Parallel institutions: Several institutions for environmental cooperation were established through different channels, including environmental ministries, official diplomatic channels, officers of environmental ministries and agencies, NGOs, and academics, with little coordination between the various channels.

Multi-layer structure: Geographical coverage of environmental cooperation institutions ranges from global, wider-than-regional to subregional. Some multilateral institutions target Northeast Asia, while some target the whole region of East Asia or, even more broadly, Asia and the Pacific. The evidence shows that South Korea tends to favor a focus on Northeast Asia, whereas Japan focuses on the broader region (East Asia), or the entire Asia-Pacific region.

Different membership: The status of participating states differs from one institutions to another, depending on diplomatic relations between countries and on the international membership of the host organization.

Weak institutional/financial structure: Since most of the regional environmental institutions have little organizational structure and a weak financial foundation, cooperation has made only slow progress. In the absence of regional organizations which can administer regional environmental plans and programs, each of them must start negotiations from scratch. Some have stagnated in terms of institutional and financial development.

The weaknesses and inadequacies of environmental cooperation schemes in Northeast and East Asia, as analyzed in this paper, have hindered the progress of regional cooperation on single issues such as acid rain and marine pollution control[14]. The question to be answered is whether and how the region can get out of this stagnation.

In the case of acid rain control, the first regional step taken in Europe was to gather scientific facts on acid deposition, emissions of pollutants, and reaction, transport and diffusion mechanisms. The second step was to develop efficient strategies for acid rain control. In this process, several protocols were adopted. The third step was to implement pollution abatement and prevention processes, mostly at domestic and local level. Considering that the Acid Deposition Monitoring Network has just started its regulatory activities, this region is currently at the first step: that of the mid-1970's in Europe. One of the biggest differences between Europe and East Asia is that the third step has already started to take shape in East Asia. That is, countries in the region are paying more attention to, and strengthening national laws and regulations on, controlling air pollution and acid rain. A large amount of environmental investment has been given to China through both official development assistance and foreign private investment. The creation of a "China Council," which consists of China as well as its donor countries, and coordinates efficient assistance to China, also is a step in the right direction.

Considering these facts, it might safely be said that a significant degree of collaboration has already taken place on the issue of acid rain in Northeast Asia. Much of this collaboration is, unfortunately, undertaken in a fragmented manner. Therefore, the region needs to form links between individual initiatives and financial mechanisms, between bilateral and multilateral aid programs, between donor agencies, and between regional cooperation institutions and financial aid mechanisms.

Northeast Asia needs to create a mechanism for systematic coordination between all the initiatives, in particular initiatives addressed at similar or related issue areas. To make it easier, the first step to be taken would be to set up a system that maintains transparency and full disclosure. Recently, some regional and subregional initiatives have set up their own web pages on the Internet. (These include the EANET, TEMM, TRDAP and the Crane Network. Collaborative activities of NEASPEC are also introduced in UN/ESCAP homepage.) This trend should grow and be further enhanced.

In the long-term, a comprehensive and strategic environmental action plan should be developed for medium and long-term objectives. Such action plans have already succeeded in other regions and subregions such as the EU, the Baltic Sea region and ASEAN.

One long-term objective for Northeast Asia would be to create a framework in which all parties in the subregion

[14] See Takahashi (2000a) and Takahashi & Asuka (2000) for the case of acid rain, and see Valencia (1998) and Haas (1998) for the case of marine pollution control.

can participate. International organizations and NGOs can play a facilitating role in that process.

Furthermore, it is expected that each country need to develop environmental diplomacy strategically and more boldly. That will enhance cooperation in the subregion.

Southeast Asia (ASEAN)

The characteristic features of existing programmes and mechanisms for environmental cooperation in the subregion may be summarized as follows:

Well established institutional structure: A number of environmental action plans and programs have been initiated by ASEAN, which has expertise in administering regional cooperation in various fields. ASEAN's well-designed organizational structure has been applied to environmental field, resulting in ministerial meetings on issues related to environment and development, senior officials meetings, working groups on single issues and an ASEAN secretariat environmental unit. There are strong affiliations between each component of the organizational structure. Accordingly, there has been little redundancy between environmental cooperation activities within ASEAN.

Weak financial structure: ASEAN is not strong financially, and has mostly relied on external financial support for implementing its environmental activities, which have been provided mostly on a project-by-project basis. This has hindered the execution of several project proposals which did not attract donors' attention.

In order to deal with these problems, ASEAN must secure the funding necessary for the implementation of environmental plans, focus more sharply on priority areas of actions, and enhance the capacity of the ASEAN Secretariat. ASEAN recently started to move in that direction. At the ASOEN meeting chaired by Singapore, in 1998, a decision was made to be more issue-oriented than project-oriented and to "restructure and streamline the ASEAN working groups to be more responsive to emerging regional and international environmental issues." As a result, only three working groups were maintained, including the working groups on Nature Conservation and Biodiversity, chaired by the Philippines, Coastal and Marine Environment, chaired by Thailand, and Multilateral Environmental Agreements, chaired by Malaysia" (Sunchindah, 1998).

With regard to transboundary issues, ASEAN is in the process of developing and negotiating the ASEAN Agreement on Transboundary Haze. The development of a legally-binding treaty is, however, not the only solution. It is more important to create mechanisms for bringing countries to comply with international commitments. To this end, regional policymakers will need to coordinate their activities with technical and financial assistance mechanisms.

South Asia

The characteristic features of existing programmes and mechanisms for environmental cooperation in the subregion may be summarized as follows:

Parallel institutions: The establishment of SACEP was a milestone for multilateral environmental cooperation in South Asia. A number of action plans and programs have been identified and implemented under SACEP. A parallel regional organization, established three years after the creation of SACEP, has also pursued regional cooperation on environmental issues. With no formal link between the two major institutions, there are certain redundancies between their activities. Some points out that this also limit the ability of SACEP to mobilize resources and implement its own plans and programs.

Weak financial structure: Facing several critical problems such as expanding populations, poverty and unsustainable use of natural resources, South Asia has difficulties in mobilizing sufficient financial resources for environmental protection. Funding comes from international organizations and bilateral donors, but according to the donor's preference. The amount of funding within South Asia and other sources is insufficient to carry out all the planned environmental activities.

Environmental cooperation based on the SACEP has become more active. SACEP therefore needs to advance the strategic goals of regional environmental cooperation, which will benefit both sustainable development and the fostering of mutual trust and peace in the region. To this end, a workshop on South Asia Water Resources to promote water quality data sharing in South Asia, organized by a research institute funded by the United States government, is a step in the right direction.

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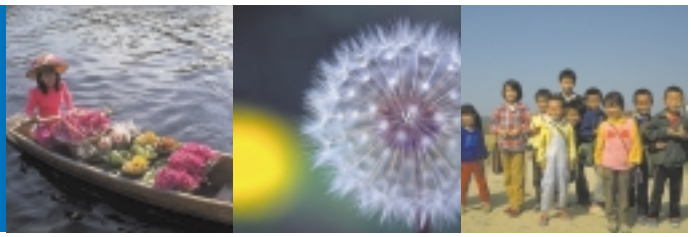
Conclusions and Policy Recommendations

Chapter 5



Conclusions and Policy Recommendations

5.1. CONCLUSIONS AND POLICY RECOMMENDATIONS IN TERMS OF 4 KEY CONCEPTS

The four concepts of Eco-consciousness, Eco-partnership, Eco-technology/ Eco-investment and Eco-policy linkage underlie broad strategies for tackling critical environmental problems facing countries in the Asia-Pacific region. The study of critical environmental issues indicates that the potential of the four concepts has not been exhausted, suggesting that greater efforts can be undertaken for their implementation. In the following part, these cases are reviewed, and lessons learned from their experience drawn to further promote the implementation of the concepts.

5.1.1. Eco-Consciousness

Eco consciousness is the fundamental basis for building a sustainable society. It can be regarded as the cornerstone of any policies addressing environmental problems within the government sector, private entities or civil society.

Climate Change

Technological development will be a major, but not sufficient element in order to face the challenge of climate change and to reach the objectives of the Kyoto Protocol. In addition to technological innovation, a reduction in energy consumption and a change in underlying lifestyles are indispensable. These require a greater environmental consciousness among people and business, implying a change in lifestyles.

We envisage that a change in lifestyle will require emission reductions in the industrial, residential and transportation sectors. One of the instruments that might raise environmental consciousness and induce reduction in emissions from the transportation and residential sectors is the use of "downstream" regulation and/or taxation, which directly places additional costs on energy consumers, thus having a greater effect.

Urban Environment

With respect to urbanization and urban environmental management, eco-consciousness has been rising in many Asian countries. This is reflected in the increase in the number of environmental NGOs in Korea and the Philippines, environment-related social activism in Thailand, and national environmental programs, actions and campaigns in China, to name a few examples.

In order to further promote environmental consciousness and greater public participation in urban environmental management, further efforts should be directed at:

(i) Creating specific institutions for representatives of the public to be involved in environmental policymaking. Environment councils under the Japanese national government and local governments, the National Environmental Board in Thailand, the Citizens' Committee for a Green Seoul, and The Philippine Council for Sustainable Development all provide good institutional models for other Asian countries.

(ii) Establishing formal and informal institutional mechanisms for the public to monitor the environmental performance of government and business.

(iii) Improvement environmental dispute and compensation mechanisms. Experiences in Japan and Korea prove that this can foster public participation in environmental protection.

(iv) Ensuring public disclosure of environment-related information covering not only environmental quality data but also information regarding policymaking and the environmental performance of government and business. In China, the release of weekly reports on environmental quality has been significant in educating citizens and fostering interest in

environmental protection.

Freshwater

The limited per capita availability of freshwater resources puts water at the forefront of environmental challenges for the Asia-Pacific region. Despite efforts to identify additional sources of freshwater, growing population will continually decrease the availability of water. Public awareness and education are crucial in promoting the most efficient use of the limited water resources available.

Public awareness and community education programs are particularly important among women, youth and farmer groups. We suggest that education programs that help communities understand the linkages between water, sanitation, health, and productivity be encouraged.

In raising environmental consciousness with respect to water conservation, two fundamental issues need to be addressed:

(i) First, recognizing the social, environmental and economic value of water in all its competing uses;
(ii) Second, changing the perception of water as an infinite bounty.

Addressing these issues will require new policy measures including the introduction of water fees/charges and a clear allocation of rights and responsibilities pertaining to water use and discharges.

Forest Conservation

With respect to forest conservation, a greater interest has been noticed in most Asia-Pacific countries. However, there still remains an overly simplistic and stereotyped conception of the causes of forest loss. In raising public consciousness, emphasis should be put on the fact that the loss of forest is not only due to shifting cultivation but also many other proximate and underlying causes.

The strong demand for natural resources both from forests and forest-converted land has been identified as one of the underlying causes of unsustainable forestry practices in the Asia-Pacific region. The gap between supply and demand will continue to put great pressure on forest sustainability. It is therefore urgent to initiate measures that limit the demand for forest products to an extent that will allow sustainability. Such measures should target consumers - individuals and countries - and encourage a sustainable use of forest resources and recycling. In doing so, mechanisms through which consumers are informed of the environmental soundness of forest products and processes can play a crucial role. Mechanisms such as forest certification schemes can ensure that consumers get the right information concerning the legality of products they acquire and thus act as safeguards in the marketplace. In order to develop acceptable forest certification schemes, it is recommended that priority be given to:

(i) Setting standard evaluation criteria and indicators among certifying institutions;
(ii) Developing domestic criteria and indicators based on those of the Forest Stewardship Council[1] and;
(iii) Establishing Asian certifying institutions.

Biodiversity

Two sets of policies are crucial to the conservation of biodiversity:

(i) Setting regulatory controls over access to and exploitation of resources under serious threat of complete loss;
(ii) Establishing legally designated protected areas, such as national parks, wildlife sanctuaries and other kinds of natural reserves. Such a strategy is already in place in several countries in the Asia-Pacific region. In total, the protected area in this region is 209,476,000 hectares.

Rising environmental consciousness has contributed a lot to the understanding, already widespread among scientists, policy makers and the general public, of the importance of biological diversity. Policy makers have also started to accord greater consideration to knowledge based on cultural and traditional values. This has prompted further research and monitoring aimed at achieving a better understanding of the current situation of the biodiversity in each country. The Global Taxonomy Initiative (GTI)[2], which has been launched under the framework of the Convention on Biodiversity, is one such example. Environmental awareness has also increased regarding the fact that often, environmental damage related to biodiversity is irreversible (i.e. the complete loss of biological resources), has also increased.

Education for Sustainability

Environmental education has been a major tool for promoting environmental consciousness. A study that reviewed the experience of 36 countries across the Asia-Pacific reveals a range of institutional changes, changes in curriculum, and educational programs to promote education for sustainability. The "Hand in Hand in the Earth Village" project run by primary school students in China, the establishment of Environmental Study Centers in all state universities in Indonesia, Junior Eco-Club in Japan, the Philippine Association of Tertiary Level Education Institutions in Environmental Protection and Management (PATLEPAM) are but a few of the many

[1] The Forest Stewardship Council (FSC) is an international non-profit organization founded in 1993 to support environmentally appropriate, socially beneficial, and economically viable management of the world's forests. The FSC accredits organizations with an international labeling scheme for forest products, which provides a credible guarantee that the product comes from a well-managed forest.

[2] The Global Taxonomy Initiative (GTI) has been established by Conference of the Parties to the Convention on Biological Diversity. The purpose of the GTI is to remove or reduce the taxonomic impediment – that is the knowledge gaps in our taxonomic system (including those associated with genetic systems), the shortage of trained taxonomists and curators, and the impact these deficiencies have on our ability to conserve, use and share the benefits of biological diversity.

initiatives towards education for sustainability in the Asia Pacific region.

In order to further promote environmental consciousness, the following measures should be considered:

(i) Improving coordination between ministries, with the ministry of education assuming a leading role in the conception and implementation of programs promoting environmental consciousness, would strengthen the institutional structure for environmental education;
(ii) Moving the focus of environmental courses from physical and natural sciences into social sciences. Social sciences are more likely to provide the kind of intellectual understanding and awareness able to change human behavior in more environmentally sustainable ways;
(iii) Integrating the various levels of the educational system from primary to tertiary levels of education;
(iv) Increasing the among of trained manpower available for environmental education, especially educators and facilitators.

5.1.2. Eco-Partnership

All segments of society, from government to business and citizens share responsibility for human-induced environmental problems. Consequently, all should be all actively involved as partners in finding solutions to these problems. Eco-partnership aims at responding to this need.

Climate Change

Because of the global nature of climate change, policy responses need to involve the greatest possible participation across society and countries. Based on the UNFCCC, a number of mechanisms for cooperation were introduced by the Kyoto Protocol to enable eco-partnership involving governments, business sectors, and non-profit organizations. In particular, mechanisms for joint implementation, emission trading, and the Clean Development Mechanism have great potential, which already has started to be explored. Under the UNFCCC, joint activities have already initiated in a few countries in Asia and the Pacific.

One of the most important realizations of eco-partnership in the Asia-Pacific region is the ALGAS (Asia Least-cost Greenhouse Gas Abatement Strategy) Project, a technical assistance project being executed by the Asian Development Bank. The ALGAS project reviews the national GHGs emissions and the projections of GHGs emissions of 12 Asian countries, and analyses mitigation options under different economic strategies.

Other regional frameworks for partnership include the Tripartite Environment Ministers Meeting (TEMM) among China, Japan and Korea, the South Pacific Regional Environmental Programme (SPREP), the South Asia Co-operative Environmental Programme (SACEP), the South Asian Association for Regional Co-operation (SAARC) and a number of co-operation programmes among member countries of the Association of Southeast Asian Nations (ASEAN).

In order to enhance regional partnership in the Asia-Pacific region, future action should aim towards:

(i) Strengthening cooperation mechanisms, with possible institutional arrangements in East Asia.
(ii) Reinforcing the financial capability of Southeast Asia to support the already well-developed framework for co-operation in that sub-region.
(iii) Finding ways of coordination between the parallel institutions existing in South-Asia.

Urban Environment

Significant institutional changes have enhanced interactions between public and private sectors and NGOs and reduced the centralization of functions in government. In this context, voluntary actions can supplement command-and-control methods and form the basis of more effective environmental management.

Inter-regional and inter-sectoral partnerships should be developed in areas such as urban water resource management because urban water management cannot be carried out within a single city, but rather requires a comprehensive approach including natural hydrological cycles and socio-economic aspects. Three areas require particular attention for enhancing eco-partnership with regard to water issues in urban environment:

(i) Water pollution control;
(ii) Water resource management and;
(iii) Inter-city and inter-regional co-operation for water resource allocation.

Some of the major achievements made in this regard include inter-city co-operative initiatives in urban

Box 5.1 Promoting environmental consciousness: The "Hand in Hand with Earth Village" project in China

Under the project "Hand in Hand in the Earth Village" initiated in 1996, students, with support from teachers, set up an earth village, which includes a waste recycling station and a small bank. The recycled products (from cans, papers, newspapers, batteries and plastic bags) are sold and the proceeds are collected in the bank and then sent to rural areas for development activities. The Project has already been successful in building two primary schools in Jiangxi Province. This Project is becoming popular in many Chinese primary schools especially in rural areas. Villages in the province now have a recycling station run by children.

Box 5.2 Eco-partnership through activities implemented jointly

As of 6 April 2001, 14 projects were accepted, approved or endorsed by the designated national authorities for activities implemented jointly (AIJ) among countries in the Asia-Pacific region. The AIJ projects covered activities in the area of forest preservation, energy efficiency, renewable energy, and fugitive gas capture.

Source: UNFCCC <http://www.unfccc.de/>

environmental management such as the "Kitakyushu Initiative for a Clean Environment". Such forms of partnership can be further extended into academic co-operation at regional and international levels.

Freshwater

Freshwater offers one of the most promising areas of eco-partnership - public-private partnership in water delivery and water related-infrastructure. There are already several cases of water-related public-private partnerships across the Asia-Pacific region. This kind of partnership can greatly contribute to improving performance and efficiency and should be encouraged further. Based on such experiences, greater private participation should be encouraged in such ways as:

(i) Combining public responsibility and ownership with private management in water service delivery;
(ii) Involving the private sector in water supply and wastewater treatment services in urban areas, based on agreed performance parameters.

Forest Conservation

Cooperation among local people, private corporations, local authorities, national authorities and non-governmental organizations is necessary for sustainable management of the forests. In order to enhance eco-partnership between the various stakeholders, attention should be paid to following factors:

(i) Changing the attitude of foresters (both corporations and government) - the so-called "foresters syndrome" or paternalistic professionalism that overly emphasizes the value of forests without integrating the concerns of people living in the forest areas. Eco-partnership should take place under socially acceptable and environmentally sustainable forest management.
(ii) Introducing "social forestry" that involves local people in forestry activity for the purpose of rural development, as a long-term alternative to "industrial forestry".
(iii) Establishing conflict resolution mechanisms through the channel of courts and also informal settings to ensure an adequate framework for partnerships that protect the rights of the local people.
(iv) Providing economic incentives for communities to be involved in forest conservation to offset the fact that compared to other activities, forest related activities generate no monetary benefit or take a long time to yield benefit, such as in the case of plantation forestry. This reality has constrained effective local involvement in forest conservation activities.

Biodiversity

The establishment of protected areas is one of the most effective means of biodiversity conservation. However, it has been observed that the establishment of protected areas might further limit the livelihood of people living around and historically depending on the resources within such areas. It is therefore important to develop mechanisms for partnership that ensure a sustainable use of biological resources while enabling local communities to make use of such resources for their living. The involvement of the local community provides not only a more effective mechanism for biodiversity conservation but also provides access to the traditional knowledge and resource management practices of such indigenous people. The San Salvador Islands Marine Park in the Philippines is a successful case of a protected area being established in partnership with the local community.

At the international level, there have been initiatives towards sharing experiences and information amongst countries with the aim of biodiversity conservation. The "Asia Pacific Migratory Waterbird Conservation Strategy" initiated in 1996 is one such example. Under that strategy, three different programmes on shorebirds, cranes and Anatidae of the region were planned and implemented jointly by governmental and non-governmental organizations.

Future policy initiatives should aim at:

(i) Initiating policies aimed at making it profitable for local communities to conserve their resources rather than exploit them. Such policies could include eco-tourism programs that generate revenues for the local community and the country and ensure an environmentally and socially acceptable management of biological resources.
(ii) Strengthening the biodiversity-related activities of regional cooperation mechanisms such as ASEAN, SACEP and SPREP.

Education for Sustainability

Sharing knowledge and exchanging experiences is particularly important in promoting environmental education. To that purpose, a network of environmental educators and facilitators from different backgrounds has been established across 36 countries of the Asia-Pacific region. This network was employed to prepare national reports from the respective countries to assess the environmental education situation of the region.

One of the remaining challenges is to increase cooperation among the governmental agencies dealing with environmental education.

5.1.3. Eco-Technology and Eco-Investment

To reduce environmental pollution and to use natural resources efficiently, the need for of environmentally sound technologies must be acknowledged and such technologies must be promoted. To this end, new and additional investment is necessary both in public and private sectors. In developing countries, however, technical and financial sources for eco-technology and eco-investment are limited.

Eco-technology and eco-investment are particularly relevant to the issues of Climate Change and Urban Environment Management.

Climate Change

In order to reduce the emissions of greenhouse gases, the technologies for promoting efficient use of fossil fuels, use of alternative energy sources and abatement of air pollution are crucial. Such technologies can be applied to many aspects of human activity such as production, consumption and transportation. Though such technologies have been created and promoted in developed countries, they have not yet been widely adopted in developing countries.

For developing countries in Asia, there are two barriers to eco-technology and eco-investment. Firstly, resources and funds are allocated towards economic growth rather than environmental protection. Secondly, there are insufficient financial resources devoted to eco-technology and eco-investment.

To facilitate the financing of greenhouse gas emissions reductions, donors have provided Official Development Assistance to developing countries. However, these funds have not been sufficient.

For further promoting eco-technology and eco-investment the following approaches have been recommended:

(i) Under quantified targets, designing and introducing appropriate emissions trading systems and carbon taxes could improve economic efficiency. Economic instruments that reduce emissions of CO_2 through price changes will not be effective unless practical energy-saving technologies are available.

(ii) Alternative sources of energy with low or zero CO_2 emissions, such as renewable energy (wind, solar, biomass, geothermal energy, etc.) and natural gas should be considered from a long-term perspective. In promoting the development of alternative energy, conventional measures such as subsidies for initial investment could be combined with policies to stimulate trade in electricity generated by alternative energy in a liberalized market (e.g. green certificates).

Urban Environment

Urban environmental management is another issue in which eco-technology and eco-investment are particularly relevant. Urban poverty, rapid economic growth, industrialization and the emergence of high consumption lifestyles have all put pressure on the urban environment of Asian cities. Lack of access to clean water for the urban poor, industrial pollution and lack of waste treatment facilities in Asian cities, particularly in Asian mega cities, suggest that investment in urban environment infrastructure has not been sufficient in these cities. It is expected that the countries at a "production stage" will soon enter the "consumption stage", implying higher consumption lifestyles, which will bring up additional volume of municipal solid waste.

Investment in waste treatment facilities, water treatment facilities and public transportation is insufficient in Asian cities, due to biased resource allocation towards big cities over smaller ones and, the poor financial capacities of the governments. To overcome these difficulties, governments should enhance the public capacity to finance urban environmental infrastructure and mobilise private funds. The development of public-private partnership is critical in this respect.

The following set of policy instruments is required to help facilitate investment in urban infrastructure:

(i) Institutional arrangement: the creation of special governmental organizations (e.g. the BOT center in the Philippines) to encourage the participation of private sectors in private finance initiatives (PFI);

(ii) Participatory approaches: public participation in the process of policymaking at city level (e.g. the creation of environmental councils being composed of representatives of the public and business as well as government);

(iii) Information diffusion & environmental education: the media has an important role in monitoring the environmental performance of government and business.

These three-policy instruments are relevant to overall urban environmental management of Asian cities and complement each other. To further enhance their effectiveness in achieving the desired environmental conditions, regional/international frameworks for cooperation are crucial. In addition, policy-makers should

Box 5.3 The CDM is expected to promote Environmentally Friendly FDI

To facilitate further financing, market-based mechanisms such as emissions trading, joint implementation and the clean development mechanism (CDM) were introduced in the Kyoto Protocol. These Kyoto mechanisms are expected to serve to incorporate the private sector in efforts to mitigate greenhouse gas emissions. Among them, the CDM is considered to have significant potential to promote foreign direct investment in the environmentally friendly projects of developing countries.

be concerned with investment in technological development of efficient energy aimed at reducing traffic air pollution.

Freshwater

Technological innovation and adaptation are key components of efforts within the water sector. At the conceptual level, models and forecasting systems are being improved to allow better predictions of temporal and spatial variations in the quantity and quality of water resources. Some of the areas where technology development policies should focus are:

(i) Water saving technologies in irrigation (e.g. drip irrigation);
(ii) Improved and cost-effective methods for the treatment and reuse of wastewater in industries and domestic systems, aquifer recharge technologies, human waste disposal systems that require no or extremely small quantities of water and cheap but effective water purification systems for villages.

Forest Conservation

Traditional Forest Related Knowledge (TFRK) will, alongside modern technology, play an important role in forest conservation and sustainable forest management. In order to understand/realize the potential of TFRK, further field research by anthropologists and ethnobotanists should be encouraged.

Biodiversity

Modern technology can foster biological protection in two ways - prevention and restoration. Using Geographic Information Systems (GIS) in the process of making a development plan can make it possible to identify crucial habitats for endangered species and ecosystems and suggest the most appropriate zoning plan for the conservation of species/ecosystems.

Once an ecosystem has been destroyed, some part of it will never be restored and it takes several years for other parts to recover. Some technologies have been developed and applied in various fields to restore deteriorated ecosystems and there are some successful cases. For example, botanical gardens and zoos can be used to recover lost populations. Head starting and transplanting to augment existing populations or establish new ones are among the other methods for recovering declined populations. International networks among botanical gardens and zoological parks can facilitate cooperation in *ex-situ* conservation. While technologies for recovery and restoration of biological resources should be promoted, the prevention of habitat destruction must be set as a priority in conservation policies.

5.1.4. Eco-Policy Linkage

There are three practical implications of the concept. The first one is that countries address their domestic environmental issues at a regional or global level. The merit in such an approach is that it provides developing countries with new flows of funding and technologies. The second one is that different sectoral policies are integrated to tackle environmental problems. The third one is to link different socioeconomic policies in their relation to the environment.

Climate Change

At the third session of the Conference of the Parties (COP 3) in December 1997, governments agreed to adopt the Kyoto Protocol, which requires developed countries to reduce their GHG emissions by 5.2 percent of the 1990 level by the period of year 2008-2012, while developing countries are exempted from reduction commitments.

However, in the future, the participation of developing countries will be indispensable in attaining global targets for emissions reduction. International climate policy frameworks, including the Kyoto Mechanisms, offer a golden opportunity for Eco-policy linkage between the developed and the developing countries.

International mechanisms such as the world trade system and development assistance also are of great relevance to the participation of developing countries in the Kyoto Protocol. However, domestic measures to achieve national emission reduction targets should be given priority in both developing and developed countries.

In addition to international policy-linkage, climate change in particular involves a strong dimension of sectoral linkage with policies relating to urban environment, forestry, water and biodiversity. Mitigating and adapting to climate change requires an integrated approach with these other issues.

Urban Environment

In the context of urban environment, there are two facets to policy linkage. The first is to address local urban environmental issues at the regional or global level. The second is to link different socioeconomic policies to tackle urban environmental issues.

Among urban environment management issues, transportation and waste treatment should be addressed at the regional or global level because air pollution by automobiles and inadequate waste treatment cannot be confined at a city level or even at a national level, but become issues beyond municipal and national boundaries.

Eco-Policy Linkage is crucial to:

(i) Finance urban infrastructure investment by foreign capital;
(ii) Exchange information and experiences among cities in Asia and the Pacific by bringing issues onto the international level.

Regarding air pollution, the mitigation of traffic pollution is particular important in Asia because many cities suffer from traffic air pollution and its impacts on the health of urban dwellers. To tackle traffic air pollution, the following policies must be linked:

(i) Energy related policy (e.g. Improvement of energy efficiency)
(ii) Urban development policy (e.g. Urban transportation

policy)
(iii) Economic policy (e.g. Industrial policy).

Freshwater

International policy coordination would often be required in the management of water resources. Especially when dealing with international watercourses, all involved riparian countries have "natural monopolies" in data collection and dissemination within their national territories. In such contexts, developing mechanisms for openness and sharing of information is important. In the case of inter-basin water management, such as in Central Asia, policy coordination is needed. Physical linkage between hitherto separated water basins can facilitate joint management.

In the Pacific, which is characterized by the co-existence of small atolls with severe water shortages and water quality problems on the one hand, and larger volcanic and high mountainous islands where water is generally abundant, on the other hand, establishing mechanisms for international cooperation is crucial.

Inter-sectoral approaches to water management are a second dimension of policy linkage. The management of land use is as important as managing the water resource itself since it will affect flows, patterns of demand and pollution loads. For example, land uses may be regulated in upstream recharge areas and around reservoirs to prevent pollution, salination and changed run-off regimes. Inter-sectoral co-ordination should also be considered for competing uses of water. Irrigated agriculture is already responsible for more than 70% of all water withdrawals in the world. With an estimated need for an additional 15-20% of irrigation water over the next 25 years, serious conflicts are likely to arise between water for irrigated agriculture and water for other human and ecosystem uses.

In order to develop appropriate ways to co-ordinate policy-making, we recommend that the integrated water resources management (IWRM) system (planning and implementation in an integrated manner across sectoral, institutional and professional boundaries) is adopted. IWRM is a process to improve planning, conservation, development, and management of water, forest, land, and aquatic resources in a river basin context, to maximize economic benefits and social welfare in an equitable manner without compromising the sustainability of vital environmental systems.

Forest Conservation

Regarding forest conservation, an increasing demand for timber from importing countries has accelerated public or commercial logging in exporting countries. For exporting countries in Asia, the export of timber is an important source of foreign exchange to finance their economic development. Forest loss as a result of over-logging is not simply a problem for exporting countries, but also importing countries. The issue of appropriate forest management should therefore be addressed at the regional or global level.

It has been observed that economic and forest policies set in one country often have effects in other countries. For example, since 1998, the logging ban in China has spurred a rapid increase in timber demand from neighboring Russia. As a result, unsustainable export-oriented commercial logging has taken place in Russia, accelerating the loss of forest.

Countries should make use of existing policy dialogue forums such as regional and sub-regional organizations to develop policy linkages among them. Such policy linkages can enable national authorities to take into consideration.

Regional cooperation mechanisms should be sought for addressing transboundary problems such as forest fires and the resulting haze problems.

Biodiversity

A number of biodiversity-related international agreements such as the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have been opened for signature and some of them have already been ratified. Many nations in Asia and the Pacific regions have ratified the CBD.

However, the capacity to implement scientific research on biodiversity is insufficient. In order to conserve the biodiversity of the region, it is necessary to have interdisciplinary and intersectoral collaborations.

5.2. CROSSCUTTING POLICY RECOMMENDATIONS

Reviewing the interactions between socio-economic factors driving environmental change and the critical environmental issues in Asia and the Pacific, taking into consideration the four concepts of Eco-consciousness, Eco-partnership, Eco-investment/technology and Eco-policy linkage, leads to several crosscutting policy instruments. These instruments, taken as a package, need to be considered in addressing major environmental problems facing countries in the region.

(i) Promotion of the monitoring of changing environmental conditions and dissemination of such information among the general public.

Box 5.4 Function of Multilateral Agreements on Biodiversity

International agreements provide mechanisms for identifying and conserving sites of biodiversity. Because of the unlimited value of biodiversity for human beings, such mechanisms benefit not only signatory nations, but also the international community.

Environmental monitoring for a better under-standing of the state of the environment and the extent of damage is necessary for devising countermeasures. In addition, sharing information and making such information available to the general public can foster concerns and action from all segments of society.

(ii) Creation of market systems that attach intangible (non-economic/social) value as well as tangible (economic) value to environmental assets.

For example, the price of resources should include not only the cost of production, but also the intangible value of the ecosystem.

(iii) Creation of institutional mechanisms that allow citizens and businesses to be involved in decision-making and also the implementation of environmental policies.

Governments, businesses and civil society organizations have their respective comparative advantages in contributing to the challenges of environmental conservation. Horizontal approaches that involve civil and business communities, create networks among National Commissions on Sustainable Development, and encourage local initiatives in the process of environmental policy-making and implementation are more likely to yield greater environmental benefits.

(iv) Promotion of a precautionary approach to health-related and irreversible environmental damage.

A systematic use of precautionary approaches needs to be adopted because for many of the environmental problems identified because i) the cost of prevention is relatively low or nil compared to the tangible and intangible loss from environmental damages and the cost of reparation and/or ii) environmental damage is often irreversible/irreparable and has negative human-health effects.

(v) Development of regional cooperation mechanisms to address cross-country environmental issues.

Many of the environmental problems facing the region are transboundary in nature and require response measures at the regional or global level. For that reason, existing regional mechanisms for cooperation should be strengthened and better integrated. New regional platforms, with multi-stakeholders' participation need to be considered to ensure cooperation in areas where no regional mechanism is in place.

(vi) Promotion of an inter-sectoral approach for interlinked issues.

There exist deep interlinkages between the different environmental problems - climate change, forest conservation, biodiversity, urban environment and freshwater - in Asia and the Pacific region. This applies to both their root causes as well as the responses needed. Taking an inter-sectoral approach to their solutions is therefore a crucial dimension of policy responses.

(vii) Selective application of traditional knowledge/techniques and modern technology.

Traditional knowledge and modern technologies relevant to environmental conservation should be promoted and diffused on a selected basis, taking into consideration their adaptability and relevance to the specific needs and circumstances of each country.

5.3. FORWARD-LOOKING ACTIVITIES

The ECO-ASIA Long-term Perspective Project (LTPP) has identified major environmental issues confronting the Asia-Pacific region, examined their connection to socioeconomic issues, promoted four key Eco-concepts and recommended crosscutting policies that can contribute to the long-term sustainable development of the Asia-Pacific region. Issues discussed in this report still remain critical in the region and need further examination. Some issues not fully addressed under the LTPP, such as land degradation, waste management, and capacity building, are also to be further examined to respond to the regional concerns.

The product of the LTPP must reflect the shift of Eco ASIA activities from policy dialogue to actions. The following activities should follow the adoption of this LTPP report.

Asia-Pacific Environmental Innovation Strategies (APEIS)

The Asia-Pacific Environmental Innovation Strategy Project will be launched at ECO ASIA 2001. This Project is a successor of the LTPP and aims to realize and substantiate the four key concepts for long-term sustainable development in the region developed by the LTPP. The objectives of the Innovation Strategy Project are three-fold:

(i) To build the scientific infrastructure necessary to formulate innovative policies for sustainable development, for the use of policy makers in the Asia-Pacific region and as a common asset in the region.

(ii) To promote environmental cooperation and capacity building so as to enable Asia-Pacific countries to formulate their own policies that take into account their national circumstances, based on the scientific infrastructure, through participation in and collaboration with the Project.

(iii) To propose a model for a regional initiative that explores sustainable development and that can be presented by this Region to the rest of the world.

This project consists primarily of three international scientific activities: satellite and ground-based integrated monitoring, assessments using environment-economy

integrated models and research on innovative strategy options. Although each can function as an individual research project, synergistic effects between these projects are anticipated because of their mutual interactions and because they collectively cover major elements required of environmental policy, i.e. the understanding of environmental conditions, assessment and future prediction, and policy formulation. The outcomes of the three main components of international scientific activities will be presented to meetings of policy-makers in order to support discussions for the elaboration and implementation of innovative environmental strategies in the Asia-Pacific region. At the same time, the scientific community will benefit from policy guidance from policy makers so that their activities can best reflect the policy makers' needs. ECO ASIA is supposed to be the primary audience and body providing policy guidance.

The Innovation Strategy Project is expected to ensure multi-stakeholder participation including scientists, policy makers and civil society and is designed to meet specific needs of the Asia-Pacific countries. Moreover, the Project is exploring collaboration and synergy with other relevant projects such as the "Millennium Ecosystem Assessment" and the National Environment Indicators and Performance Assessment Systems in Asian Developing Countries.

Asia-Pacific Forum for Environment and Development (APFED)

The establishment of the Asia-Pacific Forum for Environment and Development (APFED) was agreed at ECO ASIA 2000 and will be officially launched at ECO ASIA 2001.

In spite of the world's joint efforts towards implementation of Agenda 21 adopted at the United Nations Conference on Environment and Development (UNCED) in 1992, environment and development problems have been worsening. The APFED aims to explore a new vision for more balanced sustainable development in the context of the Asia-Pacific region and to present it to international policy dialogues on environment and development issues. APFED is expected to send messages to the United Nations World Summit on Sustainable Development (WSSD) in 2002 and present a final report to the world community at relevant occasions, including ESCAP/MCED 2005.

The critical environmental issues and socioeconomic issues identified by the LTPP could contribute greatly to the APFED in the selection of major environment-development issues to cover. In addition, crosscutting policies recommended in this section can also contribute to policy dialogues among eminent persons.

Kitakyushu Initiative for a Clean Environment

The Kitakyushu Initiative for a Clean Environment was adopted at the fourth Ministerial Conference on Environment and Development in Asia and the Pacific region, 2000. The Kitakyushu Initiative attempts to draw lessons from the experience of the city of Kitakyushu, Japan, which has successfully overcome environmental pollution and put them together as effective actions that could be useful in other cities in Asia and the Pacific region.

Its objective is to achieve measurable progress in improving the urban environment in Asia and the Pacific region, principally through local initiatives aimed at controlling air and water pollution, minimizing all kinds of wastes and alleviating other urban environmental problems. Measures considered to be effective include measures to enhance partnership, to improve the environmental technology base, to promote public and private sector investment in the environment, to promote environment information and education and to strengthen international environmental cooperation based on local initiatives as well as to strengthen local initiatives. These measures are in line with the environmental concepts developed by the LTPP. The Kitakyushu Initiative can be a showcase for enhancing the product of the LTPP.

Regional Cooperation

Regional cooperation is an essential tool for conservation of the environment shared by countries in the region. In the Asia and Pacific region, although environmental cooperation has been promoted to cope with serious environmental issues, further efforts are needed to enhance environmental cooperation.

We have high expectations that regional cooperative mechanisms such as Acid Deposition Monitoring Network in East Asia (EANET) and Asia-Pacific Migratory Waterbird Conservation Strategy could provide the venue to follow up the findings of the LTPP. They could also contribute to promote the activities under the Asia-Pacific Network for Global Change Research (APN).

Furthermore, the output of the LTPP might also be used to promote the soon-to-be established regional network in the Asia-Pacific region for environmental business, environmental accounting and environmental education.

Multi-dimensional Research Activities and Periodical Publications

Sustainable development requires a multidimensional and integrated approach. To that aim, further research efforts should be made so as to enhance the intellectual foundation for a greater integration of the social, economic and environmental dimensions of sustainable development. For that purpose, we should consider a periodical publication that provides a comprehensive analysis of these three components in the Asia-Pacific region, along with policy recommendations for actions.

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ECO ASIA (Environment Congress for Asia and the Pacific) was established in 1991, on the initiative of the Ministry of the Environment (formerly Environment Agency), Government of Japan, as a forum for high-level government officials and representatives from international organizations to discuss environmental policy in Asia and the Pacific.

ECO ASIA LTPP (ECO ASIA Long-term Perspective Project), a scientific research project to reveal the present state and future perspectives on the environment in the region, was launched in 1993 under the framework of ECO ASIA to enrich its environmental policy dialogues. LTPP has conducted comprehensive research on a wide range of issues related to sustainable development in Asia and the Pacific and put forward its research outcomes and policy recommendations to ECO ASIA.

IGES (Institute for Global Environmental Strategies) was invited to play a key role in conducting the LTPP at the 8th ECO ASIA held in September 1999. IGES has been playing its role as an international think-tank for ECO ASIA, by coordinating and implementing research activities of the LTPP, through collaboration with a number of research institutes in the region.

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