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Mainstreaming Sustainable Development Policies in East Asia

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Executive Summary

Promotion of sustainable development (SD) that simultaneously achieves poverty alleviation, economic development and environmental protection is the most urgent issue in East Asia where both rapid economic growth and aggravating environmental problems are actualised. This research project aims to mainstream SD concerns into the policy making process in this region. The geographical scope of the research is the member countries of East Asia Summit (EAS), i.e. ten countries of ASEAN, Japan, China, Korea, India, Australia and New Zealand, for which the Economic Research Institute for ASEAN and East Asia (ERIA) was established.

The research will first identify priority issues to promote SD. Then, effective policies to address priority issues will be formulated, based on prior (ex ante) policy assessment from the viewpoint of sustainable development, which is referred to in this project as Sustainable Development Policy Assessment (SDPA). SDPA is a prior policy impact assessment aiming to assess the impacts of policies from the view point of sustainable development. SDPA covers impacts of proposed policies on selected economic, environmental and poverty indicators. Policies to be assessed (SD policies) will include environmental policies, trade policies, energy policies and so on, as various categories of policies have significant impacts on sustainable development, even we narrowly focus on sustainable natural resources management and poverty reduction. SDPA employs the Integrated Policy Assessment Model (IPAM) based on a multi-regional computable general equilibrium (CGE) model as a core module of the analytical framework, but also employs other types of models, which are labelled as Thematic Models (TMs), to assess specific issues in more detail, as analysis on sustainable natural resources linking with poverty reduction, the focus of this research, often requires microeconomic models and/or spatial analysis models. TMs will provide assessment results directly or indirectly as input to IPAM. The results of research activities will be published as Sustainable Development Outlook. In addition, this research will establish ERIA Database on SD which will compile collected data and information and will be publicised through internet. This project is proposed as a pilot project for regular activities of ERIA to publish a series of Sustainable Development Outlook, and the main content of the Sustainable Development Outlook to be prepared by this pilot project will be a detailed explanation of methodologies, in particular SDPA, and illustrative examples of application of SDPA to selected priority SD issues.

In the fiscal year 2008, the Working Group of this project was established with 11 members, and three Working Group Meetings were held. The first Working Group Meeting was held on 31 July 2008 in Manila, the Philippines to discuss the research plan proposed by IGES. The second Working Group Meeting was held on 3 and 4 December 2008 at the IGES Headquarters Office in Hayama, Japan to discuss the draft of country review papers, which aim to provide background of a Sustainable Development Outlook, and report the progress of thematic studies that aim to develop TMs of priority issues. The third Working Group Meeting was held on 12 and 13 March 2009 in Bogor, Indonesia, to report the progress in this fiscal year and discuss the research plan of the next fiscal year.

The major outputs in the fiscal year 2008 were the conceptual design of SDPA, the three thematic studies to develop TMs for priority issues, and the country review papers that provide background of a Sustainable Development Outlook. As the conceptual design of SD, the overall framework consisting of IPAM employing multi-regional CGE model and TMs specific to priority issues was proposed, and a prototype of IPAM was developed with identifying necessary elaboration in the next fiscal year such as incorporation of forward-looking dynamics, explicit treatment of government sector and reflection of resource constraints. For the thematic studies, the research design were developed for three priority issues, i.e. China's enforcement of water pollution prevention and control, China's sustainable forest management, and India's sustainable livelihood based watershed management, and the research activities were commenced. For the country review papers, six working group members reviewed the existing SD conditions of the respective country with identifying priority issues. The country review papers captured the most of the negative impacts of the economic development in their respective countries and tried to come out with certain improvement direction subject to further investigation.

1. OVERALL FRAMEWORK

1.1 Background and Objectives

Natural resources play special roles in the life of the poor. More than 1.3 billion people depend on fisheries, forests, and agriculture for employment—close to half of all jobs worldwide. According to the World Bank, in 2002, 90 percent of the world's 1.1 billion poor—those living on less than $1 per day—depended on forests for at least some part of their income. In 2002, international development agencies estimated that more than 90 percent of the 15 million people working on the world's waters were small-scale fishers, most of them poor, not including the tens of millions of poor who fish inland rivers, lakes, and even rice paddies for protein.

While all human societies are linked to ecological processes and healthy ecosystems that produce the requirements for life, rural poor people depend significantly more on natural capital than do other parts of the population. In developing East Asian countries, a large population of the poor are engaged in resource-dependent activities such as small-scale farming, livestock production, fishing, hunting, artisanal mining, and logging. Poor people rely on related harvests as a primary source of income and fall back on natural resources when other sources of income fail.

Providing as subsistence to the rural poor and major sources of their income, natural resources and healthy ecosystem play a vital role in extricating the poor out of the poverty trap. In this context, sustainable management of natural resources by maintaining and improving the productivity of natural capital and creating stable and reliable income to the poor should be an integral part of poverty reduction strategy at either regional level or national level.

The United Nations (UN) Millennium Development Goals (MDGs) and the World Bank Poverty Reduction Strategy Papers (PRSP) provided some key approaches and policies in the context of development agenda and poverty reduction. Yet these approaches may not fully account for the links between resource management and poverty reduction, and subsequently fail to realize the full potential of natural resources (goods and services) as wealth-generating assets for the poor.

Against this background, promotion of sustainable development (SD) that simultaneously achieves poverty alleviation, economic development and environmental protection is the most urgent issue in East Asia where both rapid economic growth and aggravating environmental problems are actualised. This recognition is endorsed by the first article of the ASEAN Charter signed by the heads of the ASEAN member states in November 2007.

This research project aims to mainstream SD concerns into the policy making process in this region. The research will first identify priority issues to promote SD. Then, effective policies to address priority issues will be formulated, based on prior (ex ante) policy assessment from the viewpoint of sustainable development, which is referred to in this project as Sustainable Development Policy Assessment (SDPA). The results of research activities will be published as Sustainable Development Outlook. In addition, this

research will establish ERIA Database on SD which will compile collected data and information and will be publicized through internet.

1.2 Scope

The geographical scope of the research is the member countries of East Asia Summit (EAS), i.e. ten countries of ASEAN, Japan, China, Korea, India, Australia and New Zealand, for which ERIA was established. This project is proposed as a pilot project for regular activities of ERIA, with the results and findings of the research to be published in the main output entitled "Sustainable Development Outlook". The main content of the Sustainable Development Outlook will be a detailed explanation of methodologies, in particular SDPA, and illustrative examples of application of SDPA to selected priority SD issues, but as a pilot project the issues and countries to be covered by this Sustainable Development Outlook may be partial due to limited human capacity and budget constraints.

SD is related to almost every issue in society. To effectively implement this project, it is necessary to focus on specific aspects of SD. This research will mainly focus on sustainable natural resource management (such as forest and freshwater) and poverty reduction, among much wider range of issues related to SD. One of the most important factors in resource management and poverty reduction is appropriate implementation of environmental policies in each country or region. It is not until the environmental policies are actually implemented that a virtuous circle which leads to poverty reduction is brought to lives of people who benefit from natural resource. In this regard, it has been pointed out that the real problem is often inappropriate institutional and governance arrangement to ensure effective implementation of existing policies rather than lack of well designed policies in many East Asian countries. This research will address policy implementation issues such as enactment and enforcement situation of pollution restriction methods by conducting institutional study in a few case study countries.

The focus on sustainable natural resource management and poverty reduction reflects the project-specific definition of SD. In order to operationalise SD, it seems necessary to clarify (i) what "development" means, and (ii) what to be sustained. For the former question, this research interprets development as poverty alleviation, in which 'any fundamental human need that is not satisfied reveals a human poverty' (Max-Neef 1992, p.200). For the latter question, many (including both weak and strong sustainability approaches) have argued that the subject to be sustained is the level of human welfare or the main generators of human welfare such as capital stock in s broad sense (see Neumayer 2000). However, such a non-declining welfare based SD concept is apparently not acceptable for the poor who cannot satisfy their basic needs (Kojima 2007). The current poor people need drastic improvement, which is 'development', rather than sustaining the current situation. This research advocates that what to be sustained must be key ecosystems that serve as the basis of human survival and have severely damaged by conventional economic development.

1.3 Major Research Components

This project consists of the following three major components (see Figure 1.1).

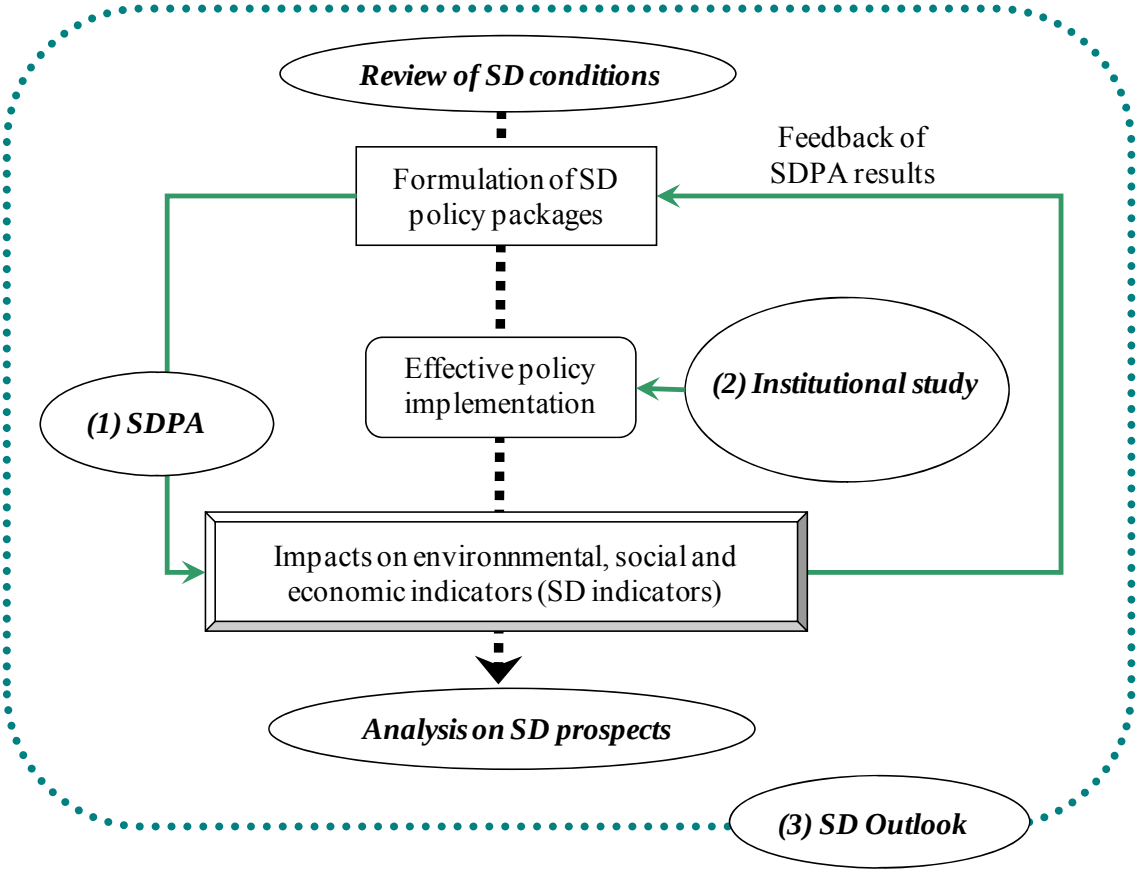

Figure 1.1 Major Research Components

1.3.1 Component 1: Sustainable development policy assessment

First, this research will identify priority issues to be addressed in East Asia to promote sustainable natural resource management and poverty reduction. This research will collect the economic, social and environmental data relevant to priority issues. The policy packages to address priority issues will be formulated and assessed using SDPA methodology.

1.3.2 Component 2: Institutional study

This component aims to propose effective measures to strengthen national institutional capacity and to promote synergy among existing regional organisations to implement sustainable development policies in this region. For this purpose, this component will (i) quantitatively assess the impacts of effective implementation of environmental policies in a few case study countries, and (ii) assess major factors, both negative and positive factors, influencing the effectiveness of policy implementation.

1.3.3 Component 3: Sustainable Development Outlook

As one of end products, a Sustainable Development Outlook will compile the established methodologies and examples of application of the methodologies to selected priority issues, against the background established by review of SD conditions. It is expected for this pilot publication to establish the basis of regular publication of Sustainable Development Outlook that facilitates policymakers of the EAS member countries to reflect SD consideration into their policymaking processes.

1.4 Organisational structure

The organisational structure of this research project is shown in Figure 1.2.

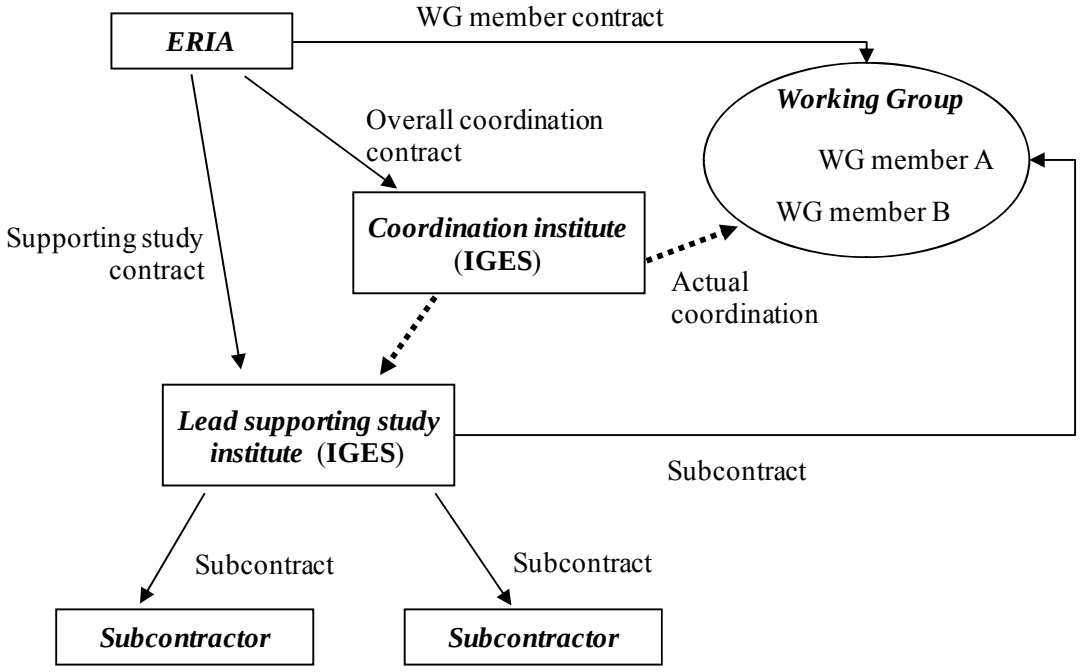

Figure 1.2 Organisational Structure

The substantial part of this research project will be provided through supporting studies, and the Working Group consisting of experts from EAS member countries implements the research project based on the inputs from supporting studies. IGES coordinates overall project as the coordination institute on behalf of ERIA, and IGES will handle contracts between ERIA and WG members as well as ERIA and supporting study institute. At the same time, IGES leads supporting studies as the lead supporting study institute.

1.5 Time Schedule

The planned time schedule is as follows:

FY 2008 (June 2008 - March 2009)

- July: 1st Working Group Meeting in Manila, the Philippines. Discuss research design.

- August-February: Conceptual design of SDPA, test run studies, country review of SD conditions.
- December: 2nd Working Group Meeting in Hayama, Japan. Report the progress.
- March: 3rd Working Group Meeting in Bogor, Indonesia. Discuss the first year achievement and the second year research plan.

FY 2009 (April 2009 – March 2010)

- April -November: Implement 3 case studies from FY2008
- April -November: Develop an integrated policy assessment model (IPAM)
- May: Invitation of case study proposals
- June: 1st Working Group Meeting, selection of additional case studies
- November: 2nd WG meeting, reporting progress and discuss final output of 2nd fiscal year
- December: Formulate draft SD policies for SDPA
- March 2010: 3rd WG meeting, report the final output of 2nd fiscal year and discuss the implementation plan in 3rd fiscal year.

FY 2010 (April 2010 – March 2011)

- April -October: Elaborating SD policies with SDPA
- April -January: Develop SD Database
- June : 1st WG meeting
- November: 1st Policy Forum, inviting various stakeholders to reflect their comments
- November-February: Draft SD outlook
- February: Final WG meeting
- February-March: Finalise SD outlook
- March: 2nd Policy Forum to launch SD outlook

2. MAJOR ACTIVITIES IN FY2008

2.1 Establishment of the Working Group

The Working Group of this project was established with the following experts.

Leader: Cielito F. Habito (Ateneo de Manila University, the Philippines)

Coordinator: Satoshi Kojima (Institute for Global Environmental Strategies, Japan)

Members: Jintao Xu (Peking University, P.R. China)
Rizaldi Boer (Bogor Agricultural University, Indonesia)
Kausik Gupta (Rabindra Bharati University, India)
Jeonin Kim (Chung-Ang University, Republic of Korea)
Souphasay Komany (Prime Minister's Office, Lao PDR)
Sitanon Jesdapipat (Mae Fah Luang University, Thailand)
Xin Zhou (Institute for Global Environmental Strategies, Japan)
Anindya Bhattacharya (Institute for Global Environmental Strategies, Japan)
Akiko Onodera (Institute for Global Environmental Strategies, Japan)

Advisors: Raman Letchumanan (ASEAN Secretariat)
Peter King (Institute for Global Environmental Strategies, Japan)

2.2 Working Group Meetings

The following 3 Working Group Meetings were held in FY2008.

- The 1st Working Group Meeting of the ERIA-SD Project was held on 31 July 2008 at the Richmonde Hotel in Manila, the Philippines. The meeting was attended by 12 participants, 11 Working Group Members from 8 countries including the project leader Prof. Habito (the Philippines) and Dr. Peter King as an advisor. At the meeting, the research plan was proposed by IGES, which is coordinating the project on behalf of the ERIA that is under preparation, and based on the proposal it was discussed how to implement the project. Furthermore, each Working Group member presented priority SD issues in his country and these input were reflected in the discussion.

- The 2nd Working Group Meeting was held on 3 and 4 December 2008 at the IGES Headquarters Office in Hayama, Japan. The unexpected airport closure in Bangkok precluded having perfect attendance, and finally 8 Working Group members including those from China, Japan, Republic of Korea, India attended the meeting. Main meeting objectives were (i) to discuss the draft of country review papers to be presented by Working Group members, and (ii) to report the progress of case studies.

- The 3rd Working Group Meeting was held on 12 and 13 March 2009 at the Novotel Bogor Hotel in Bogor, Indonesia. The meeting was attended by 12 participants, 10

Working Group Members from 7 countries except for Thailand, Ms. Riena Prasiddha from ASEAN Secretariat as an advisor, and Prof. Fukunari Kimura, the Chief Economist of ERIA, as an observer. At the meeting, each WG member presented the progress in this fiscal year, and based on these presentations the research plan of the next fiscal year was discussed.

3. MAJOR OUTPUTS IN FY2008

This project produced the following major outputs in FY2008:

- Conceptual design of SDPA,
- Three thematic studies to develop TMs of priority issues, and
- Country review papers that provide background of a Sustainable Development Outlook.

3.1 Conceptual Design of SDPA

3.1.1 Introduction

SDPA is a prior policy impact assessment, similar to strategic environmental assessment (SEA), that aims to assess the impacts of policies from the view point of sustainable development. SDPA covers impacts of proposed policies on selected economic, environmental and poverty indicators. Policies to be assessed (SD policies) will include environmental policies, trade policies, energy policies and so on, as various categories of policies have significant impacts on sustainable development, even we narrowly focus on sustainable natural resources management and poverty reduction.

This research project will mainly address SD policies to be implemented at the national level (and local level if necessary), but it is still important to include regional aspect. Its rationales include, at least;

- Linkages between regional economic integration, another pillar of ERIA research, and SD policies are important, and SD policies also include trade policies,
- Some SD issues may have transboundary nature, and
- National SD policies could have "spill over" effects and regional cooperation will facilitate effective implementation of national SD policies.

To address these issues, a multi-regional computable general equilibrium (CGE) model is an appropriate analytical tool. Multi-regional CGE models are able to reflect the above regional issues in policy assessment at the national level. SDPA employs the Integrated Policy Assessment Model (IPAM) based on a multi-regional CGE as a core module of the analytical framework.

SDPA also employs other types of models to assess specific issues in more detail, as analysis on sustainable natural resources linking with poverty reduction, the focus of this research, often requires microeconomic models and/or spatial analysis models. Policy targets for the most environmental indicators are set as permissible levels of pollutant concentrations rather than nationwide pollutant emissions, and spatial distribution of emissions is important. Health is one of the key elements of poverty, and environmental targets are normally set to avoid negative health impacts. Another important element of poverty is lack of access to sufficient quality and quantity of natural resources, and policy impact assessment from such a perspective may require detailed micro-level analysis. For example, sustainable freshwater management may require watershed model using geographical information system (GIS). These models specific to some issues, which are

labeled as Thematic Models (TM), may mainly be national or sub-national (local), but it could be cross-boundary if the studied topic has transboundary nature. TM will provide assessment results directly or indirectly as input to IPAM, as shown in Figure 3.1.

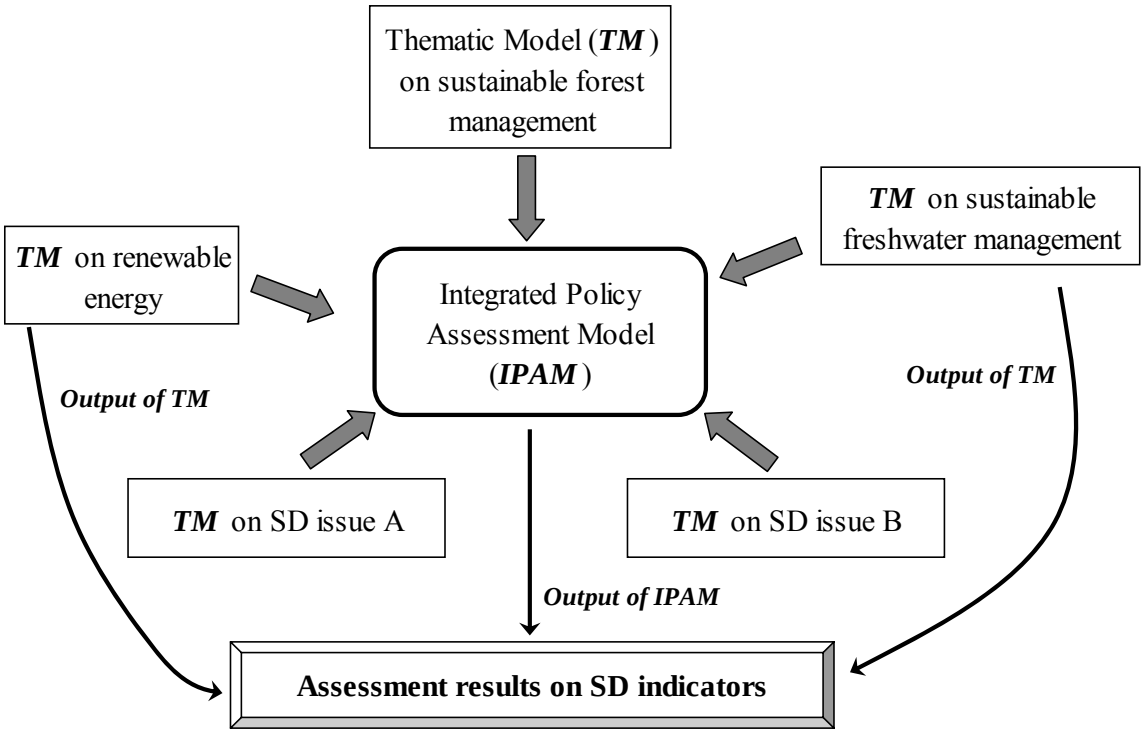

Figure 3.1 Image of linkages between IPAM and TSMs

In addition to quantitative analysis, SDPA may also include qualitative analysis if necessary, but ways to provide quantified assessment results will be always sought as quantitative evidence is more appealing to policy makers.

SDPA is expected to exhibit the environmental, social and economic consequences of implementing proposed SD policy packages. The results will be either compared with authorised policy targets of selected SD indicators or expressed as the change from the existing situation.

The assessment will be mainly done at the national and the regional levels. IPAM will directly provide assessment results at the national level (and the regional level), while some TMs may focus on the local level impacts. The outputs of such TMs will be related to the national level assessment through generalisation of the results.

SD policy packages could include environmental policies, land use policies, agricultural or forest policies, trade policies, and so on. SDPA is primarily designed for national SD policies, but regional aspects can also be reflected. Concerning the regional economic integration (REI), another pillar of ERIA research, it can be incorporated as background scenarios to see how REI will affect policy impacts. Economic integration policies can also be assessed as one component of SD policies.

3.1.2 Development of Integrated Policy Assessment Model (IPAM)

(1) REPA model: a prototype model

IGES developed the Regional Environmental Policy Assessment (REPA) model as a main analytical tool to conduct impact assessment of environmental policies under regional economic integration in East Asia (Kojima 2008). The REPA model was developed based on GTAP-E model.[1] The main features of the current REPA model are as follows:

- The world is divided into 12 regions, i.e. Japan, China, Korea, 6 major ASEAN countries, the rest of ASEAN, the rest of OECD members, and the rest of the world. An economy is disaggregated into 33 sectors/commodities.
- Dynamics towards 2020 are incorporated by solving for a series of static equilibria connected by exogenous evolution of macroeconomic drivers. The employed time steps are 2001-2010, 2010-2015, and 2015-2020.
- Impacts of several environmental policies as well as import tariff reduction can be assessed simultaneously.
- The coverage of environmental impact assessment is GHG, air pollutants, water pollutants and solid wastes.
- Economic cost of environmental policies are reflected as decreased productivity of value-added (capital and labour) caused by diverting a fraction of value added from production process to abatement activities responding to the binding environmental standards.
- Poverty impact assessment module of the REPA model follows the method developed by the World Bank (2002), in which the averaged unskilled labour wage deflated by a food and clothes consumer price index (CPI) affects poverty headcounts (Anderson et al. 2006).

The current REPA model can assess the impacts of the following environmental policy instruments:

- Carbon tax
- Carbon emission trading
- Binding environmental standards for pollutant emissions and energy efficiency improvement
- Subsidies for abatement activities by firms
- International financial cooperation financed by revenues from carbon tax and emission trading

These features make the REPA model a suitable prototype of IPAM, but the following challenges need to be addressed to develop more elaborated IPAM.

[1] GTAP-E is an energy-substitution-extended version of Global Trade Analysis Project (GTAP) model, which is a widely used multi-regional CGE model developed by an international consortium of researchers coordinated by the Center for Global Trade Analysis located at Purdue University, USA. For the details of the GTAP model, see Hertel (1996). Also see Burniaux and Truong (2002) for the details of the GTAP-E model.

- REPA model employs recursive dynamic approach that assumes steady-state equilibrium for each time step. This assumption is too strict to conduct simulations with huge exogenous shocks. It is highly desirable to develop IPAM with forward looking dynamic mechanism.
- REPA model inherits the shortcoming of the GTAP model that does not have separate government account (only "regional account" mixing up accounts of the government, households, and private sectors).
- REPA model does not reflect resource constraints and benefits from sustainable resource management are not well evaluated.
- Poverty assessment module is very preliminary, which estimates only poverty headcount (population below US$2/day). It is important to reflect unemployment issues to improve poverty assessment module, as recent debate on Green New Deal clearly aims at job creation by green investment.

(2) Forward-looking dynamics

Following Kojima (2007), it is planned to employ forward-looking dynamic specifications with imperfect foresight assumption for the development of IPAM.

Most forward-looking dynamic CGE models assume that households have perfect foresight in forming their expectations of time paths of price variables such as rental rates of capital, wage rates and exogenous prices. This apparently unrealistic assumption is helpful and justifiable to seek the first best outcomes. When the purpose of analysis is to formulate policy packages satisficing several constraints and policy targets under full of uncertainty, however, bounded rationality assumption seems an adequate approach taking into account the fact that any information is not enough for the households to perfectly predict entire time paths of exogenous prices. It is important to notice that the implication of bounded rationality is not confined in the way of information processing, such as selection of input information. Rather, awareness of bounded rationality would urge decision makers to tailor decision-making procedure itself to fit their cognitive ability. Replacing unbounded rationality with bounded rationality would introduce frequent monitoring-feedback process in the decision procedure.

In the employed forward-looking dynamic mechanisms, the households expect that the future trajectories of exogenous variables are constant at the current values but next moment they update this expectation based on realised values of exogenous variables.

(3) Explicit treatment of government

It is planned to employ 2-stage optimisation model (Kojima 2007). This model is as follows.

Let V^P and V^G denote the objective functions and $\boldsymbol{f}^P$ and $\boldsymbol{f}^G$ denote the constraint sets of the private and the public sectors, respectively. Each sector maximises (or minimises, depending on model specification) its objective function by choosing the values of its instruments (control variables) subject to the given constraint sets. Let vectors $\boldsymbol{x}^P$, $\boldsymbol{x}^G$, $\boldsymbol{y}^P$ and $\boldsymbol{y}^G$ denote the control variables and the state variables of the private and the public sectors, respectively.

The private sector problem is

$$\underset{\boldsymbol{x}^P}{Max}\, V^P\left(\boldsymbol{x}^P, \boldsymbol{y}^P; \boldsymbol{x}^G, \boldsymbol{y}^G\right) \text{ subject to } \boldsymbol{f}^P(\boldsymbol{x}^P, \boldsymbol{y}^P ;\ \boldsymbol{x}^G, \boldsymbol{y}^G) = \mathbf{0}.^2$$

The private optimal solution can be described as functions of exogenous variables, which are denoted as $\hat{\boldsymbol{x}}^P\left(\boldsymbol{x}^G, \boldsymbol{y}^G\right)$ and $\hat{\boldsymbol{y}}^P\left(\boldsymbol{x}^G, \boldsymbol{y}^G\right)$.

Now the public sector problem can be expressed as

$$\underset{\boldsymbol{x}^G}{Max}\, V^G\left(\hat{\boldsymbol{x}}^P\left(\boldsymbol{x}^G, \boldsymbol{y}^G\right), \hat{\boldsymbol{y}}^P\left(\boldsymbol{x}^G, \boldsymbol{y}^G\right), \boldsymbol{x}^G, \boldsymbol{y}^G\right) \text{ subject to}$$
$$\boldsymbol{f}^G\left(\hat{\boldsymbol{x}}^P\left(\boldsymbol{x}^G, \boldsymbol{y}^G\right), \hat{\boldsymbol{y}}^P\left(\boldsymbol{x}^G, \boldsymbol{y}^G\right), \boldsymbol{x}^G, \boldsymbol{y}^G\right) = \mathbf{0}.$$

Note that the optimal solution of this public sector problem is in general the second best policy, which is *the* optimal policy from practical viewpoint.

The above explicit treatment of the government will facilitate assessment of government policies such as public infrastructure investment.

(4) Resource constraints

In order to assess policies promoting sustainable resource management, it is highly desirable to reflect major resource constraints such as land, water, forest, or mineral and energy resources to IPAM. There have been several attempts to incorporate resource endowment into global CGE models. For example, Berritella et al. (2007) incorporate water issues into GTAP model, and Lin (2004) compiled database for GTAP incorporated agro-ecological zones that are defined as areas with particular agro-ecological characteristics such as moisture and temperature regimes, soil type, or landform. Based on these achievements, it is planned to reflect resource constraints to IPAM as follows.

- Treat these resources as factor endowments
- Modify production functions of relevant sectors
- Raw water and treated water are different commodities. Raw water is production factor of agriculture, water utility and some water-intensive industries. Treated water is output of water utility and consumer good.

(5) Unemployment issues

Another big challenge for IPAM is reflection of unemployment issue, as CGE models basically assume full employment of factors including labour. To address this challenge, it is planned to employ the rural-urban migration mechanisms in which the urban unemployment rate and the rural wage rate are endogenously determine through equilibrating the expected utility levels between rural and urban areas, in the presence of downward rigidity of urban wage rate (Kojima 2007). In this mechanism, any factors differentiate utility levels between rural and urban areas can be modelled. Successful implementation of sustainable resource management for rural community is expected to increase rural income as well as quality of life including access to natural resources, and

[2] The semicolon in the argument of functions separates the endogenous (left) and the exogenous variables (right).

will reduce rural-urban migration that leads to reduction in urban unemployment.

(6) IPAM development roadmap in FY2009 and beyond

The roadmap to develop IPAM is as follows:

April –June 2009:	Development of base regional model without resource constraints, unemployment issues.
July- September 2009:	Reflection of resource constraints and unemployment issues into regional IPAM.
April-October:	Data collection.
October – November 2009:	Calibration and validation of the model.

December 2009- :

- Application of regional IPAM to assessment of SD policies for SDPA.
- Development of country IPAM, if necessary.

3.2 Thematic Studies

In FY 2008 the following three thematic studies were initiated. It must be noted that additional thematic studies are planned to be started in FY 2009 including institutional studies in a few case study countries. It is planned to invite proposals for additional studies in June 2009.

3.2.1 Study on China's enforcement of water pollution prevention and control

It is well recognised that poor policy implementation such as lack of enforcement has severely undermined the potential of relatively well designed policies in many Asian countries. This thematic study has two major objectives.

Firstly, it aims to quantitatively assess the impacts of effective implementation of environmental policies with a case of Chinese water pollution. Our basic hypothesis is that there is correlation between effectiveness of environmental policy implementation (or level of enforcement) and society's performance in both economic and environmental dimensions, and improvement in environmental policy implementation can generate not only environmental benefits but also economic benefits. We will test this hypothesis with econometric analysis using data representing effectiveness of policy implementation and society's economic and environmental performance.

Secondly, it aims to assess major factors, both negative and positive factors, influencing the effectiveness of China's enforcement of water pollution prevention and control, and analyse the contributions of environmental investment and environmental technologies and products to effective enforcement. In addition to the data to be used in the first objective, this component will utilise statistics and firm-level survey data of major factors influencing the effectiveness of policy implementation. Furthermore, interview and questionnaire survey on environmental investment and environmental technologies and products will be conducted.

It is a challenging task to quantitatively measure the effectiveness of policy implementation. Dasgupta et al. (2001) developed indices of status of environmental policies and environmental performance of 31 countries, using the data from UNCED environmental reports, which were prepared by all UN member governments as part of the preparations for the United Nations Conference on Environment and Development (UNCED, Rio de Janeiro, June 1992). This work quantitatively assessed the effectiveness of environmental policy implementation among other indicators. We refer to this study in developing quantitative indicators representing effectiveness of environmental policy implementation, and listed the following candidates:

- The coverage of policy
- The extent of machinery for enforcement of law and the coverage of policy
- Extensiveness of the legislation so far
- The progress of preparation of a national environmental action plan
- The availability of environmental data
- Roughly percentage of GDP is being devoted for environmental control measures

Candidates of environmental performance indicators include BOD, COD, SOx, NOx and CO_2, considering the data availability in China.

The following indicators are candidates for economic impact assessment:

- Prevalence of environmental incidents/accidents
- Market share of pollution control industries in total industrial production
- The amount of damage cost from accidents
- The WTP towards environmental improvement in the former research The number of monitoring equipments and budgets for implementing monitoring
- The number of violation on law and regulations
- The amount of surcharge
- The number of a cease and desist order from administrative bodies
- The number of claim to local government and environmental law suits
- Budget and human resource for conducting environmental administration

The roadmap of this thematic study is as follows:

April-July 2009:	Data collection at the world level and its analysis
August 2009:	Research at the site in China
October 2009:	Analysis the data at the world level
November 2009:	Research at the site in China

January 2010:	Analysis the data at the national and firm level in China
February 2010:	Analysis on correlation between effectiveness of policy implementation" and "environmental and economic indicators.
April-July 2010-:	Follow up data collection in China.
August-October 2010-:	Analysis on correlation between effectiveness of policy implementation and major factors influencing the effectiveness of policy enforcement such as environmental investment and environmental technologies.
November-December 2010:	Formulate policy recommendations for effective policy implementation

3.2.2 Sustainable livelihood based watershed management – "Watershed Plus" approach

Watershed development and management in rainfed agriculture areas can have important multipurpose benefits that arise from the role of water for livelihoods and health. Steady availability of water for agriculture increases the crop production and availability of biomass as crop residue for fuel and fodder which are the additional benefits for rural livelihood. Rural livelihood also depends on various non agricultural activities like dairy which can also be highly influenced by the development of integrated watershed development programs. Thus "Watershed Plus" is an advanced idea of ordinary watershed management which primarily includes better water management, minor irrigation, drinking water supply, providing sanitation facilities, forestry and intervention to address the specific needs for the poor in terms of micro crediting to use non timber forest products, aquaculture, orchard maintenance and handicrafts for income generation and livelihood.

Participatory approach based integrated watershed development or "watershed-plus" is an important tool to break the poverty vicious cycle in India provided the income generation potential for the marginal landless people achieves the optimal level which can compensate the annual opportunity cost of migration. Unless the project ensures the income of these marginal people more than their total expected annual migration remittance, it is hardly possible to convince them to stay in the village and help to develop and maintain the watershed projects. This has been identified as one of the major threats to the success of the participatory watershed projects also (Turton, 2000). Since, the watershed-plus project implementation mechanism is highly labor intensive, therefore, high migration rate adversely affects the successful implementation and maintenance of the project in a longer term. It is therefore, prerequisite for the policy makers to estimate the minimum income generation potential of the proposed watershed project to avoid any

future failure. In India there has been very limited study so far on estimating the optimal income generation requirement for each watershed project to prevent the migration problem. Up-stream and down-stream environmental pollution control including ecosystem are also neglected in the watershed models in India which are indirectly affecting the sustainability of the project as well as sustainable development of the beneficiaries. With this backdrop a study would be conducted on estimating the optimal income level that each watershed project should generate primarily to reduce or stop forced migration and secondly to provide the long term sustainability to the watershed project by improving the income level of the beneficiaries which will lead towards the sustainable development of the beneficiaries.

In order to frame a sustainable watershed modeling, a dynamic profit maximization function (by cost reduction of a water users' group cooperative that has cost free water distribution system) will be developed subject to the constraints of achieving minimum level of social and economic capital while maintaining ecological sustainability. We will consider a Cobb-Douglas type aggregative production function of the agricultural sector surrounding the watershed where the farmers already formed a cooperative to maximize their benefit (in the form of profit) from the watershed. Here we assume that human capital and water supply are the two main inputs for the steady income for the beneficiary cooperative. Human capital is the composite of labor and other physical capital of the beneficiaries including nutrition level and education while the control variable i.e. the human capital growth is linked to the condition of other social development issues like health facilities, market linkage through better road etc. In this model we introduced two main constraints. One is the minimum standard of the per capita income of the beneficiaries of the cooperative which is linked to the nearby urban area minimum wage rate and the second one is the minimum water level maintenance in the catchments to maintain certain ecological balance and also supply sufficient amount of water to cover the activities like horticulture, sanitation etc in addition to the farming.

As a result an optimal income generation path would be derived in terms of profit maximization of the WUG cooperative which would provide certain amount of guarantee to contribute towards sustainable development at least for a longer term through integrated watershed programs. Result would tell us how much optimal income has to be generated by the project which can protect local labor migration and can reduce corresponding social problems. Result would also tell us what is the marginal cost of improving the social well being of the WUG beneficiaries under the given constraints of environmental and ecological balances. Ecological constraint would be simplistically maintained at the level of maximum water use possible from the catchments area to maintain the year long availability of water and other necessary resources like fish. Finally a clear numeric target based indicator can be generated to evaluate the performance of the existing watersheds and to evaluate the future watershed project plans in India and abroad wherever it fits suitable. As a matter of fact, this research can directly provide the policy support to the NRAA (National Rain Fed Area Authority of India) activities under the following mandates:

- To guide the implementing agencies on priority setting and monitor the specific interventions required.

– To evaluate the effectiveness of completed watersheds and concurrent evaluation of on-going programs.

3.2.3 China's sustainable forest management: policy assessment based on spatial equilibrium model

As important renewable resources, forests provide a wide range of timber and non-timber products. China has world fifth largest forestlands and sixth forest stock. However, at per capita level, China's forest resources are deficient with poor quality and unevenly distributed in the country. Rapid population growth and unprecedented economic development over the last two decades have led to a dramatic increase in wood consumption, which worsens the shortage in domestic supply.

Since late 1990s, the Chinese Government has being implemented dramatic measures including "China's Natural Forest Protection Program" that bans any logging in 18 provinces to stop overlogging of natural forests. This policy was adopted due to several well-known ecological disasters, e.g. serious flooding in Yangtze River. To sustain long-term wood supply, the Central Government has also initiated a gigantic "China's Fast-Growing and High-Yield Plantation Program" to intensify the reforestation program in China.

With its rapid economic development and expansion of external trade, China has become an important producer and exporter of processed wood products, especially wood-based panels and furniture. Moreover because of its limited forest resources and increasing restrictions on domestic timber harvest to protect its fragile natural ecosystems (Zhang et al., 2000; Zhao and Shao, 2002), China may increasingly depend on imports. This raised international concerns about the potential impacts on forest conservation in other parts of the world (Mayer et al., 2005).

What would be the potential impacts of domestic forest policies on domestic and global forest product markets and on forest resource conservation. Also what will be the impact on China's imports of timber and exports of forest products if China is fully cooperative in the spirit of Lacey Act, recently passed by the U.S. Congress, setting strict requirements on the declaration of legality of wood sourcing.

The purpose of this thematic study is to establish the Spatial Equilibrium Model (SEM) for China's domestic wood product markets and apply the SEM to the assessment of China's domestic forest policies. Two policies will be assessed. One is China's Natural Forest Protection Program. The other is China's agreement to the U.S. Lacey Act, which will have profound impacts on the income of small producers/exporters.

SEM is a model solving simultaneous equilibrium of plural regional markets under the assumption of the existence of transportation costs between any two regions. The solution of this model is equivalent to the maximization of the sum of producers' and consumers' surplus minus the total transportation costs of all shipments under the constraints of production capacity and availability of primary factors. Figure 3.2 presents the flowchart of spatial multiple wood product market.

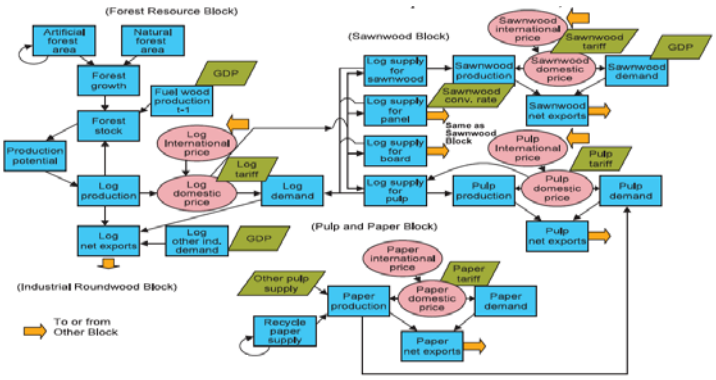

Figure 3.2 Flowchart of multiple wood product markets

SEM will be established for China's six major wood product markets and the rest of the world for six wood products, i.e. log, sawnwood, wood panel, veneer, fibreboard and flakeboard. To construct the model, both national and local statistics on social and economical development, forest resources, harvest, demand and production as well as firm-level production data based on survey will be necessary (see Table 3.1).

Table 3.1 Data requirement for SEM

Data Requirement	Description
Physical data	Firm-level and regional level production function related input-output data, intra-regional and inter-regional flows of intermediate goods and final goods, and labor requirement, etc.
Economic data	Regional demand, production capacity, price index, investment, income, transportation cost, price of other raw materials, etc.
Social data	Employment, etc.

In FY2008, a detailed research proposal based on literature review was prepared. Preparation for firm-level survey including contacts with local governments and firms and questionnaire design was also conduced. In FY2009, the following tasks will be conducted:

(i) Field survey to four provinces/cities will be conducted to collect required data;

(ii) Model establishment and parameter estimation; and

(iii) Preliminary policy assessment.

This study will be integrated into the IPAM as one of the thematic models for the development of the final output of this project, the Sustainable Development Outlook in East Asia.

3.3 Country Review

3.3.1 Background

The country review papers aim to provide background of a Sustainable Development Outlook. Based on the definition of Sustainable Development based on the Brundtland

report i.e. development that meets the needs of the present without compromising the ability of future generations to meet their own needs, the SD-Outlook would like to highlight two main issues of development including the status of poverty alleviation and the ecosystem management of the region, which are the basis of the sustainable development of the society.

3.3.2 Consequence of economic growth

Economic growth and environment is a widely debated subject since long and there are numerous studies on identifying the causality relationship between growth and environmental quality. In the country reviews it has been argued that the Environmental Kuznets Curve (EKC), the inverted U shape relationship, predicts that the developing economies are yet to reach the highest level of environmental degradation while the developed countries are in the declining stage of environmental degradation. However, the question still remains unanswered in most of the reviews that how much the each country should be allowed to pollute for their development goals and whether achievement of growth at the costs of environment is at all a long term development or not. Amidst this dilemma, the country review identified the solution lying in the concept of sustainable developed where a compromised economic development is suggested to have a better environmental quality and better social standard all together for a longer period of time. However, it is an empirical debate which will be further investigated in the future research activities of this project about the positioning of each country on this curve. But the recent development of the argument of a new dimension of natural resource endowment of each country has added further complexity to the whole situation which has been raised in one of these reviews. It has been observed that the poorer section of the world possesses more natural resources than the richer counterpart. Developing countries are often fallen victim to this commonly observed "natural resource curse" with their abundant natural wealth seemingly having become a liability rather than an instrument for achieving prosperity. Overall the country review papers tried to capture the most of the negative impacts of the economic development in their respective countries and tried to come out with certain improvement direction subject to further investigation.

3.3.3 Priority policy issues

Increasing environmental degradation and resource depletion and widespread poverty amid rapid economic growth are two great challenges faced with East Asian developing countries. Selection of proper development path decoupling environmental degradation and poverty from economic growth to ensure long-term sustainability, especially under the current global economic downturn, is fundamental and imperative task to these countries at the cross-road of sustainable development. With different social and political systems, various cultures and diversity in natural endowments, these countries are struggling with both common priority policy issues and country-specific issues.

Though manifested in different ways by individual countries, (i) to integrate sound environmental management with sound economic management; (ii) to strengthen the capacity and accountability of local governments; (iii) to facilitate better coordination both horizontally among governmental sectors and vertically between national and local governments; (iv) multi-stakeholder participation are common priorities among others.

Other selected country-specific priority issues for four countries are summarised as Table 3.2

Table 3.2 Country-specific priority issues for four countries

Country-specific priority issue	China	India	Lao PDR	The Philippines
Wider application of market-based instruments	√			√
Achieving greater efficiency in resource and energy use	√	√	√	√
Community-based management and sustainable use of natural resources		√	√	√
Income disparity	√	√		
Industrial structure	√			
Management of knowledge (information, technology and indigenous knowledge)	√			√
Underdevelopment			√	

3.3.4 Existing national laws/policies and their implementation and enforcement

For most of the selected countries, great progress has being made in formulating environmental laws, regulations, national master plans, programs and other policies to address the environmental consequences of rapid economic growth and priority issues in achieving national sustainable development target. Many countries are observed to have relevant and comprehensive environmental policies in place, however, environmental degradation, resource depletion and poverty issue are still worsening mostly due to failures in their implementation and enforcement. Three areas of these failures, i.e. legal failures, law enforcement failures and coordination failures are summarised in Table 3.3.

Table 3.3 Major failures in implementation and enforcement

Major failures	China	India	Lao PDR	The Philippines
Legal failures				
Inconsistency and ambiguities in laws and policies		√		√
Law enforcement failures				
Lack of political capacity				√
Ineffective local implementation	√	√	√	√
Corruption				√
Coordination failures				
Institutional fragmentation	√		√	√
Overlapping, duplication and competition among		√		√
Failures in applying policy mix				
Heavily dependent on command and control measures	√			√
Lack of multi-stakeholder participation	√	√		√
Insufficient capacity				
Insufficient financial capacity	√	√	√	
Insufficient human capacity		√	√	

3.3.5 Future research agenda

By the stock-taking of the environmental consequences due to rapid economic development witnessed in the East Asian countries and by identification of the national priority policy issues related to the implementation and enforcement provided in each country review paper, the agenda for future research under ERIA-SD project is proposed as follows:

(i) Environmental sustainability, poverty reduction and economic growth are envisaged as three dimensional challenges facing by the developing countries in East Asia. Though these are recognized by most of the countries, but how to achieve a win-win-win policy is still an imperative task for the decision-makers. To help decision-maker, this project will develop certain quantitative policy assessment tools for various purposes to effectively develop and then successfully implement them under different development scenarios in future.

(ii) Majority of the countries recognized their failure of effective implementation and enforcement of environmental laws and regulations as the major hurdle to see the expected outcomes on ground. This project will emphasize on quantitative analysis to indentify major factors contributing to these failures and will provide pragmatic policy improvement recommendations thereafter.

(iii) Further research will be required to recognize the need of the day like the impacts of on-going global economic recession and its long term impacts on the future direction of the environmental policies especially in the developing countries. Focus should be given on the new opportunities for the environmental policy implementation arising amidst this economic downturn. Global Green New Deal proposed by the United Nations can be further investigated on a country specific manner for identifying a win−win policy, too.

(iv) For policy implementation, we will focus on innovative measures on economic incentives, community-based approach for the management and use of natural resources, and multi-stakeholder participation as highlighted in the country review papers.

(v) Last, but not the least, to frame good governance at both national level and regional level should also be addressed in the future.

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Appendix 1

China Country Review

A.1 Environmental Policy in China: Gaps, Innovations and Future Direction

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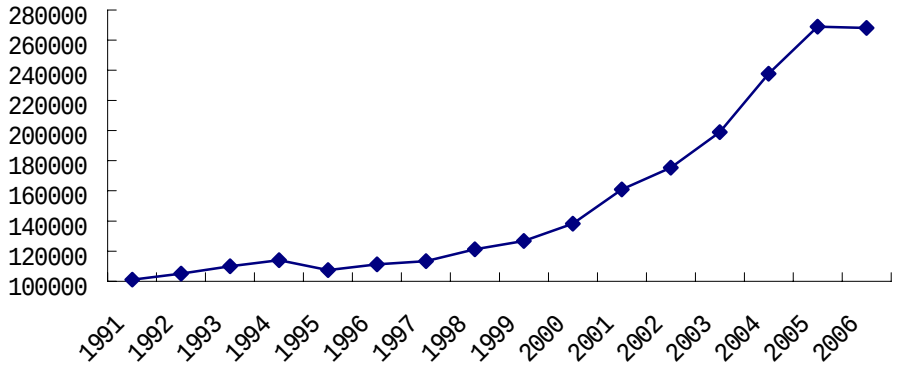
1. Serious problems from economic growth

From 1978 to 2006, China's economy saw some extraordinary growth, with GDP growing at around 10% a year. This economic growth, however, comes with significant environmental cost (Hu Y. 2005). Due to past economic growth certain environmental improvements have been attained (increased resource efficiency per unit of output, reduced solid waste generation per capita), while others – the majority of the environmental problems – have worsened, and continues to worsen unless substantial efforts are made to curb or prevent them.

Air pollution: Over the past three decades, air pollution has increased with economic growth. Industrial air pollution had experienced a 1.5 fold increase from 1991 to 2006.

Figure 1. Industrial Air Pollution in China, 1991-2006 Unit: 100 million m^3



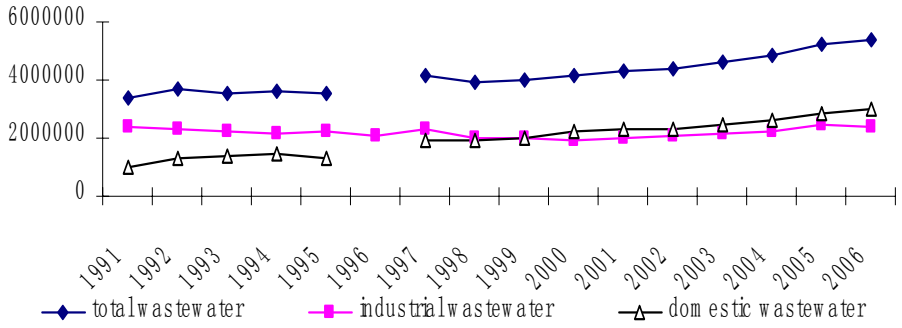
Source: China Environmental Statistical Yearbook, 1992-2007

It is important to note that SO_2 emissions remain a key area of concern for environmental protection. These SO_2 emissions mainly come from combustion of fuels (mainly coal) with high sulfur content. Power generation is the major process generating SO_2 emissions. High concentrations of SO_2 in the air impair human health and reduce industrial and agricultural

productivity due to acid rain. Total SO_2 emissions have increased by 60% between 1991 and 2006. (Liu and Chen, 2007). Industrial emissions show a similar increase, whereas SO_2 emissions from households account for a small and declining proportion of the total. During 1991 and 2006, emissions of soot in China reached a peak of 18.7 million tons in 1997, and declined thereafter. Industrial soot emission was the major component of total soot emission, whereas domestic soot emission accounted for a small proportion. The damage to human health caused by industrial dust is getting more attention in recent years due to its negative impact on human health (Yang 1997).

Water pollution: Water pollution is a major environmental issue in China. The wastewater emissions have continued to grow between 1991 and 2006. The amount of wastewater was 33.6 billion tons in 1991, and rose to 53.7 billion tons in 2006, a 60% increase in 15 years. It should be noted that during this period domestic wastewater emission has surpassed industry and become the bigger source of water pollution. Since 1999, domestic wastewater emissions increased in all provinces, except Tibet. Curbing Chemical Oxygen Demand (COD) has been the main target of water pollution control in China during the past three decades. The data indicates a decline in China's total COD emissions, with a slight increase in *domestic* COD emissions. In 1999, the domestic COD emission surpassed industrial COD emissions and became the major – and increasing - source of COD emissions. This indicates that domestic water pollution became the major new challenge facing China's COD control policies.

Figure 2. Wastewater Emission in China, 1991-2006 (Unit: 10,000 tons)

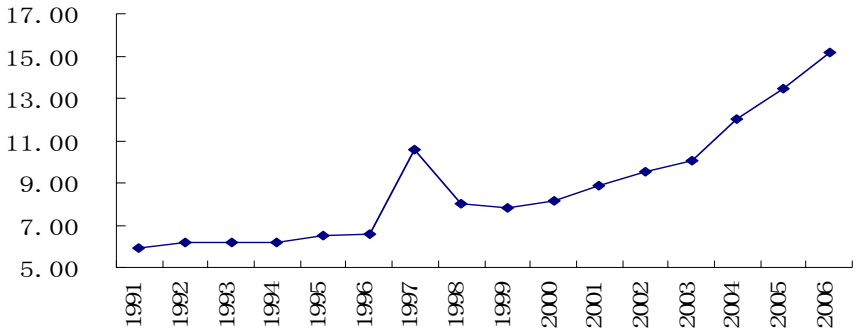


Source: China Environmental Statistical Yearbook, 1992-2007

Industrial Solid Waste: Dumping of industrial solid waste occupies land, contaminates soil, damages human health and causes serious water pollution when dumped into water. Dumping of industrial solid waste is also one of the major environmental problems facing China. China's

industrial solid waste has increased from 0.59 billion tons to 1.52 billion tons during 1991-2006.

Figure 3 Production quantity of industrial solid waste Unit: 100 million tons



Source: China Environmental Statistical Yearbook, 1992-2007

Marine resource degradation: In year 2000, an assessment of sea water quality indicated that more than 15% of the sea area was “less clean” or “slightly polluted”. Around 4% were “moderately polluted” or “seriously polluted”. Seven years later, in 2007, sea water quality has improved slightly. However, the seriously polluted area remains the same (2.9%). The largest (moderately or seriously) polluted sea area includes China’s East Sea. However, the largest pollution increase is found in Bohai, Yellow Sea and South Sea.

Table 1. Environmental Quality of China’s Sea Water (2000-2007) Unit: 10,000 square kilometers

Year	Total Area	Less clean	Slightly polluted	Moderately polluted	Seriously polluted
2000	20.6	10.2	5.4	2.1	2.9
2003	14.2	8.0	2.2	1.5	2.5
2007	14.5	5.1	4.8	1.7	2.9

Source: *China’s Marine Environmental Quality Bulletin 2000~2007*, State Oceanic Administration

Biodiversity: China’s rich and diverse geography and climate make it one of the world’s richest countries in terms of biological diversity. According to statistics, China’s biodiversity ranks eighth in the world and first in the Northern Hemisphere (Barntz, 1992). However, China is also one of the countries with the most severe bio-diversity degradation. Using endangered species as an indicator, 74 of 250 known seed-bearing plants are endangered. And 23% of the mammal

species are endangered. These figures illustrate serious problems in China's efforts to conserve biodiversity. The main causes behind the biodiversity loss are degradation and destruction of forest resources, grasslands, wetlands, rivers and lakes, respectively, and invasion of alien species.

Table 2. Endangered Species in China

Category	Number known	Number of endangered species	Ratio of endangered species (%)
Mammals	581	134	23.1
Birds	1244	182	14.6
Reptiles	376	17	4.5
Amphibians	284	7	2.5
Fish	2804	92	3.3
Insects	3400	100	2.9
Seed-bearing plants	250	75	30.0
Ferns	2400	80	3.3
Moss	2200	98	4.5

Sources: Chen (1999); Wang (2004); Wen (2004)

Soil erosion: Soil erosion is often considered the biggest environmental issue in China. Based on remote sensing data of soil erosion, the area of water and soil erosion was around 3.7 million square km^2 in the mid-1980s. This represents more than one third of China's territory. Of the eroded area, water erosion took up 1.8 million km^2, while the wind erosion area was 1.9 million km^2. In mid-1990s, the soil erosion area was 3.6 million km^2, reduced by some 0.11 million km^2. Comparisons of soil erosion data between 1985 and 2000 indicate only minor improvements at the total level. However, the area of severe soil erosion has actually increased. Major factors behind the increase include construction and mining activities (Fang et al. 2008).

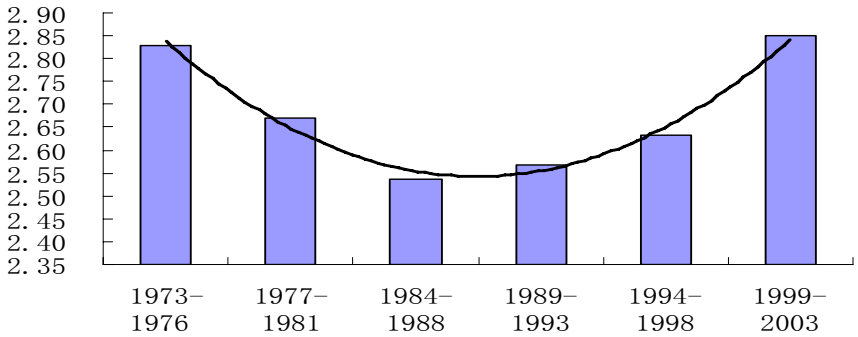
Table 3. Soil Erosion Area (unit: 1 000 000 km^2) in China, 1985-2000

Erosion Types	Year	Total Area	Low	Moderate	High	Severe
Wind, water erosion	1985	3.67	1.86	0.78	0.48	0.30
	1995	3.56	1.62	0.81	0.43	0.37
	2000	3.57	1.64	0.81	0.42	0.38

Data Source: Li et al. (2008)

Deforestation: Before the reform and opening up in late 1970s, China's forest resources had suffered unprecedented destruction with at least 25% of the forests felled (Li et al 2000). According to the data from the second forest resources inventory, up until 1981, China's forest coverage rate had been only 12%, historically the lowest. Since the reform began, serious effort in afforestation was made which have led to forest area growth. Meanwhile, the volume of standing forests has increased as well. Although government programmes have increased the area，forests cover only 18% of China's landarea, compared with 30% on world average. China is one of the world's most forest-deficient countries, with only 0.1 ha of forest per person, compared with a world average o0.6 ha. Meanwhile, the quality of China's forest is taking a decreasing trend on the whole. What's more, the structure of China's forest resources is unreasonable: ordinary trees occupy a larger proportion than valuable tress, in addition to which, the proportion of valuable trees is decreasing and primitive forest is changing into second-growth forest in a fast pace; The ratio in coverage areas among young trees, medium-aged trees and mature trees are 1.2 : 3.3 : 5.5, which means young trees and medium-aged trees are having substantial weight (Dong et al. 2002).

Figure 4. Change of China's Forest Area Unit:100million ha.



Source: China Environmental Statistical Yearbook, 1992-2007

Grassland degradation: China's grasslands are seriously degraded. The grassland degradation reduces livestock production and degrades the local environment generally. According to a survey by the Ministry of Agriculture, by the end of 2001, China's severely degraded grassland areas had reached 175.409 million hectares, accounting for 44.7 % of the total natural grassland area. Some studies (Xie 2005) reported nearly half of the grassland had been in moderate degradation. At the provincial level, the provinces (autonomous regions) with the largest areas of serious grasslands degradation were Inner Mongolia, Xinjiang, Gansu, Tibet and Qinghai; the provinces (autonomous regions) with the highest proportion of severely degraded grassland area to total natural grassland area were Ningxia, Gansu, Shanxi, Henan and Xinjiang. Among them, Gansu and Xinjiang, were the two provinces with both largest degraded area and highest

proportion. These two provinces should be given particularly high attention when dealing with grassland degradation in the future. Furthermore, combined with the grassland degradation situation in nine provinces of northern China from 1987 to 2001, we can find that China's grassland degradation represented a rapidly worsening trend. It can be predicted that the expansion of grassland degradation is still difficult to mitigate for a long time to come.

Table 4. China’s Grassland Degradation Unit：10,000 ha.

Region	Natural grassland area	Seriously degraded area		
		1987	1998	2001
Tibet	8205.2	133	221.9	1400
Inner Mogolia	7880.4	435.8	1074.9	4673.1
Qinghai	3637	0	1018.6	1351.4
Heilongjiang	753.2	59.8	7.2	210
Gansu	1790.4	222.7	433.4	1508
Shaanxi	520.6	7.3	107.6	140
Jilin	584.2	13.2	50.1	107.3
Hebei	471.2	37.9	99.5	216.7
Liaoning	338.9	0	52.4	81.4
Total	24181.1	909.7	3065.6	9687.9

Source: Xie (2005)

Natural Disasters: China is one of the countries in the world which are most affected by natural disasters. Floods and droughts are the most common types of disasters with the largest impact in terms of area coverage in China. Other natural disasters include earth quakes, pests and cyclones. Since 1950, the area subject to natural disasters has basically remained the same. In terms of area coverage drought is the largest factor. However, floods and earthquakes may be more limited in area coverage but cause much larger economic and social damage. People can cope with drought using irrigation system to sustain crop production, but have limited capability and capacity to mitigate flood damage.

Rural environmental pollution: With China's economic development, rural pollution has become more serious. In some case, rural pollution originates from urban pollution. The emissions of wastewater and solid waste from urban industry and household are transferred to rural areas, causing pollution in rural air, water and soil. However, more commonly large-scale use of chemical fertilizers, pesticides and farm plastic films in agricultural production are direct

sources of rural environment pollution and degradation. The booming rural industry has also increased the severity and complexity of China's rural pollution. Application of pesticides in China's agriculture has increased substantially since 1991. In 1991, pesticide use was only 760,000 tons, but by 2005, this figure had reached 1.46 million tons. Regarding agricultural fertilizer, the use continues to grow. Between 1978 and 2005, the fertilizer application volume increased 439% (16% annual growth). Undoubtedly the increase in agricultural fertilizer use has increased agricultural production, but it has also contributed to negative downstream water resources impacts (e.g eutrophication of water reservoirs). Another significant and growing environmental issue is the use of plastic film in agriculture. Plastic film is a successful technology to increase agricultural output. However, the plastic film is difficult to degrade in natural conditions and may pollute the soil for at least 200 years unless it is removed. The opportunities for recycling and reuse are limited. To illustrate the magnitude of the problem China has doubled its use of plastic film since 1995, and in 2005 1,762,325 tons were used in agricultural production. In addition, 960,000 tons of mulching film was used, which is somewhat less environmentally polluting.

Figure 5 Pesticides Use 1991-2005 (10,000 tons)

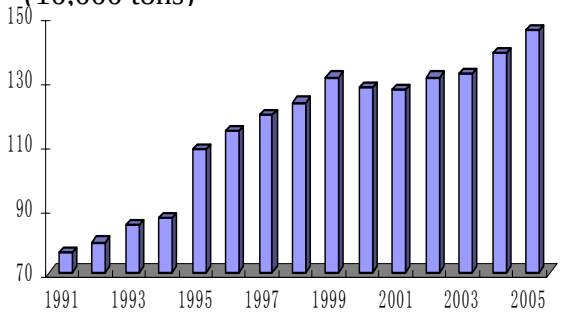
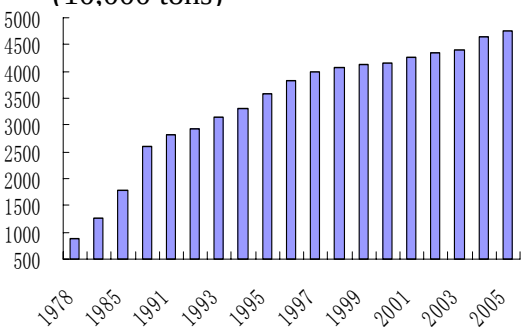


Figure6 Fertilizer Use 1978-2005 (10,000 tons)



Source: *China Statistical Yearbook 2007*

Energy production and consumption: Both energy production and consumption have increased significantly over the past 28 years (1978-2006). Energy *production* increased by more than 2.5 times; energy *consumption* increased by 3.3 times. Starting in 1992, imported energy surpassed

domestic supply and became the major source of energy supply. China’s quest for energy continues to affect global energy production and energy prices (Yang et. al 2005). China's per capita energy consumption is still low. If per capita energy consumption in China reaches the level of OECD countries, total energy consumption in China will rise dramatically in the future due to the large population size (Hang 2007; Research Group of China’s Energy Demand and Supply 2007). Regarding energy production structure coal remains the dominant energy type in production as well as consumption. The share of coal production in total energy has remained stable over the years (around 75% since 1990) while that of hydro-power has more than doubled. Crude oil is the second major type of energy production, but its share of production has decreased (12% in 2006). China’s crude oil production is low due mainly to its limited oil reserves and large coal reserves (Zhou 2004). The gap between domestic crude oil supply and demand is estimated to continuously widen in the future. The estimated proportion of the gap in total domestic demand will be 46.0 % in 2010 and 53.4 % in 2015, respectively (Zhou 2004).

Table 5. Energy Production and Structure 1978-2006

Year	Total Production (millions tce)	Share (%)			
		Coal	Crude Oil	Natural Gas	Hydro-Power
1978	62 770	70.3	23.7	2.9	3.1
1990	103 922	74.2	19.0	2.0	4.8
1996	132 616	75.2	17.0	2.0	5.8
2002	143 809	72.2	16.6	3.0	8.1
2006	221 056	76.7	11.9	3.5	7.9

Source: China Statistical Yearbook 2007

Climate Change: The average temperature over China increased by 0.79°C over the period of 1905-2001, slightly above the global average, with greatest warming experienced in Northern China and in winter. There has been no clear national trend in precipitation, although at the regional level some trends are apparent, such as drying in the Yellow River basin and North China Plain (Yin et al 2007, NDRC 2007). Effects of increased temperatures since 1950 have included a 21% reduction in glacier extent, a reduction of 5m in the thickness of permafrost on the Qinghai-Tibet plateau, a 2-4 day advance in the first budding of plants, severe drought in the North and North-East of China, a 7-fold increase in the number of reported floods and a decrease in sea-ice in the Yellow Sea and Gulf of Bohai. (NDRC 2007, Zeng et al 2008, Lin et al 2007). Climatic hazards, including floods, droughts, tropical cyclones and storm surges, account for 89.1% of economic losses from disasters in China from 1980-2003 (Shi et al 2008). National-level projections of climate change for China show that average national temperatures are likely to increase faster than the global average, by 2.3-3.3C by 2050 and 3.9-6C by 2100, subject to large regional differences. Average precipitation is expected to increase by 10-12% by 2100, with large variation across regions. Most likely there will be more extreme rainfall events and the intensity of tropical cyclones is expected to increase. Without adaptation the overall effects on Chinese agriculture are likely to be negative, as grain yields could decline by 5-10% by 2030 and cropping systems destabilized. Warming is expected to increase demand for irrigation thus putting more pressure on water resources and wetland areas, and will favor the spread of agricultural pests. In light of the ensuing social, economic and environmental effects, the needs for accelerated *mitigation* as well as *adaptation* are evident. Although some initial efforts are being made, more needs to be done.

Cost of Environmental Problems: Based on a report published by SEPA (2004), the direct economic cost of environmental pollution (except health effects) was estimated at 512 billion

Yuan per year, corresponding to 3.1% of GDP that year. Calculating the economic impacts of environmental pollution and natural resource depletion of this kind is associated with large uncertainties. Compared to other calculations of similar kind (compiled in table 7 below) implies that this figure is a relatively conservative estimate of the environmental costs; it gives an indication of the magnitude of the problem, and point at the potential benefit of cost-effective environmental abatement. (to be developed)

Table 6. Economic Cost of Environmental Pollution

Year of Analysis	Cost/year (bill. Yuan)	Share of GDP	Source
1980	44.4	9.3%	"China Environmental Forecast and Macro Environmental Analysis toward 2000", 1983.
1981-1985	38.2	6.8%	"China Environmental Forecast and Measures toward 2000", Research team, 1984
1988	95.0	6.8%	CCICED, 1992
1992	40.0	3.0%	Smil, 1992
1992	129.7	4.9%	Lei, 1995
1993	102.9	3.2%	CASS, 1996
1995	187.5	3.3%	Zheng etal, 1999
1997	54.0(US$)	8.0%	World Bank 1997, "Clean Water, Blue Sky"
2004	511.8	3.1%	SEPA, 2005

Source: Qi(2005)

2. Identification of priority issues in order to promote sustainable development

The general consensus is that China's environmental situation has improved in some respects, but deteriorated in general. Based on analyses of environmental authorities (Xie 2005, Zhou 2008), the pattern of the high economic growth and industrial structure are mainly to be blamed for the problems. The irrational mode of development is manifested in many aspects, the most important of which include a widening income gap, an imbalanced industrial structure and low

energy efficiency.

Income disparity : It is the same in China. During the process of China's economic development, the gap in per capita income among different groups of people is widening. According to *Yearly Report on China's Per capita income of 2006*, the gap includes four aspects: the first is concerned with the gap between urban and rural per capita income. In 2005, the former is 3.2 of the latter. Secondly, gap exists among the urban residents. In 2005, the per capita income of the 10% highest-income group is 9.2 times that of the 10% lowest-income group. Thirdly, gap exists among the rural residents. In 2005, the per capita income of the high-income rural households is 7.3 times that of the low-income rural households. Fourthly, gap exists between regions. At present, urban per capita disposable income in eastern part of China is 1.5(Zhao,2008) that of western part of China. It is the same case with rural capita net income. The aforementioned difference in income put China in a difficult position to choose between economic development and environmental protection. For the low-income group, economic welfare is the priority, whereas for those who have stepped out of poverty, environmental quality become significant in their welfare. Since the formation of policies is collective action, the government are inevitably put into a dilemma that focus should be put on the economic welfare of low-income people or demand in environmental service of high-income group.

For exemple, developing the western regions is a challenge that China faces. With both low per capita income and rich natural resources, the local governments in the western part of China have strong wishes to develop their economy. However, the environment in western China is fragile and worsening. If more economic construction is carried out, the environmental situation would become worse. At the same time, western regions are the origins of many major rivers of China where there is large area of grass land as well, and therefore play critical role in preserving water and soil. As a result the developed provinces down the rivers hope the central government would spend more efforts in ecological construction. Consequently, the contradiction is marked.

Industrial Structure: In China, since the initiation of reform and opening-up, the industrial development, especially the development of heavy industry, strongly promoted the development of the whole economy. China's heavy industry took on speed in development from the late 1980s, and since then has occupied larger and larger share in China's industrial system (Li 1998). During the years from 2002 to 2006, the percentages of China's heavy industry are 60.5%, 60.9%, 64.3%, 67.6% and 68.5% respectively (Yang 2008). Heavy industries include those producing machinery, energy, and chemicals, etc, all of which are require substantial

energy consumption and pollution prone. In other words, China's industrial structure featured by heavy industry playing a key role is the major factor of pollution. With large number of rural migrant workers pushing for jobs it is becoming a daunting task to balance pollution control and industrial growth.

Energy Efficiency: China is facing two difficulties in the energy use. On the one hand, China is the second-largest energy consumer, after the United States, and the demand of energy increases rapidly; on the other hand, there is a large gap in the energy use efficiency between China and other countries. China is still following the mode of "high energy consumption, low output" (World Bank 2001). So far from 1978, China's energy use efficiency has experienced two stages. From 1978 to 2000, China's energy use efficiency had improved steadily; from 2000 till now, China's energy use efficiency starts to decline. (Shi 2002). In all, China's energy use stays in a relatively low level. As most researches find, China's energy use intensity is 8 to 9 times of Japan's and 2 to 3 times of the world average. Even take into the consideration of exchange rate adjustment, China's energy use intensity is still 4 to 5 times of Japan's. If we use the energy physical efficiency as an indicator, China's energy efficiency is about the early 1990s level of Europe's and the middle 1970s of Japan's (Wang 2005). Apart from the backward production technology, the change of industrial structure is one of the important reasons which result in the low efficiency of energy use. The proportion of heavy industry increases rapidly while light industry decreases rapidly. The rapid development of high energy consumption industries such as iron, steel, chemical and construction materials results in a sharp increase of energy demand.

Central-Local Divide in Envrionmental Protection: In China, the central government plays a major role in environmental protection. China's environmental protection system which follows the traditional political system is vertical management. The most distinctive feature of this system is that the central government will give some indicators to the local government and conduct regular assessment on those indicators. With this top-down approach, the environmental policies are uniform, with no regard of the differences in local environmental conditions, economic development, and corporate pollution reduction costs. The consequences of this approach are low efficiency and social injustice. Command and control plays a dominant role in environmental management, while the role of economic incentives is quite limited. As statistics indicate, there are as many as 100 types of fines in the national and local laws and regulations. This kind of environmental management mechanism makes corporate and individual passive recipients of environmental policy. There are few channels for the public to participate in the environmental protection. In the meantime, there are no incentives for the local government to undertake environmental management innovation. What's most important, market cannot play a

significant role in environmental protection as it should be.

3. Existing national policy or law

From 1992, the Chinese government has established and promulgated a series of laws and regulations to promote sustainable development in China. More than 100 enviromental policies, laws and regulations have been passed. These laws and regulations involved every aspects of the sustainable development and initially formed the law and regulation system for the sustainable development of China. The key laws and regulations to promote the sustainable development are listed in table 7:

Table 7: The key laws and regulations to promote the sustainable development

Item	Name	Ratification Organ and Date	Main Contents
1	Ten Primary Measures for Environment and Development	CPC and the State Council of China, 1992	a programmatic document for the environment and development of China
2	China's Environmental Protection Strategy	The National Environmental Protection Agency, the National Planned Economy Committee, 1992	Policy files on environment protection
3	China's national scheme on gradually eliminating the damaging substances to the ozone layer	The State Council of China, 1993	The concrete scheme to comply with the Montreal Protocol
4	China Environmental Protection Action Plan （1991-2000）	The State Council of China, 1993	The country's ten-year environmental protection action plan by fields
5	China's 21st Century Agenda	The State Council of China, 1994	The White Paper for the people, environment, and development of China, the national *21st Century Agenda*
6	China's Action Program of Biological Diversity Conservalion	The State Council of China, 1994	National action plan for performing the *Convention*
7	China's 21st Century Agenda: Environmental Protection	The National Environmental Protection Agency, 1994	The department level *21st Century Agenda*
8	China's 21st Century Agenda: Forestry Industry	The Ministry of Forestry, 1995	The department level *21st Century Agenda*

9	China's 21st Century Agenda: Ocean Industry	The State Oceanic Administration, 1996	The department level *21st Century Agenda*
10	Resolutions to Some Environmental Protection Problems from the State Council of China	The State Council of China, 1996	The regulation files of the State Council of China
11	The Ninth Five-Year Plan for National Environmental Protection and the Prospective and Target in 2010 of China	The State Council of China, 1996	Action outlines to the environment protection in the next five to fifteen years
12	China Trans-Century Green Program（The first issue）	The State Council of China, 1996	Concrete program of the Ninth Five-Year Plan for National Environmental
13	The Country's Main Waste Emission Volume Control Plan	The State Council of China, 1996	Mandatory national plan for decreasing waste emission during the Ninth Five-Year
14	Notification on further strengthening the land management and protecting the arable land	CPC and the State Council of China, 1997	
15	Division Scheme on the Acid Rain Control Area and the CO2 Pollution Control Area	The State Council of China, 1998	In the "Two areas", the CO2 emission needs to meet the standard, and the total volume of CO2 emission is under strict control
16	Notification on stopping producing, selling and using the vehicle gasoline that contains lead before required date	The State Council of China, 1998	Make a deadline through the country to stop producing, selling and using the vehicle gasoline that contains lead

17	Notification on protecting forest resources and restraining deforesting, reclamation and occupying the forestland in random	The State Council of China, 1998	Resolutely protect the virgin forest and protect the forestland
18	The National Plan for Ecological Environment Construction	The State Council of China, 1998	Ecological construction plan in the fields of agriculture, forestry and water conservancy
19	National Eco-environment Protection Outlines	The National Environmental Protection Agency, 2000	Prospective, tasks and measures for eco-environment protection
20	China's Sustainable Development Action Compendium for the early 21st Century	The State Council of China, 2003	Pointing out the prospective, key areas and safeguard measures for sustainable development
21	Notification of key works to construct the economizing society	The State Council of China, 2005	Quickening to construct the economizing society in production, construction, circulation and consumption
22	The advises to develop the cycler economy	The State Council of China, 2005	Policy files on cyclic economy
23	Guidelines on Collective Forest Tenure Reform	CPC and the State Council	Provisions to promote and guide tenure reform in rural China

Source:Chen et al.(2007)

Specifically, China's environmental Sustainable development has included 9 dimensions, all of which covered by a series of policies (table 8).

Table 8 Sustainable development dimensions and policy issues of concern

	Sustainable development dimensions	Sustainable developmen policy issues of concern
1	Industrial sustainable development	controlling industrial pollution of air, water and solid waste; the resource utilization efficiency; environmental protection industry
2	Construction and protection of the eco-environmen	national garden cities; eco-agricultural demonstration counties and places; desertification; soil erosion; basic farmland reserves; nature reserves
3	Development and utilization of energy	saving the energy; energy structure; clean energy; renewable energy and the new energy
4	Protection, development and utilization of water resources	water resources shortage; water pollution
5	Management and protection of forest resources	maintain and expand forest resource; mountain area forestry's comprehensive development
6	Management and protection of grassland resource	grassland protection system
7	Management and protection of marine resources	pollution control;ecological protection;and resources management
8	Air protection	sulfur dioxide emission; acid rain; vehicle waste emission;
9	Disaster prevention and decreasing	comprehensive projects construction to decrease disasters; national disaster monitoring and warning system; disaster insurance

Source: Zhang (2004)

Industrial sustainable development: Firstly, to adjust the industrial structure, the Chinese government has shut down a batch of mills which are lag in technology, causing serious pollution and consuming more energy and materials in production. MEP (and earlier, SEPA) has mainly focused on controlling industrial pollution of air and water. The key policy instruments used by MEP and local agencies include pollution standards and a levy system, initiated in early 1980s. In late 1990s, more command and control measures have been adopted in order to enhance effectiveness of pollution control. Most dramatic actions include the Midnight Actions on New Year’s Eve (January 1) of 1997, on Huai Riverbasin, when all mills failing to meet pollution standard would be closed by force. Another most influential measure was the closure

of all under-sized mills in 15 sectors recognized as most pollution intensive. During the 9th 5-year plan, the Chinese government has closed 85,000 under-sized mills such as steelmaking mills, small cement mills, small glass mills and so on. Secondly, the Chinese government is actively regulating the strategy of the industrial pollution prevention and control and energetically promoting the clean production in order to improve the resource use efficiency and alleviate environmental pressure. Meanwhile, Chinese government also emphasizes the enforcement of the industrial environmental protection law. The mills must meet the emission standard within the required time, and the production equipment which are outdated and may cause serious pollution will be forced to phase out. Till the end of 2000, about 90 percent of the pollution-causing mills reached the waste emission standard, which resulted in one third decrease of emissions from 1995 level. Thirdly, Chinese government is doing technical transfer in order to decrease the consumption and control the pollution. From 1994, the Chinese government has invested 30 billion Yuans on 232 technical transfer projects for environmental protection. Finally, China actively supports the environmental protection industry and defines it as the priority development area. Up to the year of 2000, the total value of the environment protection industry has reached 108 billion Yuan, and there are more than 18,000 enterprises and institutions with more than 1.8 million people partially or fully employed in environmental protection industry. The income of the environment protection related industry in GDP was about 1.9% and about 1.6 times the government total investment to environmental pollution for the same time (Li 2002).

Since 1997, Chinese government has promulgated a series of regulations and rules to control solid waste and set up the solid waste declaration and registration system and the hazardous waste transferring registration system. The government has also begun to try out the management licensing system for hazardous waste in the comparatively developed coastal cities and provinces. Meanwhile, the comprehensive utilization of industrial solid waste in China has achieved great improvement. In 1996, the government put into place the tax break policy for the comprehensive utilization of industrial solid waste, in particular for fly ash and coal gangue. China's industrial solid waste has increased from 0.59 billion tons to 1.52 billion tons between 1991 and 2006. In the year 2007, the comprehensive utilization rate of industrial solid waste reached 62.8%. Since 1998, municipal solid waste landfills, incineration plants, and chemical fertilizer plants with advanced treatment technologies were installed in many cities financed through national debts.

Hazardous waste management is also highly regarded. Up to now, the government has built up two radioactive waste treatment plants. And 23 temporal storehouses for radioactive waste by

the nuclear technology use has been put into effect. The radioactive waste is under effective control. The government also seriously executes the *Basel Convention*. And China has established the Asia Pacific Hazardous Waste Management Training and Technology Transfer Centre under the support of the Secretariat of the *Basel Convention* to provide trained technical personnel of hazardous waste management to the Asia-Pacific countries.

Protection of ecology and environment: Firstly, the Chinese government has established *the national ecological construction planning* and *the national eco-environment protection compendium*, and gradually brought these policies into the national economy and society development plan for implementation. Secondly, the whole country has established 20 national garden cities, 120 eco-agricultural demonstration counties and more than 2000 eco-agricultural demonstration sites. At the same time, in order to prevent and control the desertification on a large scale throughout the country, the government has established 20 key counties, 9 test areas and 22 test demonstration bases. Thirdly, soil erosion control has made significantly progress by expediting the soil erosion control in typical areas and actively promoting the comprehensive control experience in small watershed. Up to 2005, the accumulated new soil erosion control area of the whole country is 920,000 square kilometers. Chinese government has made about 83% arable land of the country under effective protection by demarcating basic farmland reserves. Meanwhile, the government has build up a compensation system of farmland occupancy. From 1998 to 2005, the arable land of the country had increased by 2,130, 000 hectare by developing, cultivating, and reclaiming, which exceeded the area of arable land converted for construction in the same period, and resulted in a balance of land occupancy and compensation. In order to protect and ameliorate the farmland quality, the government has implemented a farmland environmental quality detection system and fully promoted the pollution prevention and control technologies for agricultural chemicals. Finally, the scale and quality of nature reserves are greatly improved. Most typical eco-system and endangered species obtain effective protection. Up to 2007, China has built up 2,531 nature reserves with total areas reaching 15.188 million hectare。

Development and utilization of energy: The Chinese government pays great attention to energy saving and has established a series of regulations and technical or economy policies on energy saving. The government also promotes the clean coal and the technology of the coal cleaning and comprehensive utilization. The renewable energy and new energy have also been brought into national agenda recently.

Protection, development and utilization of water resources: The government has primarily

established the law and regulation system and made a series of policies for the sustainable usage of water resources. Up to 2002, the Chinese government has revised, promulgated and implemented four laws: the *Water Law of the People's Republic of China*, the *Flood Control Law of the People's Republic of China*, the *Soil and Water Conservation Law of the People's Republic of China*, and the *Law of the People's Republic of China on Prevention and Control of Water Pollution*; 18 water administrative regulations, such as the *Implementation Methods of the License System for Water Utilization*; about 88 water conservancy rules, such as the *Guideline to the Long-term Water Supply and Demand Plan;* other policies like the *Water Resources Industry Policy* and technical standards on the comprehensive management of water resources. The local governments have established many relevant local policies and regulations based on their local situations. In order to alleviate water shortage, the government has invested in water-saving irrigation and water-saving agriculture. For these reason, water consumption in China has been being kept on a relatively low level with the fast growth of economy. From 1980 to 2007, China’s water consumption per capita and water consumption per ten thousand yuan of GDP were still decreasing. The government also worked on the water pollution control in many key watersheds, such as Huaihe river basin, Haihe river basin, Liaohe river basin, Taihu Lake, Dianchi Lake, and Chaohu Lake; speeded up the construction of the sewage treatment plant in cities in order to make the trend of the water environment deterioration under control.

Table 9: The water resources consumption of China, 1980-2003

	Total water consumption （billion m^3）	Water consumption per capita （m^3）	water consumption per ten thousand yuan of GDP （m^3）
1980	4436	452	9820
1990	5411	473	2911
2000	5498	430	615
2007	5760	437	251

Source: Wang et al .(2005)

Protection of forest resources and grassland resources: To maintain and expand forest resource base in China, a set of policies were developed over time. Components of the policy set include a logging quota system, relatively centralized tenure system, ecological compensation fund and a series of national afforestation programs implemented over the past three decades. The government has carried out some important forestry eco-system construction programs, such as the Natural Forest Protection Program (NFPP), Sloping Land Conversion Program (SLCP), Beijing-Tianjin Sandstorm Source Control Program, the Three-North Shelterbelt Program, etc. In particular, the central government issued policy of tenure reform on collectively owned forests in July 2008. The policy allows farmers to have user rights for up to 70 years and enjoy comprehensive property rights (transferability, inheritance, and collateral). This is a major effort on the central and local government parts to improve farmer livelihood in the natural resource rich areas and to attract private sector investment to forest resource development. Subsequently, other key forest policies are subject to revision. The implementation of logging quota policy has already been altered in the reform regions and revision of the policy is pending upon revision of the forest law.

China has established three laws on the grassland protection like the *Grassland Protection Law* to strengthen the protection and management of grassland resources. Regulations like the *Construction Plan for National Grassland Ecological Protection* were developed. During 2000 and 2001, about 97 natural grassland recovery and construction projects had been completed throughout the country, which greatly improved the ecological integrity of the grassland. Up to 2007, the grassland enclosure area of the country reached 55 million hectare.

Management and protection of marine resources: China has established regulations and laws to protect marine resources. Up to the end of 2006, 90 marine nature reserves had been established. The marine environmental detection network and marine environmental information and forecasting system have also been strengthened.

Air quality control: Firstly, the government has defined the sulfur dioxide and the acid rain control areas, and carried out the control of sulfur dioxide emission within the areas. Attempts have been made to promote clean coal, clean combustion, flue gas desulfurization and dedusting technology and to increase the use of natural gas and centralized heat-supply system. Several major municipalities have had policies to regulate urban vehicle uses in order to reduce the increasingly serious emissions from automobile use. In general priority is given to developing public transportation and controlling emission of vehicles. The government is also seriously performing the *Montreal Protocol on substances that causing damage to the ozone layer*, controlling and eliminating these substances.

Disaster prevention and decreasing: The government launched some comprehensive projects to decrease disasters, such as flood control and drought resistance, and disaster mitigation, geological and biological hazard prevention and control, and so on. Meanwhile, the government established the national disaster monitoring and warning system. The loss caused by natural disasters has been reduced significantly.

International cooperation: In order to improve the work in protecting natural resources and environment, China is strengthening law making at home and cooperation with other countries by signing international conventions, such as Basel Convention. In addition to these multilateral treaties, China has also signed 25 bilateral treaties. Through implementation of these treaties and conventions, tremendous learning has been achieved and performance enhanced.

China has also done a lot in the areas of multilateral and bilateral cooperations, such as the cooperation with the European Union (EU). In 1985, China signed with EU *Treaty on Developing Partnership and Cooperative Relationship between China and European Countries,* which laid foundation for their cooperation in resources and environment. In the following years, a mechanism on carrying out dialogue between China and EU has been built up. Since 1994, in every 2 or 3 years, China and EU would sponsor an international conference on energy in turn. By 2006, 6 conferences have been held. In April of 2004, China and EU have together initiated a 5-year project conerning resources and environment, which is worth 42.9 million Euros. The goal of this project is to realize sustainable use of natural resources. In June of 2007, EU started in China a program on realizing clean development which is worth 2.8 million Euros.

Actually, there are still some cases of using market tools to protect environment in addition to the government, and it ignites hopes in protecting China’s environment.

Water trading:. In 2000, Dongyang and Yiwu, two cities in Zhejiang province, signed a contract about transferring parts of of Hengjin reservoir's water rights to Yiwu. Dongyang sold about 49.999 million cubic meters of permanent water rights to Yiwu at a price of RMB 0.2 billion. The water right trading between Dongyang and Yiwu is the first case in China and it is a mechanism innovation in water management. What's more, Zhangye, a city in Gansu, is also a successful example in water rights trading. In 2000, the State Council imposed a total quantity control in water diversion from Hei river by Zhangye city. As a result, Zhangye began to implement total quantity control and sell those tradable permits to farmers. Now, about 22 million cubic meters of water will be saved each year by Zhangye and the fees of watering each acre of land are reduced by 7 yuan. There are not only economic gains, but also great contributions to the ecosystem downstream. Another successful case is the water use compensation between Beijing and the neighboring Hebei province. To compensate the loss of Hebei province in supplying water to Beijng, Beijing gives the local farmers 450 yuan per acre of land for changing their plantations of rice to some dry crops in upper places of Miyun reservoir such as Zhangjiakou. It has successfully solved the problem of water use conflicts between Beijing and Hebei province.

Forestry carbon sequestration :As for forestry carbon, there are 8 projects in Inner Mongolian, Guangxi, Sichuan, Yunnan, Liaoning, Anhui, Hebei and Shanxi provinces so far, among which Guangxi and Inner Mongolian forestry carbon projects are CDM projects. The methodology of Guangxi project, which was approved by CDM board, is the first one on CDM reforestation approved in the world. There will be 77,300 tons of carbon dioxide credits generated during the counting period 2006 to 2035. The total cost of this project is 22.7 billion US$. (Li , 2007) The total income is estimated at US$ 21.1 million within crediting period, including: US$ 15.6 million from employment; US$ 3.5 million from sales of wood and non-wood products; US$ 2.0 million from sales of CERs. It is estimated that 5,000 local households will benefit from this project.

Figure7. China’s forestry carbon pilot projects

Source: http://www.fcarbonsinks.gov.cn/thxm/index.aspx

Environmental Trading Centers: At present, China have established several Environmental Trading Centers for trading in SO2, carbon sequestration, environmental technology and water rights and so on. China Beijing Environment Exchange(CBEE), Shanghai Environment Energy Exchange(SEEE) and Tianjin Climate Exchange(TCX) are very famous in China. CBEE and SEEE are international comprehensive market platform for the transactions in the fields of environment and energy. SEEE is mainly engaged in the transactions of technological property rights, equity and capital from pollutant discharge reduction, environmental protection, energy and energy- saving. TCX is focus in the transactions of SO2 and COD at the initial stage.

Figure 8, SEEE and TCX

Source: Those pictures were downloaded from the website as follows;

SEEE：http://www.cneex.com/ourservice/jienenghuanbao.html

TCX：http://www.chinatcx.com.cn/templet/default/index_cn.jsp

4. The problem from implementation of existing policy or law

The Chinese government has been attempting to establish a comprehensive system of laws concerning sustainable development; Numerous laws and regulations were drafted and released. However, the effects of these laws are in general low. As was admitted by Premier Wen Jiabao in the 2006 National Environmental Protection Conference, during 2000-2005, the eleventh five-year plan period, China had realized its goal of economic growth, but failed to achieve the goals of environmental protection.

In 1997, China put into practice *Laws on Saving Energy* and corresponding regulations as well. Besides, China has also set up in its 10^{th} 5-year plan the goal of realizing 15%—17% reduction of energy consumption per unit of output from the year of 2001 to 2005. However, two institutional defects prevent these goals from being reached: firstly, there is no special structure in charge of coordinating the formulation and implementation of energy policies; secondly, energy enterprises enjoy important political and economic power in both central and local settings. And lastly, some energy-intensive enterprises such as steel and chemical enterprises are controlled by the state and are free of hard budget constraint, which make them suffer little influence caused by the rise in price of energy.

People generally point the cause of failure in complying with environmental regulations to lack of funding, industrial structure and lack of policy enforcement by local government. These are

probably all true. However, the root causes for all of the above are not sufficiently addressed. Existing regulations and policy have a heavy reliance on command and control measures. It seems that the central government is the only authority to implement environmental protection. Lack of funding and shortage of absolute power over local government were often cited as major causes for the underachievement. Less was noticed in policy design that local economic conditions vary so tremendously that it is impossible to achieve the same level of equilibrium via an uniformed policy. Without properly addressing teh huge variation in costs and benefits of environmental protection across locations, current environmental regulations simply render social cost of pollution control too high to afford by most local jurisdictions. The necessity of establishing some kind of market mechanism seems to be extraordinary.

5. Summary

Along the path of fast economic growth, environmental problems become increasingly severe which is not only causing damages to various dimensions of human life, but also damaging the prospect of sustainable development in the country. Some dramatic changes in policy and modes of development have to happen in order to mitigate the impacts caused by environmental degradation.

China seems to be at a turning point as awareness of environmental protection and conservation among government, academia and civil society has reached historical height. Ambitious goals and numerous strategies were made in recent years in the pursuit of improved environment. However, effective and efficient policy instruments have yet been found and used. Government efforts are still largely focused on command and control measures. Uses of market based instruments and private sector initiatives are still limited.

Taking stock of current knowledge, several changes are necessary. First, while efforts need to be strengthened in industrial pollution control, effective policy should be designed to curb the ever growing urban and rural non-point source pollution; secondly, on industrial pollution, policy should be transformed from focusing only on one pollutant (e.g. COD) to the control of multiple pollutants in order to reap the co-benefits of pollution reduction. Policy also needs to be in place to enhance effort in the adoption of clean production technology, instead of only focusing on end of pipe pollution control; Thirdly, market based solutions should be given higher attention. Successful example of this includes water trading between Beijing Municipality and upper reach farmers in Hebei Province. Tremendous cost saving has been

achieved through this trial. Fourthly, using economic instrument to reduce urban air pollution is an area with tremendous potential.

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Appendix 2

India Country Review

A.2 Sustainable Development Outlook: India*

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1. Serious problems from economic growth

The relationship between economic growth and some indicator of environmental degradation is usually explained in environmental economics literature in terms of an inverted-U shaped curve (known as the Environmental Kuznets Curve or EKC). Various authors have tried to explain the shape of EKC through different economic hypotheses.[2] Empirically it has been observed that one common feature of developing countries is that the rising part of their EKC is widely stretched so that the turning point of EKC is reached at high levels of economic growth. It implies that for most of these countries, an increase in economic growth (usually measured in terms of an increase in per capita real gross domestic product (GDP)) leads to an increase in environmental degradation. The view that in developing countries the relationship between increase in per capita real GDP and increase in environmental degradation is positive is expressed in most of the global reports including the Global Monitoring Report or GMR (2007) on Millennium Development Goals (MDGs).

If we compare the Human Development Reports (HDRs) with that of the MDGs we find that the common link between the two is poverty reduction and environmental sustainability. One of

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[2] See Barbier (1997) for an extensive survey of literature on this topic.

the key capabilities of human development is having a decent standard of living and one of the essential conditions of human development is environmental sustainability. If we look at the MDGs we find that MDG1 focuses on reducing poverty and hunger whereas MDG7 focuses on ensuring environmental sustainability. MDG7 emphasizes on integrating sustainable development into country's major policies and on reversing the loss of environmental resources. In a resource dependent economy it implies a strong link between this goal and poverty reduction.

Environmental problems in India can be broadly classified into two categories; a) the problems arising due to negative effects of the very process of development and b) the problems arising from the conditions of poverty and underdevelopment. The first category deals with the impact of various efforts to achieve economic growth and development and the continuing demand generated by the economically advanced sections of the community on the country's natural resources .The second category deals with the impact of poverty on the availability of natural resources of the Indian economy. In fact poverty, hunger and environmental degradation are closely linked with each other in most of the developing economies including India. The problem is particularly important among the rural poor (which constitutes a large part of India's population) when such degradation affects soil fertility, quantity and quality of water, forests, wildlife and fisheries etc. Among the various environmental problems facing the Indian economy in course of its drive towards economic growth two major environmental problems are deforestation along with forest degradation and pollution from freshwater resources. In Table 1 we list the major environmental impacts of various developmental activities to fight against underdevelopment.

Table 1: Impacts of Some of the Developmental Activities on the Environment

Developmental Activities	**Major Impacts on the Environment**
Forest Clearing and Land Resettlement	Extinction of rare species of flora and fauna, creation of condition for mosquito breeding leading to infectious diseases such as malaria, dengue etc.
Use of Pesticides	Pesticides used in agriculture sometimes go into the food chain or in water bodies that may result in harmful health hazards.
Agro Industries	Large amount of highly polluting organic wastes, surface water pollution.
Timber Extraction	Degrades land, destroys surface oil, reduces production potential of future forests.
Urbanization and Industrialization	Concentration of population in urban centres makes huge demands on production in rural areas and put pressures on land, air and water pollution.
Water Resource Projects e.g. Dam, Extensive Irrigation	Human settlement and resettlement, spread of waterborne diseases, reduction of fisheries, siltation, physical changes, e.g. temperature, humidity.

Source: Compendium of Environment Statistics, 2007, Central Statistical Organization (CSO),Government of India.

Forests play an important role in protecting environment and meeting livelihood needs. It contributes significantly to the economic, social and environmental well being of a country and hence conservation of forests is a prerequisite for sustainable development. Depletion of forest resources can be viewed from two angles: quantitative and qualitative. Quantitative aspects include forest cover and its distribution, deforestation, demand and supply of forest products etc. Mainly commercial demand for timber, legally or illegally, drives the felling of trees. When land under forest is needed for mining, agriculture and grazing we find that the possibility of deforestation increases. Quality of forests (forest degradation) depends on the day-to-day human use and misuse of forests. In India nearly 7 crores tribals and 20 crores non-tribals are dependent upon forests for their livelihoods (Report of the National Forest Commission or Report of the NFC, 2006). As a result of this forest degradation is taking place in a rapid pace. Degraded forest is accounted for about 41% of forest cover. Out of this 70% of the forests have no natural regeneration and 50% of forests are prone to fire (Report of the NFC, 2006).

Forests provide various benefits to mankind including improvement in the quality of environment. They provide goods and services and maintain life support systems like timber, fuelwood, fodder, a wide range of non-timber products and also provide natural habitats for biodiversity, means for recreation along with eco-tourism etc. They also help in watershed development, regulate water regime, conserve soil and control floods.

Various ecological functions of forests have been examined in the Indian context by authors like Kadekodi and Ravindrnath (1997), Haripriya(2001), Hadker, Sharma, David and Muraleedharan (1997), Chopra(1998)etc. Kadekodi and Ravindranath(1997), for example, have examined the value of carbon store at the all India level and suggested Rs.1.2 per hectare benefit using indirect estimates. Haripriya (2001) has estimated value of carbon store at Rs.20125 per hectare and aggregate of Rs.1292 billion from Indian forests using species miscellaneous forest inventory data. For more details about functions of forests in India one can refer to the works of Hadker, Sharma, David and Muraleedharan (1997) on Borivili National Park, Mumbai, and Chopra (1998) on Periyar Tiger Reserve and Bharatpur Keoladeo National Park.Degradation of forest resources has a detrimental effect on soil, water and climate, which in turn affects human and animal life. This has created global concern for protection and preservation of forests.

India's freshwater resources consist of river systems, groundwater and wetlands. Indian rivers are subject to siltation from sediment loads due to soil loss, net withdrawals along their course due to agricultural, industrial and municipal use, as well as pollution from human and animal wastes, agricultural run offs and industrial effluents.

Box 1 : The Koshi River Example

The Koshi river is a transboundary river between Nepal and India and is one of the largest tributaries of the river Ganga. Over the last 250 years, this river has shifted its course over 120 kilometers from east to west. The main reason behind this is attributed to the heavy silt that it carries during the monsoon season. Although the rivers possess significant natural capacity to absorb many pollutants, the existing pollution inflows in many cases substantially exceed such natural capacities. The mix of pollutants along with progressive reduction in stream flows causes decline in river water quality in the downstream. It affects livelihoods of the fisherfolk and causes significant impact on human health from polluted water. On 18 August 2008the Koshi river picked up an old channel it had abandoned over 100 years ago near the border with Nepal and India. Approximately 2.7 million people were affected as the river broke its embankment at Kusaha in Nepal thus submerging several districts of Nepal and India. It is reported as the worst flood in the area in 50 years. The Prime Minister of India declared it as a natural calamity.

In India from the point of view of groundwater we find that the water table has been falling rapidly in many areas of the country in recent decades. This is mainly due to heavy demand from agriculture, industry and urban use causing withdrawal in excess of annual recharge. In urban areas, apart from withdrawals for domestic and industrial use, the major sources of groundwater demand are housing and infrastructure, such as roads. In addition, some pollution of groundwater occurs due to leaching of stored hazardous waste and use of agricultural chemicals, in particular pesticides. Contamination of groundwater is also due to causes like leaching of arsenic and fluoride from natural deposits. Since groundwater is frequently a source of drinking water, its pollution and contamination leads to serious health impacts.[3]

2. Identification of priority issues in order to promote sustainable development

Economic growth bears a dichotomous relationship with environmental degradation. On one hand economic growth may result in environmental degradation through large-scale exploitation of natural resources. On the other hand economic growth results in improvement of environmental quality by making available the necessary resources for environmental investments and creating the necessary environmental ambience through institutional and policy change. It is to be noted that in India poor environmental quality has adversely affected human health. For example, nearly 20 percent of the burden of disease in India and a number of environment-health factors are closely linked with dimensions of poverty (e.g. malnutrition, lack of access to clean energy and water). Institutional failures, implying insufficiently enforced property rights and access to and use of environmental resources, result in environmental degradation. Traditionally, in India, village common water resources, grazing grounds, local forests, fisheries etc. are protected by local communities from overexploitation. However, these norms may fail due to the very process of economic growth resulting in large-scale urbanization and high population growth (due to sharp reduction in mortality) causing degradation of the natural resources. It ultimately affects the livelihood of the concerned community.

As India’s development challenges have evolved, the understanding of the role of environmental concerns in development has sharpened. Sustainable development takes into account all these environmental concerns and broadly deals with enhancement of human well being that is considered as a recurring theme in India’s development policy. It requires a balance and harmony among economic, social and environmental needs of the country. The major

[3] According to the Union Ministry of Water Resources in India, eight districts of the state of West Bengal and one district of the state of Bihar are arsenic-contaminated. At present the arsenic problem is also spreading in some of the districts of the states of Uttar Pradesh and Assam.

national policies in recent years related to environmental management in the Indian context are National Forest Policy or NFP (1988); the National Conservation Strategy and Policy Statement on Environment and Development or NCSPSED (1992); the Policy Statement on Abatement of Pollution or PSAP (1992). Some sectoral policies like the National Agricultural Policy or NAP (2000); National Population Policy or NPP (2000) and National Water Policy or NWP (2002) have also contributed towards environmental management. Finally, the National Environment Policy or NEP (2006) has attempted to extend the coverage and fill the gaps that still exist in light of the existing policies and also in terms of present knowledge and accumulated experience.

Focusing on India's forestry sector we find that some site-specific non-forest activities may be beneficial for the society in the sense that the benefits from the non-forest activities significantly exceed the benefits provided by the particular tract of the forest. Maintenance of forests involves a cost to the states, not only in terms of direct costs of manpower and associated infrastructure but also in terms of the opportunity cost of maintenance. However, it is to be noted that large-scale forest loss would lead to catastrophic and permanent change in the country's ecology leading to major stress on water resources and soil erosion .It ultimately leads to loss of agricultural productivity, industrial potential and living conditions along with increasing vulnerability to natural disasters including droughts and floods.

In 1988 India adopted the NFP with the aim to increase the country's forest cover to one-third of the total land area. In some states of India we find forests along with substantial non-forest wastelands. In those states it may be easily possible to convert the wastelands to agricultural lands. Again it may not be feasible to convert forest areas to agricultural lands in hilly tracts. In some other states that have negligible forest cover, soil and climatic conditions barely support dryland farming and are not conducive to development of forest cover. A change in the land utilization pattern implies an increase or decrease in the proportion of area under different land uses at a point in two or more time periods. Table 2 shows land utilization pattern in India from 1951 to 2006.

Table 2. Land Use Pattern in India, 1951-2006(in million hectares)

Classification	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2001-02 *	2003-04*	2005-06*
I. Geographical Area	328.7	328.7	328.7	328.7	328.73	328.73	328.73	328.73	328.73
II. Reporting Area for Land Utilization Statistics (1 to 5)	284.32	298.4	303.7	304.1	304.86	306.06	305.11	305.4	305.27
1. Forests	40.48	54.05	63.91	67.47	67.8	69.02	69.57	69.72	69.79
2.Not Available for Cultivation**	47.52	50.75	44.64	39.62	40.48	42.41	41.79	42.24	42.5
3.Other Uncultivated Land (excluding fallow land)***	49.45	37.64	35.06	32.31	30.22	28.49	27.36	26.98	26.91
4.Fallow Land	28.12	22.82	19.88	24.75	23.36	24.91	24.96	25.49	24.18
5. Net Area Sown	118.75	133.2	140.27	140	143	141.23	141.43	140.97	141..89
III.Net Irrigated Area	20.85	24.66	31.1	38.72	47.78	55.08	56.67	56.62	60.2

Source: Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India(2007-08), and www.indiastat.com ,Data India Net Private Limited (2009).

- Provisional figures

** Not available for cultivation means non agricultural uses and barren and unculturable land

***Other uncultivable land implies permanent pasture and other grazing land, land under miscellaneous tree crops and groves not included in net area sown and culturable wasteland.

Table 3: Comparative Situation of Forest Cover in India, 2001-2005

States/UTs	Total Forest Cover (in Sq Kms)			Change in 2003(col 3-col 2)	Change in 2005(col 4- col 3)
	2001	2003	2005		
1	2	3	4	5	6
Andhra Pradesh	44637	44419	44372	-218	-47
Arunachal Pradesh	68045	68019	67777	-26	-242
Assam	27714	27826	27645	112	-181
Bihar	5720	5558	5579	-162	21
Chhattisgarh	56448	55998	55863	-450	-135
Goa	2095	2156	2164	61	8
Gujarat	15152	14946	14715	-206	-231
Haryana	1754	1517	1587	-237	70
Himachal Pradesh	14360	14353	14369	-7	16
Jammu & Kashmir	21237	21267	21273	30	6
Jharkhand	22637	22716	22591	79	-125
Karnataka	36991	36449	35251	-542	-1198
Kerala	15560	15577	15595	17	18
Madhya Pradesh	77265	79429	76013	2164	-3416
Maharashtra	47482	46865	47476	-617	611
Manipur	16926	17219	17086	293	-133
Meghalaya	15584	16839	16988	1255	149
Mizoram	17494	18430	18684	936	254
Nagaland	13345	13609	13719	264	110
Orissa	48838	48366	48374	-472	8
Punjab	2432	1580	1558	-852	-22
Rajasthan	16367	15826	15850	-541	24
Sikkim	3193	3262	3262	69	0
Tamil Nadu	21482	22643	23044	1161	401
Tripura	7065	8093	8155	1028	62
Uttaranchal/	23938	24465	24442	527	-23

Uttarakhand					
Uttar Pradesh	13746	14118	14127	372	9
West Bengal	10693	12343	12413	1650	70
Andaman & Nicobar Islands	6930	6964	6629	34	-335
Chandigarh	9	15	15	6	0
Dadra & Nagar Haveli	219	225	221	6	-4
Daman & Diu	6	8	8	2	0
Delhi	111	170	176	59	6

Source : 1.Forest Survey of India, Government of India

2. www.indiastat.com, Government of India

From Table 2 we find that the land use pattern in India is more or less stable since 1950-51. Again from Table 3 we find that the states that have shown significant increase in forest covers are Bihar, Himachal Pradesh, Uttar Pradesh, Karnataka, Tamil Nadu, Gujarat, Manipur, Tripura, West Bengal and Meghalaya.

The poor are highly vulnerable to the loss of resilience in ecosystems. Large-scale reduction in resilience causes distress of the ecosystem that ultimately affects the livelihood of the poor people. This may happen even if the economy faces high rate of growth. It is increasingly evident in India that poor water quality has adversely affected human health of poor people mostly living in rural area. Again urban environmental degradation due to lack of waste treatment, sanitation treatment and industry and transport related pollution has adversely affected air, water and soil quality.

Water pollution is a common problem facing both the urban and the rural poor. It comes from mainly three sources: domestic sewage, industrial effluents and run off from activities such as agriculture. In India the Central Pollution Control Board (CPCB) along with State Pollution Control Board (SPCB) of various states is operating over last few years the water quality-monitoring network for monitoring aquatic resources of the country. It comprises 784 stations in 26 states and 5 union territories of the country. On the basis of the results obtained during the year 2003 we find that organic pollution is the predominant form of pollution of aquatic resources.

The direct causes of river degradation in India are linked to various policies and regulatory regimes related to irrigation systems, agricultural production and industrial use. Policies and regulatory regimes related to agricultural activities and industrial use are not only related to river degradation but also groundwater pollution. The irrigation tariffs are insufficient for proper maintenance of irrigation systems. In particular, resources are not available for lining irrigation canals to prevent seepage loss. It causes reduced flow of river water. Pollution loads that are mixed with river water are also linked to pricing policies leading to inefficient use of agricultural chemicals. Pollution of groundwater in India from agricultural chemicals, especially chemical pesticides, are also linked to their improper and inefficient use and one of the main reasons behind this is pricing policies related to agriculture. Pollution regulations in India are not designed in such a manner so that there is clustering of industries in order to facilitate effluent treatment plants. This results in high costs of effluent treatment that ultimately causes the failure to meet the requirements for setting such treatment plants by a large number of firms causing ultimately river degradation.

One of the major reasons of groundwater depletion in India is the pricing policy of diesel. Groundwater being an open access resource, subsidies for diesel reduces the marginal cost of extraction resulting in its overextraction through pumpsets even below the efficiency level. It causes fall in the water table. Apart from this, support prices for several water-intensive crops with implicit price subsidies aggravate the problem as the farmers have more incentive to take up these crops rather than the less water-intensive ones. Overexploitation and inadequate recharge of groundwater also causes serious problem like increase in salinity leading to adverse health impact and loss of land productivity, especially in costal areas.

In order to identify the priority issues for promoting sustainable development in the context of an economy like India one should start with the objectives of NEP (2006) of the Government of India (GOI). The objectives can be listed as follows.

(i) Conservation of critical environmental resources which are essential for enhancement of livelihood and human well being along with economic growth.

(ii) Intra-generational equity and ensuring that the poorer sections of the society have secured access to these resources.

(iii) Inter-generational equity.

(iv) Integration of environmental concerns in economic and social development

(v) Efficiency in environmental resource use.

(vi) Good governance regarding management and regulation of the use of environmental resources.

(vii) Enhancement of resources for environmental conservation through mutually beneficial multistakeholder partnerships among local communities, public agencies, academic and research community, investors and multilateral/bilateral development partners.

Thus we find that the objectives are designed in a manner so that human beings remain at the centre of concerns for sustainable development. The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations. To achieve these objectives priority should be given for protection of the country's forestry sector and freshwater resources so as to enhance the livelihood of poor people along with reduction in poverty and hunger.

The main reason behind priority to protection of forests is due to the fact that in India the forestry sector plays a multi-dimensional role in the context of its attempt to achieve the path of sustainable development. It is through protection of forests not only critical environmental resources are conserved so that biodiversity can be protected, but also protection of forests help to meet the needs of the poor, given that a large proportion of India's poor are dependent on forests. Apart from this, wide scale afforestation helps the economy to have low level of greenhouse gas (GHG) emissions. Thus importance should be given to formulate an innovative strategy for the forestry sector in order to protect the existing forests along with to increase forest cover through afforestation of degraded forestland and wastelands. It can be achieved through multistakeholder partnerships involving the Forest Department, landowning agencies, local communities and investors. Together with this, for participatory management of the forestry sector priority should be given so as to adopt community based practices in forest management like Community Forest Management (CFM), Joint Forest Management[4] (JFM) and their variants with assured participation of women throughout the country.

The main reason behind protection to fresh water resources follows from the fact that in India unsustainable use of freshwater resources can always be linked with health problems[5] and its sustainable use can be considered as a step towards enhancement of livelihood of the fisherfolk and also to promote irrigational activities. In other words sustainable freshwater resource

[4] Of all the managed systems CFM and JFM are the most popular ones. JFM is a participatory forest management system between village community and the State Forest Department that came into effect from June 1990.This is the most popular of all the managed systems. Since 1990 all the states have been trying to bring more and more forest area under this system. CFM is actually self-initiated forest protection by the villagers. CFM is also popular in state like Orissa.

[5] One can consider various cases like how groundwater pollution causes drinking water problem in rural India ultimately leading to various health problems in almost every year. One such example is the case of arsenic problem and related health problems in the state of West Bengal, India.

management can be considered as a major drive towards sustainable management of *'watershed plus'*. Regarding freshwater resources emphasis should be given on integrated approaches[6] to management of river basins by the concerned river authorities in order to take into account the interface between land and water, pollution loads and natural regeneration capacities. The aim should be to ensure maintenance of adequate water flows along with maintenance of water quality standards throughout the year. Apart from this, optimal utilization of fertilizers, pesticides and insecticides in agricultural fields should be encouraged for improving groundwater quality. Priority should be given to implement a comprehensive strategy for regulating use of ground water by large industrial and commercial establishments on the basis of a careful evaluation of aquifer capacity and annual recharge. Finally, wetland conservation, including conservation of village ponds and tanks, should be integrated into sectoral development plans for poverty alleviation and livelihood improvement. Efforts for conservation and sustainable use of wetlands should be linked with the ongoing rural infrastructure development and employment generation programmes.

3. Existing Relevant National Policies or Laws.

The main theme of the NEP (2006) is based on the fact that while conservation of natural resources is necessary to secure livelihoods and well-being of all, the most secure basis for conservation is to ensure that the people dependent on a particular resource obtain better livelihood from the conservation of the resource rather than from the degradation of the resource.[7]

The NEP (2006) emphasizes on reduction in delays in environmental decision-makings, greater transparency and accountability in such decision-makings and decentralization of environmental functions .In order to make the clearance processes more effective it proposes a few action plans. Some of the major aspects of the action plans are stated as follows.

(i) To encourage regulatory authorities both Centre and State should institutionalize regional and cumulative environmental impact assessments (R/EIA) for appraising and reviewing new projects.

[6] The NWP (2002) along with NEP (2006) emphasizes on this strategy.

[7] Article 51-A(g) of the Indian Constitution states that it is the fundamental duty of every citizen of this country to protect the environment. The State's responsibility in this regard has been laid down in Article 48-A of India's Constitution.

(ii) To encourage clustering of industrial units to facilitate setting up of environmental management infrastructure and also for monitoring of activities that affect the environment.

(iii) To restrict diversion of dense natural forests and areas of high endemism of genetic resources, to non-forest purposes. These are mainly for site-specific cases of vital national interest. Apart from this there will be no further permission of cases involving direct or indirect encroachment to forests.

In this context it is relevant to mention that the action plan, as proposed in NEP, in connection with climate change considers various aspects that include assessment of the scope of incorporating watershed management, coastal zone planning and regulation, forestry management etc. in relevant programmes on climate change.[8]

Regarding degradation and depletion of natural resources NEP states that they should be incorporated into the decisions of economic actors at various levels. At the macro-level a system of natural resource accounting is essential to examine whether as a result of economic growth there is enhancement or depletion of natural resource base of the country. Integration of economic factors with environmental compliance can be done through application of the principle of "polluter pays". This may ensure that for any given level of environmental quality desired, the society-wide cost of meeting the standard is minimized.

We now focus on some of the aspects of the action plan related to freshwater resources. The major elements of the action plan regarding water pollution, as mentioned in the NEP, can be listed as follows:

(i) To develop and implement at the pilot level public-private partnership models for setting up and operating effluent and sewage treatment plants. Once the models are validated, public resources along with external assistance can be used progressively so as to have a catalytic effect on the partnership. In fact emphasis should be given for enhancement of municipalities for recovery of user charges for water and sewage systems.

(ii) To prepare and implement action plans for preventing water pollution in major cities. Public-private partnerships can be encouraged for treatment, reuse and

[8] The action plan on climate change, as mentioned in NEP, also aims to provide encouragement to Indian industry to adopt Clean Development Mechanism (CDM). Apart from this, it suggests to participate in voluntary partnership with various developed and developing countries to address the challenges of sustainable development and climate change consistent with the provision of the United Nations Framework Convention on Climate Change (UNFCC)

recycle where applicable of sewage and wastewater from municipal and industrial sources before final discharge to water bodies.

(iii) To take measures to prevent pollution of water bodies from waste disposals on lands.

(iv) To take explicit account of groundwater pollution in pricing policies of agricultural inputs.

From the legal point of view the GOI has taken various steps for environmental protection. The Environmental (Protection) Act was introduced in 1986 as an umbrella legislation to provide a holistic framework for protection and improvement to the environment. More particularly, The Wildlife (Protection) act was introduced in 1972 and was amended in 1983,1986,1991 and 2002. The Water (Prevention and Control of Pollution) Act was introduced in 1974 with the objective to prevent and control water pollution. The Act was amended in 1988. Apart from this the Water (Prevention and Control of Pollution) Cess Act was introduced in 1977 and was amended in 1991.The Forest (Conservation) Act was introduced in 1980 for conservation of forests and regulating diversion of forestlands for non-forest purposes. This law was later amended in 1988 in line with NFP (1988) of GOI. The Ministry of Environment and Forests has enacted the Biological Diversity Act in 2002 under the United Nations Convention on Biological Diversity (UNCBD) signed in Rio de Janeiro on 5th June 1992 of which India was also a party. The Act aimed to provide conservation of biological diversity, sustainable use of its components, fair and equitable sharing of the benefits arising out of the biological resources etc.[9]

The GOI has advocated for a judicious mix of civil and criminal processes for any environmentally unacceptable behaviour. The proper enforcement will be done through a review of existing legislation. Civil laws may govern most situations of non-compliance. Criminal processes may deal with more serious infringements of environmental laws.

4. The Problem from Implementation of Existing Relevant Policies or Laws

The key environmental challenges mentioned in NEP are more of general type and less of India-specific. It is more concerned with speeding up of clearances than introducing comprehensive reform. Apart from this there is huge amount of ambiguity regarding

[9] Many other acts/rules were introduced by the GOI to promote sustainable development. Examples of few such acts/rules are Air (Prevention and Control of Pollution) Act which of 1981 (amended in 1988); Hazardous Wastes (Management and Handling) Amendment Rules, 2003;Ozone Depleting Substances (Regulation and Control) Rules, in 2000 etc.

implementation of the various policies. As it is not possible to discuss here all the aspects related to implementation of various policies we confine ourselves only to those cases that are someway or other related to the forestry sector and water pollution.

Regarding conservation of resources the NEP proposes to complement current efforts with multi-stakeholder partnerships involving the forest department, local communities, NGOs, 'universalisation' of JFM etc. The most crucial of all these is the relationship between local communities and the forest department. The policy proposal has stated for 'legal recognition of traditional rights'. This is ambiguous unless the role of forest department in the context of its relationship with local communities is clearly specified. In India, for example, the state of West Bengal is not fulfilling its poverty alleviation potential through JFM. In fact, there is disillusionment among the local people about JFM. For most of the forests of West Bengal, the forest department is the dominant partner and the local communities are excluded from decision-making. The forest department is more interested in development of forests rather than on improvement of livelihood. In other words, the forest department has delinked livelihood development from forest development in most parts of the state. Due to this de-linking, in the forests of the northern part of West Bengal nowadays we find that the stakeholders follow a participatory type forestry management and it is more of CFM type than of JFM type.

Apart from the issues related to JFM in the Indian context, the issues related to impediments of sustainable development of non-timber forest production are also important. For illustrative purposes we can say that inadequate organizational structures acts as an impediment to procurement of non-timber forest products (NTFPs). This problem is matched with lack of development of small-scale industries based on NTFPs.[10]

From the point of view of biodiversity protection only little changes are considered in institutional arrangements. The NEP has addressed the issue of multi-stakeholder partnership for enhancement of wildlife in 'conservation reserves'. It has also stressed on building up a 'community reserve' so that the local communities associated with forestry will be encouraged to find alternative livelihoods. Inspite of the announcement of the new measures their implementations are not clearly mentioned in NEP.

One major issue demanding the attention of policy makers is the question of water pollution from increasing economic activity. The most polluting among the various sources are city

[10] See Lele, Mitra and Kaul (1994) for details.

sewage and industrial waste discharged into the rivers. Over the last fifty years though the number of industries in India has grown rapidly, water pollution is concentrated within a few subsectors, mainly in the form of toxic wastes and organic pollutants. In fact a number of large and medium-sized industries covered by the Ganga-Action Plan do not have adequate effluent treatment facilities. Most of these industries include sugar mills, distilleries, leather processing industries and thermal power stations. The NEP (2006) has stressed on public-private partnerships for setting up effluent treatment plants. It is not possible for the small-scale industries to set up these plants, as they cannot afford enormous investment in pollution control equipments due to their low profit margins. Hence, the feasibility of public-private partnership for all type of industries regarding setting up of effluent treatment plants is questionable.

In the context of water pollution from industrial wastes one can refer to the case of water pollution due to discharge of effluents by factories in Khari River in the city of Ahmedabad, India.[11] This city has the highest number of composite textile mills in the country. As a result of this we find that over the years there is a subsequent increase in the number of small scale and medium scale dye and dyestuff manufacturing units in this area. Most of these industrial units are located in industrial estates promoted by the Government of Gujarat through Gujarat Industrial Development Corporation (GIDC). Three such industrial areas causing high volumes of flow of effluent to the river stream are Naroda, Odhav and Vatva on the eastern periphery of Ahmedabad city. Common effluent treatment plants (CETPs) were set up in all three industrial estates after Gujarat High Court passed orders that these plants should be set up. The CETPs are designed to meet the requirements of standard water pollution parameters like chemical oxygen demand (COD), biological oxygen demand (BOD), pH etc. However, they are not designed to meet standards related to total dissolved solids (TDS) and heavy metals. Apart from this continuous discharge of effluents to medium and deep aquifers through deep tube wells by medium and small-scale industries in the above-mentioned industrial areas has resulted in high level of groundwater contamination. All these factors have affected the health of the local people. People are forced to drink polluted water due to the absence of alternative sources. To tackle these problems in December 2003 a core group was formed. This core group was actually a subgroup of Sabarmati Stakeholder's Forum (SSF). Thus it consisted of the various stakeholders who are affected by the water pollution along with representatives of industrial association, representatives of CETPs, various NGOs and Government officials. The stakeholders in the form of the core group were successful in alleviating the problems of effluents discharged by factories on Khari river in the eastern periphery of Ahmedabad city.

[11] For details see Mudrakartha, Sheth and Srinath (2006).

The use of land for agriculture and the practices followed in cultivation mainly in the form of use of fertilizers and pesticides used to affect quality of groundwater in India. The NEP (2006) has focused on prevention of water pollution from waste disposal on lands and surface flow of waste–mixed water, but implementation of such a policy may create problem in the sense that the issue of land-water linkage is not being properly addressed in the present water and land policies. For example, in many areas surface flows of water in the past have helped to prevent increase in soil salinity by leaching of the salts. So there is a need for comprehensive land-water resource management for implementation of the policies related to water pollution due to agricultural runoff.

5. Summary

In India we find poverty and environmental degradation are closely linked with each other and any attempt to achieve sustainable development must deal with enhancement of human well being and improvement of livelihood of the poor. It requires a balance and harmony between economic, social and environmental needs of the country. Among the various environmental problems facing the Indian economy, two major environmental impediments to achieve sustainable development are large-scale deforestation and pollution from freshwater resources. One of the major objectives of the NEP (2006) is conservation of natural resources to secure livelihoods and well being of all in the country. To achieve this objective priority should be given to protection of the country's forestry sector and freshwater resources so as to enhance the livelihood of poor people along with reduction in poverty and hunger. So far the NEP (2006) has yet to achieve its goal as at present almost 27.5% of the rural and urban poor combined lives below the poverty line.[12] It cannot be denied that the NEP(2006) has focused on various objectives that are considered as major issues in achieving sustainable development. However, the problem lies in the implementation of those policies. For example, if we focus on the forestry sector we find that the policy proposal has stated for legal recognition of traditional rights. This is effective in the context of JFM only when the relationship of the forest department with local communities is clearly specified. In India, the state of West Bengal was the pioneer of JFM but at present it is not fulfilling its poverty alleviation potential through JFM leading to disillusionment about the programme. This is mainly because of the fact that the forest department is the dominant partner and there is lesser people's participation than that was

[12] This figure is taken from Economic Survey2007-08, Government of India (2008).It has been calculated on the basis of 61st round of National Sample Survey.

expected at the time of initiation of the programme.

Regarding water pollution though the NEP (2006) has stressed on public-private partnerships for setting up of effluent treatment plants, the feasibility of such programme, especially for small-scale industries, is questionable in the Indian context. We have also mentioned earlier that the effectiveness of the policy of prevention of pollution from waste disposal requires a clear-cut analysis of land-water linkage in the Indian context.

Apart from the above-mentioned issues, the policy makers should also take into account an important area like prevention of air pollution, especially vehicular pollution, to check urban environmental degradation and also to protect the health of the urban poor. Another important area in the context of its move towards sustainable development is related to conservation of biodiversity and use of traditional knowledge. Finally, comes the issue of GHG emissions. This is linked to conservation of forest resources. Forests contribute to process of carbon sequestration and act as carbon sink, which is important for reduction of GHG emissions and global warming.

India is a fast developing country and its economic structure, technologies and resource availability are fast changing. Inspite of these changes poverty is one of the major problems of the country. Herein lies the question of implementation of the existing policies. The prospects of NEP are not bleak provided they are properly implemented.So in India periodic reviews of implementation of the environmental policies are essential.[13] Apart from review of the existing environmental policies attempts should also be made to bring the environmental policies as a part of India's development programme. It will be a first step towards mainstreaming of sustainable development policies. It is expected from that it would be possible for India to achieve this goal provided the policies are implemented in a comprehensive manner with participation of people from all sectors of the society.

[13] The NEP(2006) is relatively new and it requires periodic review to examine whether the policies proposed can be properly implemented.

List of Abbreviations

BOD	Biological Oxygen Demand
CDM	Clean Development Mechanism
CETPs	Common Effluent Treatment Plants
CFM	Community Forest Management
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
EKC	Environmental Kuznets Curve
GDP	Gross Domestic Product
GHG	Green House Gases
GIDC	Gujarat Industrial Development Corporation
GMR	Global Monitoring Report
GOI	Government of India
HDR	Human Development Report
IPRs	Intellectual Property Rights
JFM	Joint Forest Management
MDG	Millennium Development Goals
NAP	National Agricultural Policy
NCSPSED	National Conservation Strategy and Policy Statement on Environment and Development
NEP	National Environment Policy
NFP	National Forest Policy
NPP	National Population Policy

NTFPs	Non-timber Forest Products
NWP	National Water Policy
PSAP	Policy Statement on Abatement of Pollution
R/EIA	Regional and Cumulative Environmental impact Assessment
SPCB	State Pollution Control Board
SSF	Sabarmati Stakeholder's Forum
TDS	Total Dissolved Solids
UNFCC	United Nations Framework Convention on Climate Change
UNCBD	United Nations Convention on Biological Diversity

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Appendix 3

Indonesia Country Review

A.3 Reduction Emission from Forestation and Forest Degradation and Sustainable Development in Indonesia

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1. Introduction

Indonesia is one of the world's forest-rich countries. Based on vegetation map of Indonesia (Hannibal, 1950), nearly 84 percent of Indonesia's land area was covered mainly by primary and secondary forests. The forest area is defined by its function and use, i.e. conservation forest, protection forest, limited production forest or production forest. Part of the production forest is convertible. These forests have been used for many generations by the communities living in and near them. Since the 1970s, the government too has used them more extensively to contribute to national economic development through State-owned and private companies. This has made the forestry sector one of the most important contributors to Indonesia's economy over the last three decades. Before, the monetary crisis hit Indonesia and many other Asian countries in 1997, the forestry sector was contributing about US$20 billion/year, or about 10 percent of total gross domestic product (GDP) (ITTO, 2001).

At present about 30 million people depends their livelihood on Indonesia's forests. However, in the last three decades little it has been done to develop rural areas or improve the livelihoods of people living in and near forests. This is mainly due to the overwhelming problems of unclear land tenure and local communities' lack of participation or involvement in the management and use of forest resources. After the fall of the New Order regime in May 1998, Act No. 22/1999 and Government Regulation No. 25/2000 gives more authority to local (provincial and district) governments, triggering autonomy euphoria all over Indonesia. Issuance of Forestry Act No. 41/1999, which superseded Forestry Act No. 5/1967, marked the onset of reformation in the forestry sector. However, neither this new act, nor the other natural resource regulations issued in the last five years is in favor of local communities. Some individuals and groups have taken advantage of the ambiguity of the laws and regulations to abuse the system, leaving the majority

of local communities still insecure over the ownership of land and natural resources (Simorangkir and Sardjono, 200?).

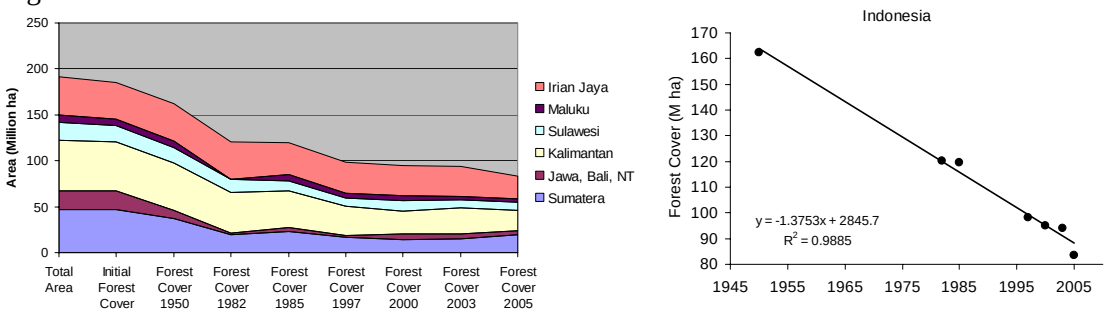
The above condition exposed Indonesian forest into serious degradation. High rate of deforestation due to rapid development and increase land demand for agriculture activities, and forest degradation due to illegal logging activities have been observed in many part of Indonesia, particularly in the islands of Sumatra and Kalimantan. This problem brought Indonesia to be one of developing countries with significant contribution to the global GHG emissions. In response to this situation, Government of Indonesia has issued a number of policies that can lower deforestation and forest degradation. Among others, some policies are creating incentive and disincentive mechanism for local government in managing their forests, law enforcement for forest fire prevention and controls, strict rules in peat land management and implementing REDD (*Reducing Emission from Deforestation in Developing Countries*).

This paper highlights deforestation and forest degradation problem that cause serious threat to future Indonesian economic development, and dilemma faced by the country in managing its forest resources. In the later sections, it describes key policies and programs on forest management focusing on REDD and factors that may cause the ineffective or inappropriate implementation of the policies and the programs.

2. Deforestation and forest degradation

The rapid increase of use of forest resources for livelihood and development puts Indonesian forest under serious decline. Throughout Indonesia, forest clearance began in the lowland areas, where topography and soil fertility were most favorable to human settlement and agriculture. In 1970s and 1980s forest clearance also occurred for plantation and transmigration program as well as commercial logging. However, It is difficult to get good estimates of forest clearance. Different studies provided different estimates (RePProt, 1990; Hannibal, 1950; Intag, 1990; MoF, 1998, 2000, 2001 and 2002; FWI and GFW, 2001). However, based on these studies the average annual reduction in forest area over the last 50 years fluctuate around 1.8 million ha reaching a peak of about 2.8 million ha during the years 1997-2000. Based on linear regression analysis, an average annual reduction in forest area is about 1.4 million ha per year (Figure 1).

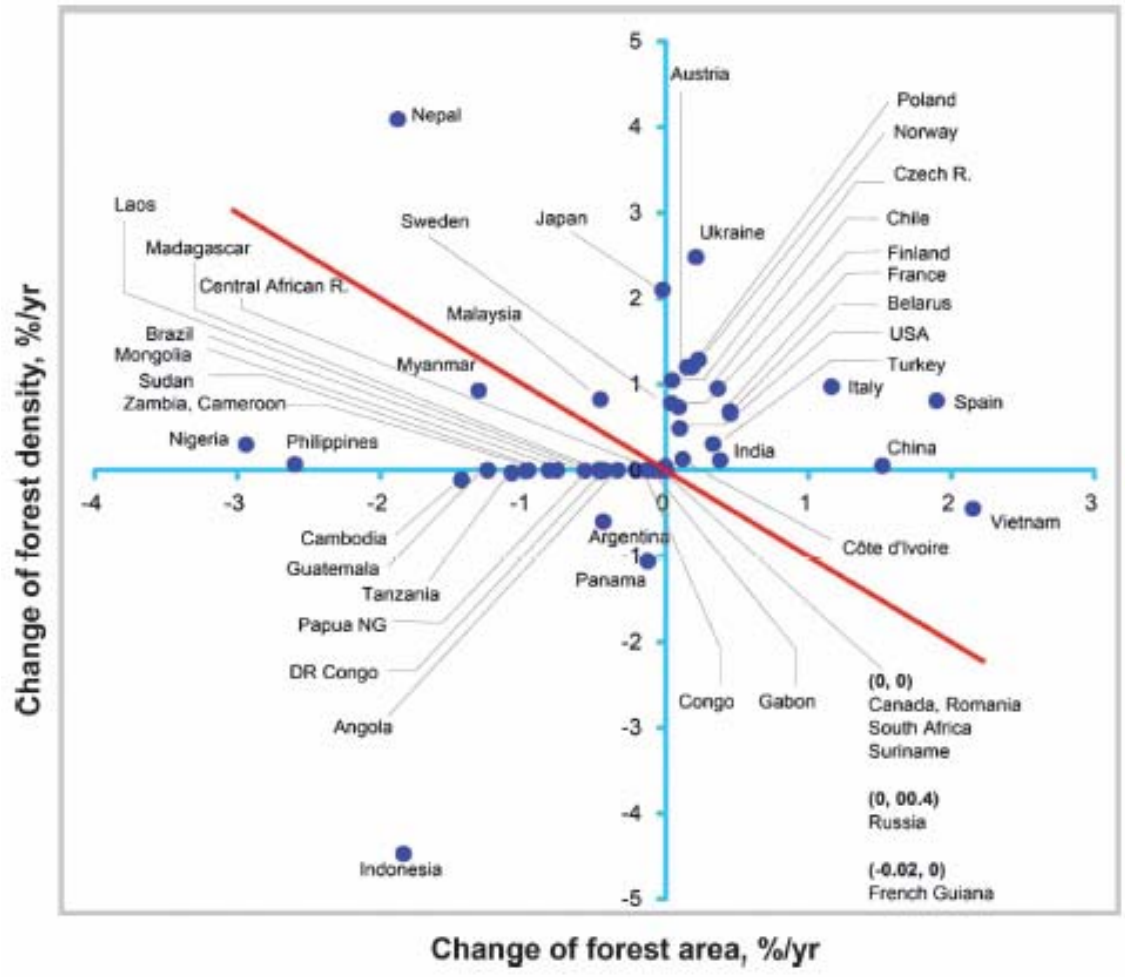
Figure 1



Source: Rate of deforestation in Indonesia (Developed based on data from RepPort, 1990; Hannibal, 1950; Intag, 1990; MoF, 1998, 2000, 2001 and 2002; FWI and GFW, 2001, MoE, 2005, and from BAPLAN in Sugadiman, 2007)

Recent study conducted by Kauppi et al (2006) using data from the Global Forest Resources Assessment by the United Nations Food and Agriculture Organization (FAO, 2005), in addition to rapid rate of deforestation, excessive logging also causes Indonesia forest under serious level of degradation. Among the 50 nations, Indonesia has been found to be a country with the largest degradation rate (Figure 2). Rate of deforestation is also higher like other developing nations with rate of about 1.7% per year (equivalent to 1.87 Mha per year). However, based on new analysis conducted by Ministry of Forestry in collaboration with SDSU (South Dakota State University) using MODIS, it was suggested that rate of deforestation in Indonesia is lower than that reported to FAO under FRA2005. In the period of 2000-2005, the average deforestation rate declined to only 0.72 million ha per year or about 0.65% per year (Figure 3;). However the rate is increasing from year to year. In 2000-2001 the rate of deforestation was only 220 thousand ha and in 2004-2005 it increased to 1,182 thousand ha. The most rapid deforestation was in Sumatra and Kalimantan.

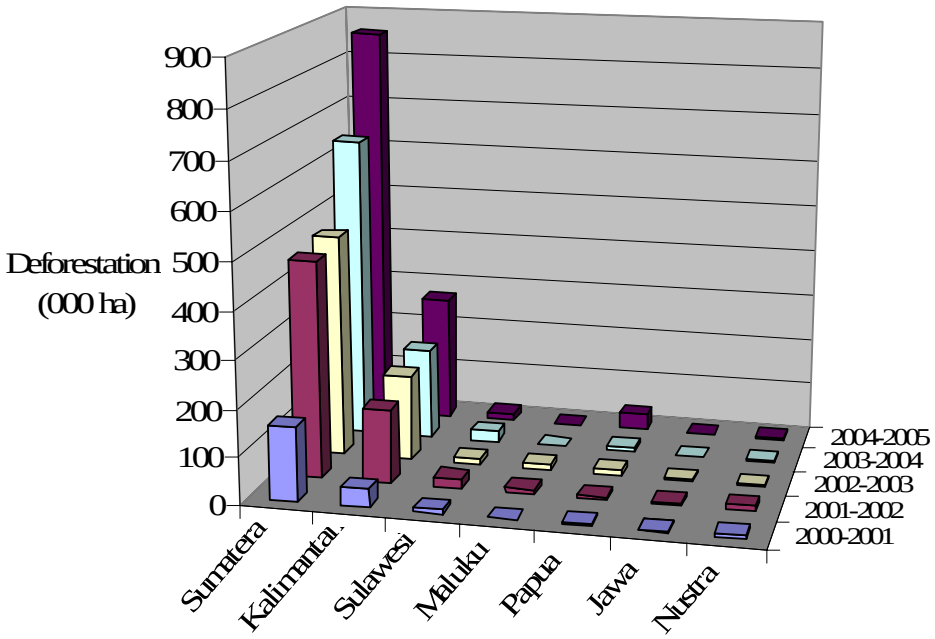
Figure 2. Changes in forest cover and forest density during 1990–2005 in the 50 nations



Source: Kauppi *et al.*, 2006

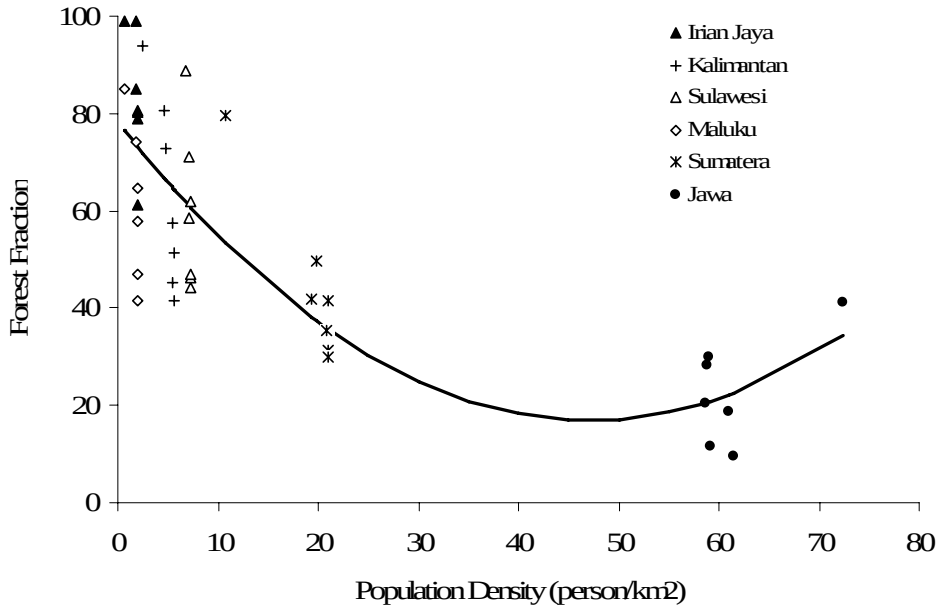
Many studies suggested that deforestation rate is strongly correlated with population density, with the correlation increasing with the number of rural landless families (Ludeke et al. 1990; Reis and Margulis (op. cit.), 1991; Adger and Brown 1994; Harrington 1996; Sisk et al. 1994; Kaimowitz 1997; Ochoa-Gaona and Gonzales-Espinosa 2000). However in Indonesia, the decreasing rate of forest cover with population density varied considerable between islands. The highest decreasing rate occurred in Irian Jaya, Kalimantan, Sulawesi, Maluku and Sumatra. While in Java it already entered transition period. The Forest area expanded in late 1990s, whereas population grew although slowly (Figure 4).

Figure 3. Annual rate of deforestation by island during 2000-2005 using MODIS data



Source: Developed based on data from BAPLAN in Sugardiman 2007

Figure 4. Relationship between forest fraction and population density by island



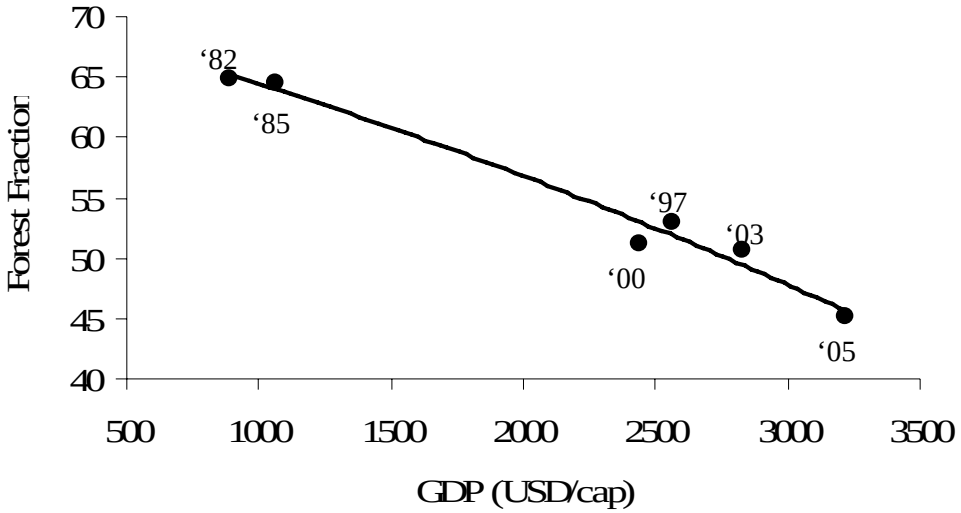
Source: Developed based on data from RePProt, 1990; Hannibal, 1950; Intag, 1990 MoF, 1998, 2000, 2001 and 2002; FWI and GFW, 2001, and BAPLAN in Sugardiman, 2007; Population Data from BPS)

Rapid decreased in forest cover in islands outside Java with slight increase in population density was due to large conversion of forest area for agriculture plantation, particularly to palm oil. For example, more than 1.1 million ha of oil palm was planted in Riau (Sumatra) alone during the period 1991-2005. Another 438,199 ha was planted in South Sumatra, 429,099 ha in North Sumatra and 394,945 ha in Jambi. In 2004, the government announced that it would establish a million hectares of oil palm in Kalimantan. Recently the government also plans to develop a Mega oil palm project on the border between Kalimantan and the neighboring Malaysian states of Sarawak and Sabah. But the program was cancelled after a number of NGOs protested against the plan. A new regulation (PP 26/2007) now offers investors the opportunity to establish up to 200,000 ha of oil palm plantations in Papua[1].

The prolific growth of the oil palm sector has conferred important economic benefits. Palm oil has become a valuable source of foreign exchange and employment. In 2005, oil palm industries employed around 1.86 million people and exported about 10.3 million tonnes of palm oil bringing in earnings valued at $3.75 billion. As contribution of agriculture sector to national GDP is quite significant, the reduction of forest cover has been found to be significantly correlated with the increase in GDP (Figure 5). Based on data from the 50 nations (see Fig. 2), Kauppi et al. (2006) found that the forest transition period started to occur when the GDP was more than 4,600 USD/cap.

[1] Menteri Pertanian PP 26/2007 tentang Pedoman Perizinan Usaha Perkebunan.

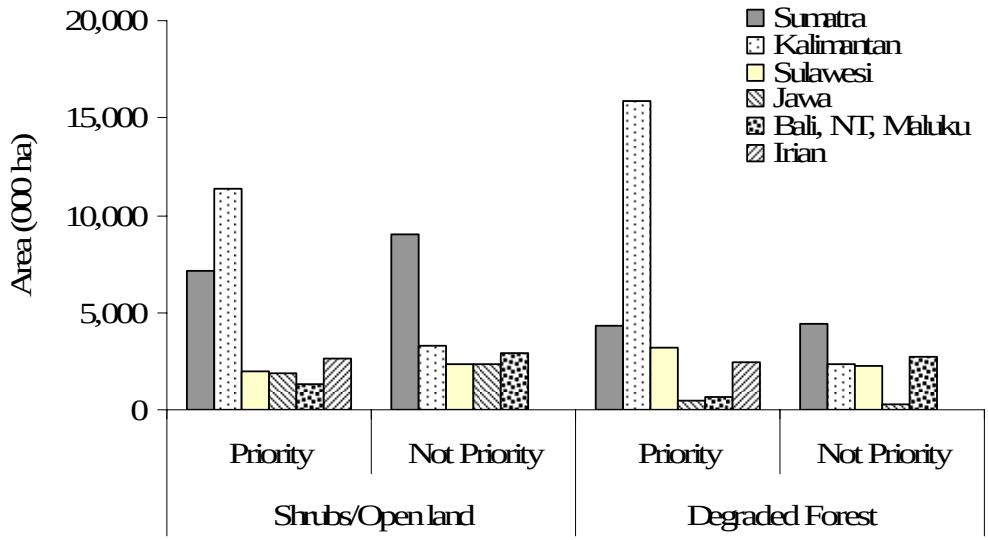
Figure 5. Relationship between forest fraction and GDP in Indonesia



Source: Developed based on data from RepProt, 1990; Hannibal, 1950; Intag, 1990; MoF, 1998, 2000, 2001 and 2002; FWI and GFW, 2001, and BAPLAN in Sugardiman 2007; and data on GDP based on purchasing-power-parity (PPP) per capita are taken from http://www.indexmundi.com/indonesia/gdp_real_growth_rate.html)

High rate of forest degradation occurred mainly in production forest due to high illegal logging activities. This condition was triggered by the high dependence of the wood products industries on logs from the natural forests and many poor people live surrounding forests (about 50-60 millions people) with little land and few options for maintaining livelihood. World Bank estimated that the lost of revenue due to illegal logging activities reached USD1500 million per annum. In 2002 the Secretary General of the Ministry of Forestry, Wahyudi Wardoyo, gave a figure of $600 million per annum. High rate of deforestation and forest degradation have caused many watersheds throughout Indonesia becoming critical. About 52.3 Mha has been prioritized for rehabilitation (Figure 6). Most of them are located in Kalimantan and Sumatra.

Figure 6. Area of critical land and degraded forest prioritized for rehabilitation program

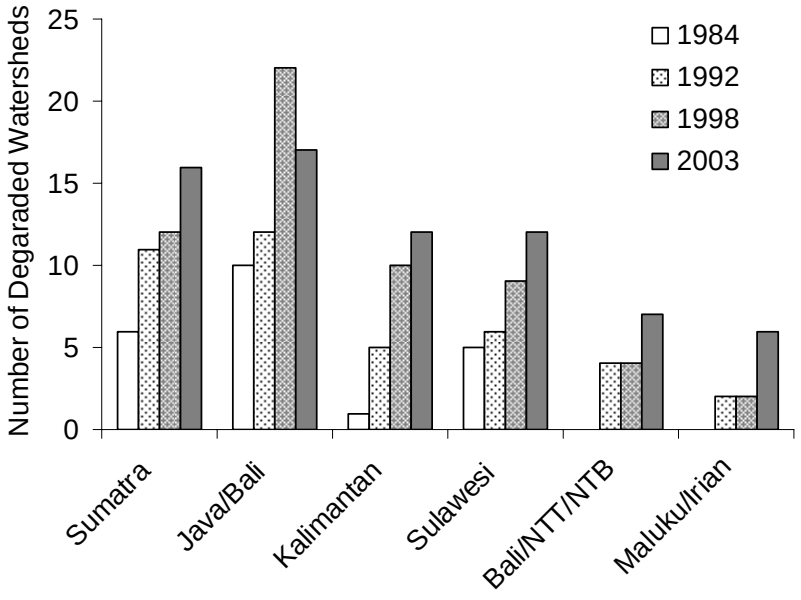


Source: based on data from the Directorate of Land Rehabilitation of Social Forestry Ministry of Forestry

3. Reducing rate of deforestation and forest degradation

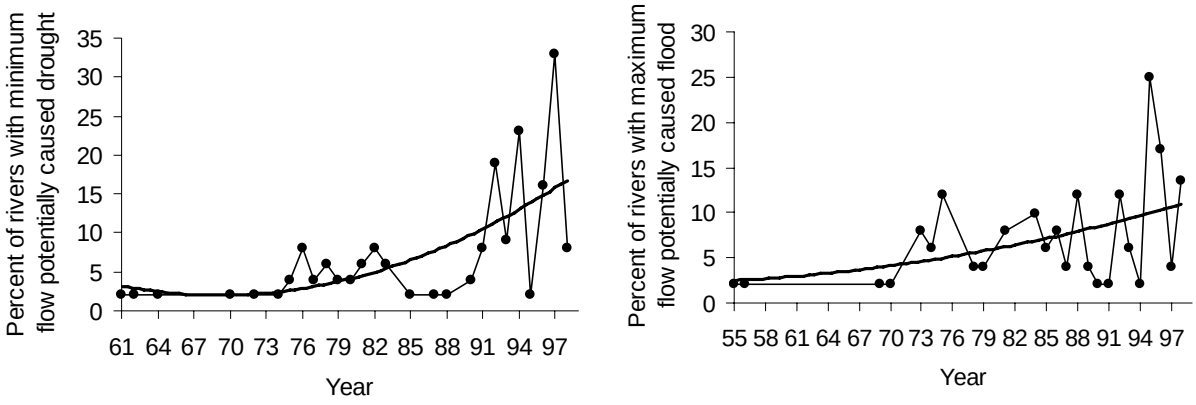
As indicated above, high rate of deforestation and forest degradation have created many critical watersheds. In 1984, number of degraded watershed was only 22 watersheds, in 1992 it increased to 40 watersheds and in 1998 it increased further to 58 watersheds. In Java, between 1992 and 1998, number of degraded watershed increased rapidly and after 1998 some of these degraded watershed have been restored (Figure 7). Degradation of forest cover in the main watersheds increased the risk of flood and drought. Flow data from 52 rivers across Indonesia showed that number of rivers in which the minimum flow potentially caused drought has increased significantly. Similarly, the number of rivers in which the peak flow potentially caused flood also increased significantly (Figure 8).

Figure 7. Number of degraded watersheds in Indonesia by islands



Source: MoF, 2007

Figure 8. Percent of rivers which have minimum and peak flows that potentially cause drought and flood problems in Indonesia

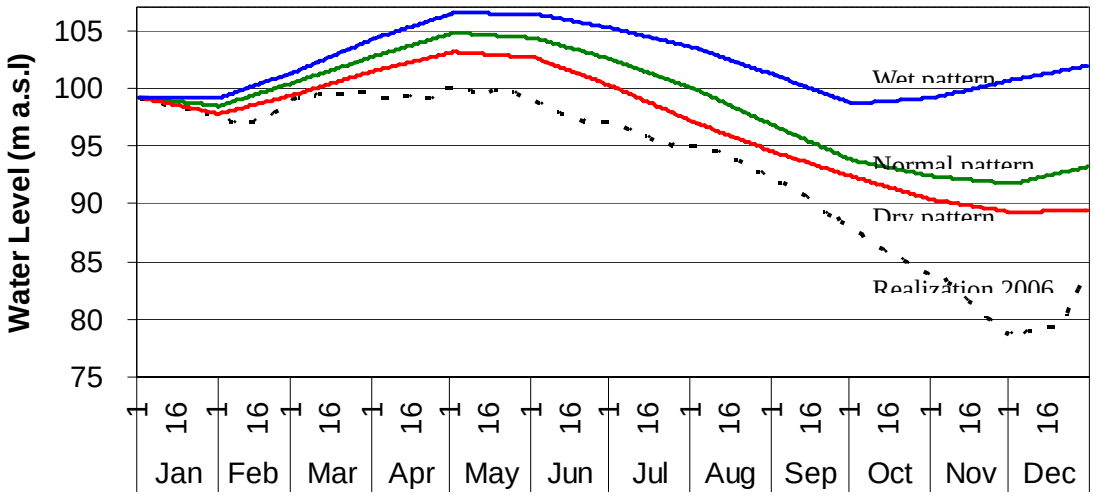


Source: Based on data from Loebies, 2001

Degradation of forest cover in the main watersheds has exacerbated the impact of extreme climate events. For example, in the El-Nino year 2006, the water level in Jatiluhur, the main dam of West Java at Citarum watershed, has fall much below the water level of the dry scenario (Figure 9). This has serious impact in many sectors. The shortage of water in the reservoirs and rivers will influence the availability of drinking water, especially in urban/metro areas.

Under extreme dry years, the water level at Jatiluhur Dam could go down to a level of less than 75 m. Under this condition, the water pump at the dam can not be operated and supply of water to the processing plant will stop. Many or irrigated rice field also could not get water, causing huge drought area. .

Figure 9. Change is water level of Juanda Dam in El Nino 2006



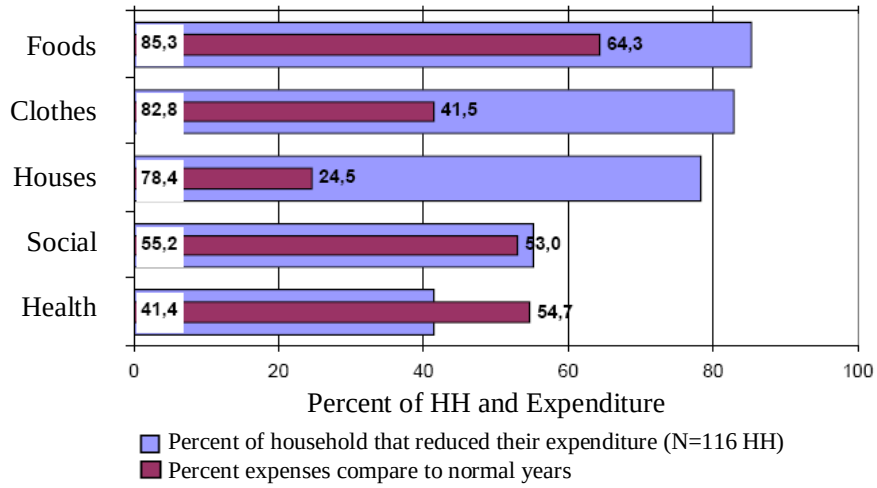
Source: Data from Ministry of Public Work, 2007. (Similar patterns were also observed in other El-Nino years.)

Many reports showed that crop failures due to severe drought affected community income seriously. In main rice crop production area such as Indramayu for example, during El-Nino of 2003 huge rice production loss caused a significant increased in a number of poor farmers. During that year, number of household that could not meet their food basic needs increased by 14% (Boer et al., 2004). Similarly in Central Sulawesi, the drought occurrence during that year pushed farmers to reduce their expenditure for food by about 40% and also others (Figure 10). In East Nusa Tenggara, the reliance of farmers to government aid tended to increase during extreme drought years. In El-Nino 2006/2007 for example, most of income sources of the poor come from government aid (‘bantuan pemerintah’; Figure 11).

On the other hand, in extreme wet years, the flood will damage the processing plant and contaminates the water. Floods occurred in February 2007 have caused damage in the production installation which amounted to about 2.2 million USD. Heavy rainfall also increases the turbidity and this will increase the cost of water processing. Current technology for water processing is still conventional and it can tolerate the turbidity of between 500 and 2000 NTU. Under emergency, the plant still can be operated even though the turbidity has

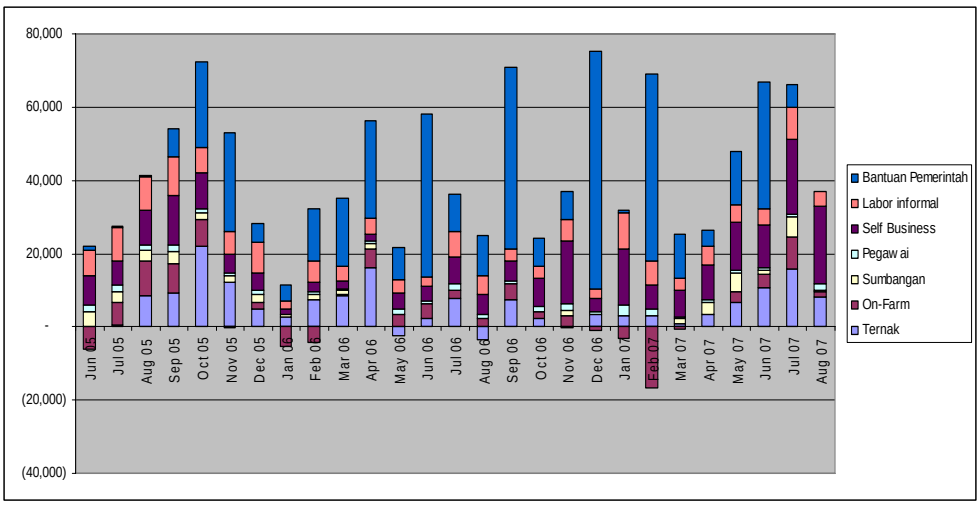
increased up to 8.000 NTU, but the cost for the processing will increase significantly. If the turbidity goes beyond 8,000 NTU, the plant can not be operated (Boer et al., 2007).

Figure 10. Percent of household that reduce their expenditure during El-Nino years 2002



Source: Impenso Project, 2008

Figure 11. Source of income of farmers at Timor of East Nusa Tenggara Provice in 2006/07 El-Nino.

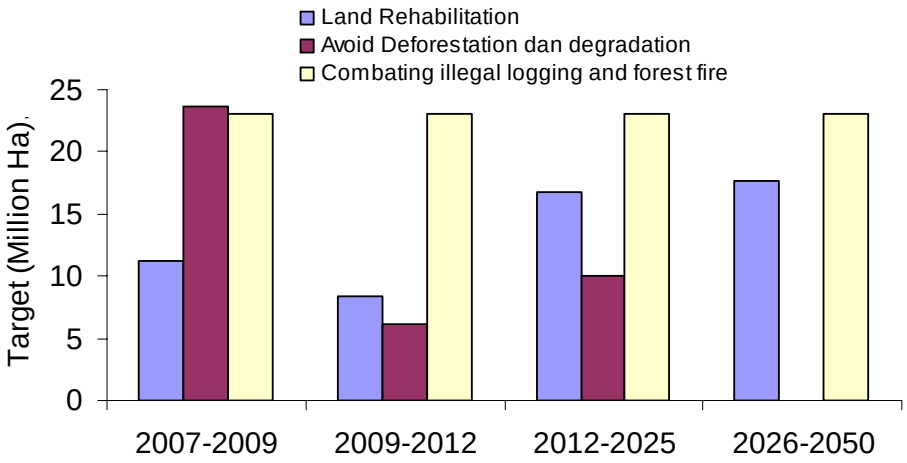


Source: Kieft (2007)

As high rate of deforestation and forest degradation has direct and indirect negative impact on many sectors and also put Indonesia as one of significant contributor countries to global GHG emissions, Government of Indonesia (Ministry of Forestry) has set up progressive target to rehabilitate critical land and degraded forest. The programs include enhancing carbon

sequestration (rehabilitation of degraded land), avoiding deforestation and forest degradation and combating illegal logging and forest fires (Figure 12). Carbon market and the new global mechanism, which is currently being negotiated in the framework of the UNFCCC to finance the reduction of carbon emissions linked to deforestation in developing and emerging countries (REDD), have been considered to be one of potential mechanisms that can assist the country to achieve such progressive target. REDD offer the prospective to optimize the existing potential of Indonesia's tropical forests and to revitalize forest industries. It also can conserve biodiversity as well as indigenous and rural people.

Figure 12. Target area for implementing land rehabilitation programs, avoiding deforestation and degradation and combating illegal logging and forest fire



Source: SME, 2007

4. National Policies for reducing deforestation and forest degradation and land rehabilitation

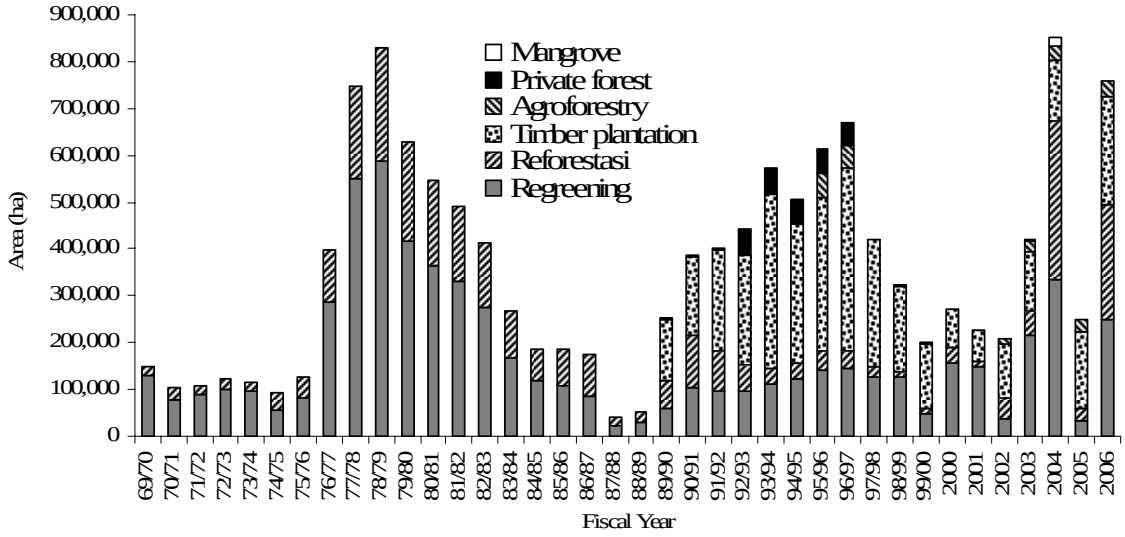
Many policies and programs already exist to reduce deforestation and forest degradation. For example, regulation on restoration of production forest ecosystem (SK 159/Menhut-II/2004), control of illegal logging (Inpres 4/2005), control of forest fires (KepMenut 260/1995), ban of using fire in land clearing (PP4/2001) and many others. Five priority programs described in Forestry Strategic Plan for 2005-2009 under the Ministerial Decree Number P.04/Menhut-II/2005 are closely connected with avoiding deforestation and forest degradation. The five programs include

1. Combating illegal logging and its associated trade by securing forest areas and controlling on forest product administration;

2. Revitalization of forestry sector, particularly the forestry industries through restructuring the primary forestry industry, accelerating the establishment of plantation forest, implementing sustainable management of primary production forest and improving the management of natural production forest management which under non-concessionaire license.
3. Conservation and rehabilitation of forest resources, through the development of plantation seeds, management of watershed areas, rehabilitation of forest and land, self management of forest and land rehabilitation, development of national park management, management of nature preservation/sanctuary reserve/hunting park areas, controlling of forest fire, management of biological diversity, management of protected forest, and utilization of wildlife and plants products and environment services.
4. Empowering the economic of the community within and surround the of forest area by giving more access to forest resources such as development of community forest and community plantation forest, development of NTFP utilization, development of buffer zone area surround the conservation areas, and development of social forestry.
5. Stabilization of forest area for promoting and strengthening the sustainable forest management. The activities include inventory and mapping of forest resources, development of information assessment system on forestry development, gazettement of forest area, preparation and evaluation of the utilization and conversion of forest area and development of Forest Management Unit.

Serious efforts have been conducted by the governments for rehabilitating the degraded forest and lands. Timber estate plantation that had been developed since 1989 was 3.65 Mha, while degraded forest and lands being rehabilitated through regreening, reforestation, mangrove restoration, agroforestry (community forest) and private forest since 1969 was 9.9 Mha (Figure 13). However, the survival rate was very low (between 10% and 50%). Refer to government target for land rehabilitation, total area that will be rehabilitated in the next 40 years (2007 to 2050) will be about 50 Mha (see Figure. 10) or about 1.2 Mha per year. This target is very progressive since as it almost four times of the planting rate done in the period 1969-2006 (0.36 Mha). If the source of funding comes from national budget only, this target is impossible to be achieved. Therefore, government of Indonesia will seek alternative fund from various sources such as bilateral, multilateral funds and carbon fund.

Figure 13. Land rehabilitation program done in the period 1969-2006



Source: Based on data from Ministry of Forestry

In addition, Government of Indonesia is now in the process of developing strategies to implement REDD. Many international agencies has put support for Indonesia to prepare the implementation of REDD. Some of international support programs on REDD is given in Table 1.

Table 1. Some of key International support program related to REDD in Indonesia

No.	Title/Donor/Duration	Objectives
1	Cooperation to Support Forest Governance and Multistakeholders Forestry Programme (UK, 2007-2010)	1. Support governance reforms to reduce and eventually eliminate illegal logging and its associated timber trade, with a particular focus on support to negotiation and implementation of the EU-GoI FLEGT VPA and other international arrangements; 2. Through a multistakeholder approach, help build capacity of central and local government and civil society, support partnerships between government and civil society, promote policy analysis and development, and support poverty reduction through more equitable and sustainable management of natural resources, with a particular focus on the rights and opportunities through community forestry for disadvantaged and women's groups; 3. Explore the opportunities for governance reforms that are necessary for Reduced Emissions from Deforestation and Degradation (REDD).
2	Financial Cooperation / FC Untuk kegiatan Issue Climate Change dan REDD Dengan judul FORESTRY-CLIMATE CHANGE PROJECT IN CENTRAL AND EAST KALIMANTAN (German, 2009-2015)	**Overal Objective**: To support Indonesia with the reduction of Green House Gases (GHG) emission (mitigation) from deforestation and degradation. **Specific Objective**: 1. To support priorities policy of Ministry of Forestry in REDD 2. To support the implementation of mechanism related to avoiding deforestation by development of pilot projects in Indonesia with the involvement of local communities in sustainable forest management
	Technical Cooperation / TC Supporting implementation of Ministry of Forestry's	To implement of strategic plan which is integrated and synergized with other sector planning, in particular provincial and districts programme

	strategic plan (German, 2008-2010)	
	Technical Cooperation Forestry Program in Implementing The Heart of Borneo Initiative (German, 2008-2010)	Objectives : 1. To establish trilateral, national and local (states, provincial, and district) institutional arrangement to support the implementation of the HoB Program 2. To develop mechanisms, including inter alia, action plan at all levels, on yhe implementation of HoB program. 3. To strengthen capacity of stakeholders related to the implementation of HoB programs.
3	A Program of Bilateral Cooperation to Reduce Greenhouse Gas Emissions Associated with Deforestation in Indonesia under the Global Initiative on Forests and Climate (Australia, 2007-2012)	The goal of the program is to support GOI efforts to reduce greenhouse gas emissions associated with deforestation in Indonesia, through action to reduce rates of deforestation, support reforestation and promote sustainable forest management, delivering improvements in rural livelihoods and environmental benefits.
4	Korea-Indonesia Joint Pro gram on Adaptation and Mitigation of Climate Ch ange in Forestry through Afforestation and Reforest ation Clean Development Mechanism (A/R CDM) a nd other Related Mechani sms (Korea, 2008-2012)	1. To acquire cost-effective potential A/R CDM sites and to establish foundation for carbon credits in preparation of post-2012 emission commitment - Site survey on potential CDM sites - Collection of information to establish forest sink measures for post-2012 reduction commitments by identifying profi tability of CDM plantation projects - Analysis of land-use change by applying remote sensing (RS) - Forest resources assessment and forest carbon stock estim ates 2. To analyze REDD application, one of the key issues in i nternational climate change discussions, and to acquire fra mework in carbon credits by preventing forest conversion as a post-2012 preparative measure - Assessment of forest resources, land-use status including r

		ate of forest conversion, changes in carbon stock - Analysis of forest conversion and forest degradation drivers - Effectiveness of incentives for preventing forest conversion and forest degradation - Development of measures to interlink incentive programs with the sustainable development policies on the national/local level 3. To implement capacity building programs including expert exchange and training courses - Development and exchange of A/R CDM and REDD experts - Capacity building of related professionals in the host country
5	Accountability and local level initiative to reduce emission from deforestation and degradation in Indonesia (ALLREDDI; DFID, 2009-2011)	Overall objectives to assist Indonesia to account for land-use based greenhouse gas emissions and to be ready to use international economic 'REDD' incentives for emission reduction in its decision making at the local and national levels Specific objectives: 1. Developing national carbon accounting system that comply with Tier 3 of the IPCC guidelines for AFOLU (Agriculture, Forestry and other land uses), completing and maximaing existing efforts; 2. Strengthening national and sub-national capacity in carbon accounting and monitoring, and 3. Designing operational REDD mechanisms in five setting for REDD

Source: Directorate of Foreign Cooperation, Ministry of Forestry

5. The problem from implementation of existing relevant national policies

One of the main problems affecting the effective implementation of existing national policies particularly the one related to reduction of deforestation is decentralization. Local governments have been granted autonomy after the government reform to manage their territories. This to some extend has created tension between the use of forest land determined

by the central government and the need for the release of more land to local government. The problem is that local governments have authority over land use planning but they do not have direct access to decisions related to the release of forest land.

On the other hand, the issuance of Act No. 26/2007 on Spatial Plan Regulation (*UU Penataan Ruang*) and Act No. 41/99 on Forestry (*UU Pokok Kehutanan*) state that the total forest area that must be maintained is at least 30% of the total area of the watershed and/or island considering the condition of the ecosystem. These regulations encourage the districts to propose to the Ministry of Forestry to release some of the forest area to become non-forest area which is called as APL (*Area Penggunaan Lain or Non Forestry Kawasan Budidaya non-Kehutanan*). At present there are about *538* proposals from districts to the Ministry of Forestry to release more of forest land as APL. Recently the Ministry of Forestry agreed to release some of forest land to become APL for all districts on Kalimantan.

The introduction of REDD into Indonesia provides the opportunity for local government to earn income from maintaining their forested land through re-examining their spatial plan, i.e. to reconstruct them and to ensure that there is the greatest level of harmony possible between the functional land use zoning that is required under local government spatial planning and the functional land planning and management of forest areas within the Forest Estate.

Government of Indonesia just issued an act which requires local governments to progressively revise their spatial plans (Act 26/2007). On the other hand, the existence of the Government Regulations PP 6/2007 and its revision PP 3/2008 provides a framework for licensing the use of forest land for a range of environmental services as well as timber products. PP6 and PP3 also accommodate a greater range of community interests through licenses for Community Plantation Forests (HTR), Community Forests (HKm) and Customary Forests (*Hutan Adat*). With the existence of these new regulations, local government and National Government can put together their national and local land use planning that ensure the largest areas of contiguous forest are preserved, thereby minimizing fragmentation.

6. Conclusions

High rate of deforestation and forest degradation has caused serious problems in many regions of Indonesia. Intensity of drought and flood enhanced and caused serious impact on community livelihood. Continuation of this condition will slow down the development process. Government of Indonesia is in the process of set up strategies to reduce emission from deforestation and forest degradation with support from a number of international funding agencies and developed countries. The main challenge in the implementation of the REDD program is synergizing the land use spatial plan between local and national government and programs on poverty reduction.

The existence of Act 26/2007 which requires local governments to progressively revise their spatial plans (Act 26/2007) and the Government Regulations PP 6/2007 and its revision PP 3/2008 creates good framework for licensing the use of forest land for a range of environmental services as well as timber products for local and national governments and also to accommodate a greater range of community interests through licenses for Community Plantation Forests (HTR), Community Forests (HKm) and Customary Forests (*Hutan Adat*) for combating poverty.

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Appendix 4

Korea Country Review

A.4 Reviewing Sustainable Development Policy in Korea; Past and Future Direction

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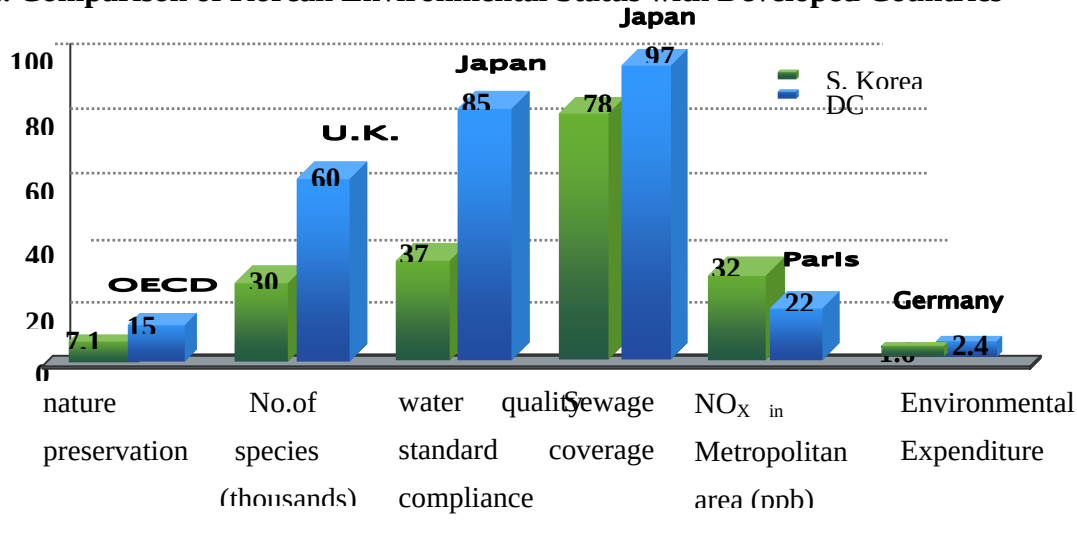
1. Background of Korea

The Korean peninsula is surrounded by the Pacific Ocean on three sides with more than 3,200 islands, and the coastline extends for about 17,000 km. The continental shelf including tideland accounts for twice the size of terrestrial land at 500,000 ㎢, of which 80% is located along the west coast. With population of 48 million, Korean population density with 481 people per ㎢ is among the highest in the world and hence causes high burden on the environmental pressures.

Figure 1. Comparison of Korean Environmental Status with Developed Countries



Source; Lee Chang Heum,"Major Environmental Polices of Korea and Future Direction," 2007.5.30

The number of species in Korea is believed to be around 100,000 kinds. However, asides from vertebrate and flowering plant species, species are not well known exactly. However, total number of 29,852 known species is identified so far1 Average yearly precipitation is 1.3 times

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1 18,052 animal species, 821 plant species, and 3,528 species of mycota and protista.
2 OECD average was 41%

more than the world average at around 1,283mm, however due to high population density per capita precipitation per year is 2,705 tons, which is 10% of the world average. Rainfall is usually in the summer season, so streams and rivers often become dry for most of the year, which makes water supply is very vulnerable to heavy volume of water fluctuations.

Korean's forests have cool-temperate and warm-temperate at the same time. The warm-temperate zone is south of the 35° north latitude where the annual mean temperature is over 14°C. The cool-temperate zone is in the 35~45° north latitude where the annual mean temperature is 6~14°C. Most of korean territory lies in the cool-temperate zone where the forests are dominated by broad-leaved deciduous species such as Quercus spp., Acer spp., Fraxinus spp. Although 63% of the total land area is covered by forests, 87% of the trees are less than 30 years old, and have not yet reached full maturity. Most of the timber is importing and domestic supply rate shows a merely 13%.

After the Korean War, Korean economic growth was quite high until economic crisis in 1997. Even if Korea had overcame economic crisis, economic growth rate was not high compared to before economic crisis Korean economy achieved about 4-5% economic growth rate per annum. As a result of rapid economic growth, energy consumption has also increased. In terms of energy consumption, Korea ranked as 10th in the world, oil imports as 4th, and oil consumption as 7th as of 2006.

Table 1. Comparison of World's Energy Consumption with Korea, 2006

Division	1	2	3	4	5	6	7	8	9	10
Energy consumption (million toe)	America 2,326	China 1,698	Russia 705	Japan 520	India 423	Germany 329	Canada 322	France 263	England 227	Korea 226
Oil imports (million toe,`05)	America 600	Japan 216	China 127	Korea 117	Germany 115	India 102	Italy 95	France 84	Netherlands 63	Spain 61
Oil consumption (million bbl/d)	America 20.6	China 7.4	Japan 5.2	Russia 2.7	Germany 2.6	India 2.6	Korea 2.3	Canada 2.2	Brazil 2.1	Saudi 2.0

Source: MKE, “Energy Information Korea,” 2008. 4.

2. Serious Environmental Problems from Economic Growth

Korea’s economy grew overall by 116% during 1990 – 2004.[2] while its population grew by 12%. Except from the recession period from 1997-2000, GDP has continuously increased between

1990 and 2004. GDP increased by 33% while industrial production increased by 71%, road freight traffic by 41%, total primary energy supply by 19%, and total final consumption of energy by 17% <See (Table 2)>.

During 1990-2007, SOx emissions were strongly decoupled from economic growth, primarily due to adoptor of industrial combustion technology such as low-sulphur heavy fuel oil, strengthening of emission standards, and imposition of an heavy emission charges. However NOx emission increased from industrial combustion and road transportation.[3] Intensity of CO emissions is highest among the OECD standards.

[3] SOx emissions per unit of GDP are well below the OECD average while NOx emission per unit GDP are close to the OECD average

Table 2. Economic Trends and Environmental Pressures (% change)

	1990-2004	1997-2004	2007
Selected economic trends			
GDP[a]	116	33	5.0[a] (969.3[a] billion us$)
Population	12	5	4.84mill
GDP[a]/capita	93	27	20,045US$
Agricultural production	14	-4	-
Industrial production[b]	192	71	-
Car Ownership[c]	395	35	10,880,000
Selected environmental pressures			
Pollution intensities			
CO emissions from energy use[c,d]	98	7	1.9(2005)
SOx emissions[c]	-46	-36	-
NOx emissions[c]	47	7	-
Energy intensities[e]			
Total primary energy supply	127	19	3.0
Energy intensity (per GDP)	5	-10	0.34h)
Total final consumption of energy	122	17	3.4
Resource intensities			
Water abstractions[f]	28	3	-
Nitrogenous fertiliser use[c]	-29	-29	-
Pesticide use[c]	-13	-9	-
Municipal waste	-32[g]	6[c]	-

a) At 2000 prices and purchasing power parities.

b) Includes mining, quarrying and manufacturing, electricity, gas and water industries.

c) To 2003.

d) Sectoral approach excluding marine and aviation bunkers.

e) 2004: estimates

f) To 2002

g) 1992-2003

h) This single year data

i) ton/1000$

Source: EMEP; FAO; IEA; OECD. 2006. MKE, “Energy Information Korea” 2008. 4

The Korea has driven its economic development based on oil-intensive industry. Therefore, primary objective of the Korea’s energy policy has been to secure an economically stable supply of energy. This policy has been promoted by governmental intervention and regulation rather than free competition. However, restructuring has been carried out in the energy industry since the late 1990s based on the Plans for Privatization of State-owned Companies initiated in 1999. Government regulations were reduced, leading to price liberalization in the oil sector, eliminated entry barriers, and restructured electricity and gas industry.

Table 3. Major Indicators of Energy

	‘95	‘96	‘00	‘01	‘02	‘04	‘07
Primary Energy Consumption (1000 TOE)	150.437	165.209	192.887	198.409	208.600	220.238	240.5
Per capita (TOE)	3.34	3.63	4.08	4.191	4.379	4.58	4.96
Energy / GDP Ratio	100	102.9	101.6	104.2	103.9	103.2	103.4
Overseas Dependence Ratio	96.8	97.3	97.2	97.8	97.3	97	97

Note: 1) dependence ratio: petroleum imports amount out of total energy imports,

2) Energy /GDP: TOE/ 1990's 1000 US$

3) Mid-year estimates

Source: KEMCO, “*Handbook of Energy Saving*,” 2005, MKE, “Energy Information Korea” 2008. 4

Primary energy consumption over the past thirty years had increased rapidly along with economic growth from 19 million TOE (ton of oil equivalent) in 1970 to 240 million TOE in 2007[4]. As a result, Korea has become one of the world’s 10 major energy consumers, hence, dependence on overseas energy sources has also a risen from 87.9% in 1990 to 97% in 2007. As of 2005, Korea is the sixth largest oil consumer and the fourth largest oil importer.

Table 4. GHG Emission and Key Indexes in Korea

[4] Per capita consumption has increasing form 0.61 TOE in 1970 to 4.58 TOE in 2002.

	1990	1995	2000	2002	2004	2005	1990-'05 Annual Increasing Rate
GHG Emission (million tCO_2)	300.0	451.8	528.5	569.0	587.3	591.1	4.6
Per capita(tCO_2/person)	7.00	10.02	11.24	11.95	12.21	12.24	3.8
GHG Intensity (tCO_2/Million Won, 00)	0.94	0.97	0.91	0.89	0.85	0.82	-0.9

Source: KEEI, "3rd National GHGs Report". 2006.12

Korea has not adopted any domestic quantitative targets for overall green house gases emissions. However, since the late 1990s, Korea has prepared four national action plans focused on research, studies, mitigation of GHG emissions, and adaptation to climate change trends so far. Now the government is working for the 4th National Plan.

Since 1990, Korea's CO_2 emissions from energy use have essentially doubled. No decoupling of CO2 emissions from GDP growth has been achieved. Korean economic growth remains largely based on energy-intensive heavy industries and a petroleum-dependent transport sector. The energy intensity of the economy grew by 7.2%, as compared with decreases in energy intensity in most other OECD countries, e.g. France (-4.7%), Germany (-20%), Japan (-0.5%), Mexico (-10.4%), United Kingdom (-19.1%) and United States (-18.9%). Korea's increase in energy production and intensity resulted in an increase in CO2 emissions of 98.2%, in contrast to much lower increases in Japan (+19%), Mexico (+28%) and the United States (+18%), and an actual decrease in Germany (-12%) and the United Kingdom (-4%).

Table 5. Current Status of Emission from GHG by Sector

	1990	2000	2002	2003	2004	*2005*	*Increasing Rate/yr*
Energy	247.7 79.8	438.5 (83.0)	473.0 (83.1)	481.4 (82.7)	490.2 (83.0)	498.6 (84.3)	5.0%
Industry	19.9 (6.4)	58.3 (11.0)	64.5 (11.3)	68.7 (12.0)	69.4 (1.7)	64.8 (11.0)	9.3%
Agriculture	17.5 (5.6)	16.2 (3.1)	15.8 (2.8)	15.5 (2.7)	15.9 (2.7)	14.7 (2.5)	-0.7%
Waste	25.5 (8.2)	15.6 (3.0)	16.0 (2.8)	15.6 (2.7)	15.1 (2.6)	13.0 (2.2)	-3.7%
Total Emission	310.6 (100)	528.6 (170)	569.3 (183)	582.3 (187)	590.6 (190)	591.1	4.7%
Land use/ Forestry	-23.7 (-7.6)	-37.2 (-7.0)	-33.4 (-5.9)	-33.3 (-5.8)	-33.3 (-5.6)	-32.9	2.4%
Net Emission	286.8 (100)	491.4 (171)	535.9 (187)	548.6 (191)	557.3 (194)	558.3	4.9%

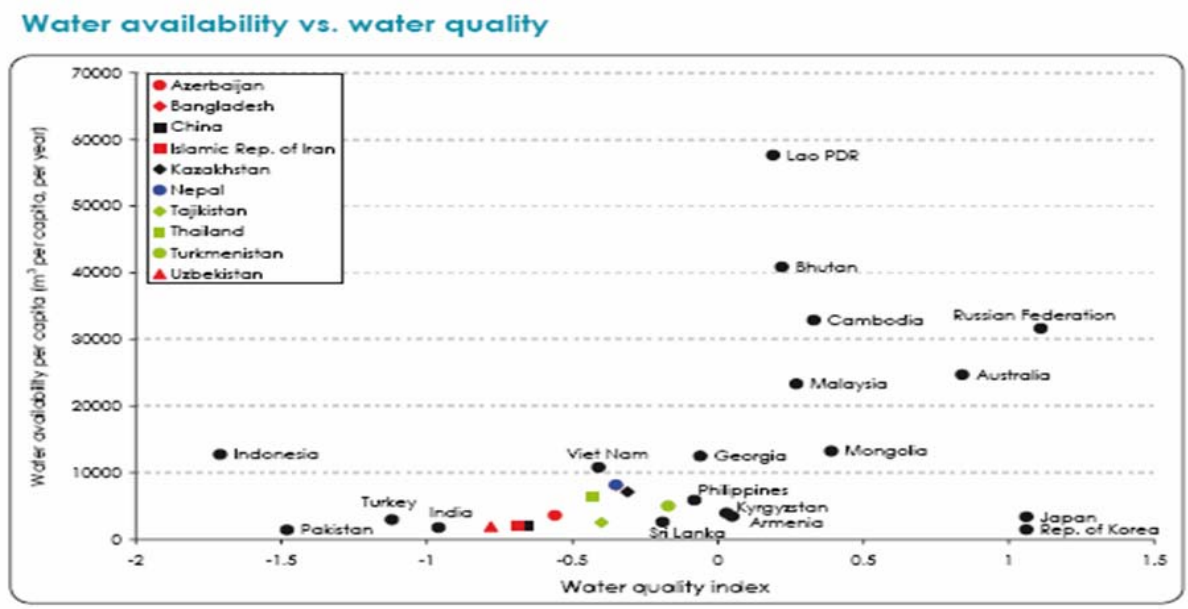
Source; KEMCO, "*Handbook of Energy Saving*," 2005, KEEI, National Report, 2007.10(draft)

Korea is, however, counting on several factors to promote a steady decrease in the rate of growth of GHG emissions from 2005. These include: i) improved energy conservation and efficiency; ii) less reliance on fossil fuels in the energy mix ; and iii) a dematerialization of its economy.

After increasing by 10% between 1994 and 1998, water withdrawals were weakly decoupled from GDP growth due to declines in public water supply and irrigation facility.

Public water supply declined with some reasons) a reduction in non-paying uses and leakages, and) reduced household consumption, partly reflecting water price increases. In the early 2000s, the intensity of water use was among the highest in the OECD area and it is probably still very high by OECD standards, reflecting the widespread use of irrigation for rice production. Water quality has largely improved over the years, but non-point source pollution such as run-off from agricultural fields, forests, and roads has become most serious problems. (See Figure 2)

Figure 2. Water Availability and Water Quality



Sources: FAO AQUASTAT online database, accessed on 18 August 2005 from <http://www.fao.org/ag/agl/aglw/aquastat/main/index.stm>; Esty, Daniel C., Mark Levy, Tanja Srebotnjak and Alexander de Sherbnin (2005). Environmental Sustainability Index: Benchmarking National Environmental Stewardship (New Haven, Yale Center for Environmental Law and Policy). Water quality index based on dissolved oxygen concentrations (1993-2002), electrical conductivity (1994-2002) and phosphorus concentrations (1994-2003). The lower the indicator value, the lower the assessment of overall freshwater quality. Based on data for the latest year available in the time period indicated.

Source: www.fao.org/ag/aglw/aquaastat/amin

During 1997-2004, the use of pesticides and nitrogenous fertilizers decreased by 9% and 29%, respectively, while agricultural production decreased by 4%. This decoupling reflects changes in agricultural policy introduced in 1996 (introduction of cross-compliance and of agri-environmental payments). However, the intensity of pesticides use and nitrogenous fertilizer's use per-hectare is still much higher than the OECD average, partly because of support for agricultural policy. Nitrogen efficiency (nitrogen output/nitrogen input) is half the OECD average, as a major concern. Waste generation has steadily increased with economic growth and rising with consumption levels.

Municipal waste generation increased by 6%, a lower rate than GDP and private final consumption, while per capita waste generation remained lower than the OECD average. This reflects Korea's active policy of waste recycling and charging for waste collection according to the volume based waste charge system. In contrast, industrial waste generation increased by 45%, mainly reflecting a threefold increase in construction and demolition wastes. Nevertheless, the intensity of industrial waste generation per unit of GDP has remained slightly below the OECD average.

Urbanization is most serious problems from the economic growth. The population of Seoul metropolitan city increased more than the national population increase (see <Table 6>). Seoul's population grew by 5.47%, which was more than twice the national rate of 2.48%. In particular, the explosive growth of vehicles in the Seoul Metropolitan Areas, which accounts for 12% of the landmass, and has a high population density of 1,858 people per ㎢, has brought about severe deterioration of air quality.

Table 6. Population in MSAs (Unit; thousands)

MAS	2000	2005	rate(%)
Seoul	15,765	16,627	5.47
Busan	4,187	4,173	-0.34
Daegu	2,709	2,707	-0.07
Incheon	2,462	2,519	2.32
Gwangju	1,452	1,505	3.62
Daejeon	1,533	1,600	4.38
Ulsan	1,014	1,049	3.43
Nation	46,136	47,279	2.48

Source; MOE, “Environmental White Paper,” 2007

For the periods of 1997-2003, motorization rates had recorded 5.1 per cent (ESCAP, 2005). In many of the urban areas in Korea, this situation has resulted to high road network densities, cause traffic congestions, increase high fuel consumption, and cause bad air pollution. For example, in 2004, the Republic of Korea's vehicle density (number of vehicles per route kilometer) is estimated at 150Km as compared to Japan's 62Km per day. The transportations cost as percentage of GDP for the road transport between Japan and the Republic of Korea is estimated at 2 per cent and 3-4 per cent out of GDP per year, respectively. It is particularly noteworthy that the Seoul metropolitan area occupies 51.8 per cent (US$ 12 billion) of the national traffic congestion costs, causing the metropolitan area to become ecologically inefficient.

Table 7. Congestion Costs of Road Transport in Selected Countries

Country	Congestion cost as percentage of GDP	Sourcs and Year of estimates
Europe 17a	3 per cent	INFRAS/IWW(2004)
OECD countries	3 per cent	OECD(2001)
United states	1.5 per cent	OECD(2001)
Philippines (Manila)	4 per cent	Sigua and Tiglao(2000)
Thailand (Bangkok)	1-6 per cent	Lvovsky, K and others(1999); SweRead(1997);Pendakur(1996)
Japan	2 per cent	Ministry of Land, infrastructure and Transport(2000)
Republic of Korea	3-4 per cent	Korea Transport Institute(KOTI) (2005)

Note: a Europe 17 Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, italy, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.
Source: Information compiled by ESCAP ESDD (2007)

One of main reasons for the high transportation congestion cost is related to high sales of automobiles size. In Korea, the sales rate of large car over 2000 CC has been increased from 29.7% in 2001 to 32.5 % in 2007.

Table 8. Sales of Automobiles By Size in Korea

Vehicle type	2001		2004		2005		2006p		2007p	
(engine size)	Unit	%	Unit	%	Unit	%	Unit	%	Unit	%
Light (800cc)	82	7.7	47	5.5	47	5.1	40	4.0	43	4.0
Small (800-1599)	79	7.4	47	5.5	59	6.5	81	8.1	80	7.4
Midsize (1600-2000)	58	55.2	430	50.1	509	55.8	560	56.1	611	56.2
Large(>2001)	316	29.7	334	38.9	298	32.6	317	31.8	354	32.5
Total	1,065		858		913		998		1,088	

Source: Hong Jong-Ho, “Second Dialogue on Green Growth”, 2006,

At the same time, large size of electric goods in household is also one of the reasons for the high social cost. Main electric goods such as TV, refrigerator, washing machine are getting bigger and bigger as year goes by. (See <Table 9>)

Table 9. Large Consumer Electronics for Market Share in Korea

	Car (2000cc over)	Color TV (25 inch over)	Refrigerator (500L over)	Washing machine (8.6kg over)
1995	10.0	26.7	14.0	13.2
1997	15.5	33.8	20.3	24.9
2000	17.7	50.4	42.0	46.2
2002	34.1	57.5	46.8	65.1
2004	28.8	58.1	49.7	74.0
2006	29.8	65.7	66.7	83.4

Source: KEMCO, “White Energy Paper, “ 2007

Besides, as a result of low energy price policy, and strong ownership tendency for the large volume of electric equipments in household, per capita energy consumption per household compared with the other developed countries, Korean household is very high comparing with the other countries.

Table 10. Per capita Energy Consumption from HH & Comparison of Major Counties with Korea, 2005

	Korea	Spain	Italy	Canada	Mexico
GDP (billion $)	638	680	1,133	822	636
Population (million people)	48.29	43.40	58.53	32	105.30
Energy Consumption (million toe)	213	145	185	272	176
unit of energy source (toe/1000$)	0.335	0.213	0.164	0.331	0.277
Per capita energy consumption (toe/person)	4.43	3.35	3.17	8.43	1.68
-Per capita consumption of home	0.38	0.35	0.55	0.97	0.17

Source: KEMCO, “White Energy Paper, “ 2007

Yale University’s Environmental Performance Index (EPI) for North-East Asian countries, shows that Korea’s EPI got lower scores. In average, the Korea acquired 75.2 scores and ranked 42nd out of around 100 countries. Especially, overfishing and low rate of renewable energy usage out of total energy use was lowest, and energy efficiency is one of the most concerned areas as we can see in <Table 11>. Energy efficiency was third area of concern.

Table 11. Selected Environmental Performance Index for North-East Asian countries

Indicators		Republic of Korea
Overall ERI Score		75.2
Overall Rank		42
Performance on selected indicators based on standardized proximity to target at (100=target met)		
Policy Category: Environmental health	Percentage with access to drinking water	85.6
	Percentage with access to adequate sanitation	100
	Urban particulates	76.8
	Nitrogen loading in milligrams per liter nitrogen in water bodies	99.2
Water Resources	Water consumption, percentage of territory with oversubscribed water resources	82.3
Production of Natural resources	Timber harvesting, percentage of standing forests	100
	Overfishing	16.7
Sustainable energy	Energy efficiency (in terrajoules per million US$GDP (PPP)	67.5
	Renewable energy (percentage of total energy consumption)	0.7
	CO_2 per GDP (emission per GDP (PPP)	83.6

Source: Yale University (2006). Pilot 2006 Environmental performance index accessed on 20 January 2007.

Case Study 1: Phenol Accident (Water)

The “Phenol leakage from Nakdong River” occurred in 1991 had changed Korean people’s

general perception on environmental accident and its devastating consequences. It had much influence on the importance of effective environmental monitoring and policy implementation both in the national and local levels. Civilian environmental movement has gained more popularity and influence in the Korean society. Doosan Group, which was responsible for the leakage, suffered from massive protests from civilians all over the country, and had bad company group image..

On March 14, 1991, 30 tons of Phenol was leaked in the upper Nakdong River of Gumi. Five days later local police announced that Doosan Electro-Materials Co. in Kumi, Kyongsang-bukdo, was responsible for polluting the tap water source by discharging wastewater containing Phenol into the Nakdong River.

Doosan Electro-Materials Co. were accused of dumping huge amount of industrial waste containing phenol substance into the river, The contamination of tap water has spread from Taegu to Pusan, Changwon, and Masan, alarming approximately 5 million residents. 500 times based on the national standard levels of 0.005 ppm were detected in the Nakdong River.

President condemned the contamination of tap water as “anti-social and immoral acts, and ordered the administration to probe thoroughly the reported pollution of piped water.”

Some consumer groups boycotted all products manufactured by the Doosan Group and its subsidiaries including OB beer and Coca-Cola.

The city administration claimed a total of 1.35 billion worth of cost to the company for its economic losses. <Table 12> is the breakdown of the financial compensation claimed by the city. Doosan agreed to pay the claimed amount in full plus interest of 4,543,368 won.

Table 12. Financial Compensation paid to Citizens by the Doo San Group.

Category	Amount
Direct payment	1,100,000,000 won
LEDCC arbitration	290,000,000 won
CEDCC arbitration	62,000,000 won
Teagu Local Court Ruling	120,000,000 won
Total	1.572 billion won

Note : LEDCC = Local Environment Disputes Coordination Commission, CEDCC = Central Environment Disputes Coordination Commission

Source: Hong Jong-Ho , ‘ Environmental Protection Policy, : 2008,’ KOICA, 2008

City of Taegu asked the citizens to claim their financial losses with a deadline of April 30.

13,242 citizens reported damages for financial compensations in 13,455 cases, claiming a total amount of 16.6 billion won. After a negotiation process, Doosan was able to settle with 11,182 claimants out of 13,242, paying a total amount of 1.1 billion won.

Case Study 2: The Saemangeum Project (World Largest tidal flat.)

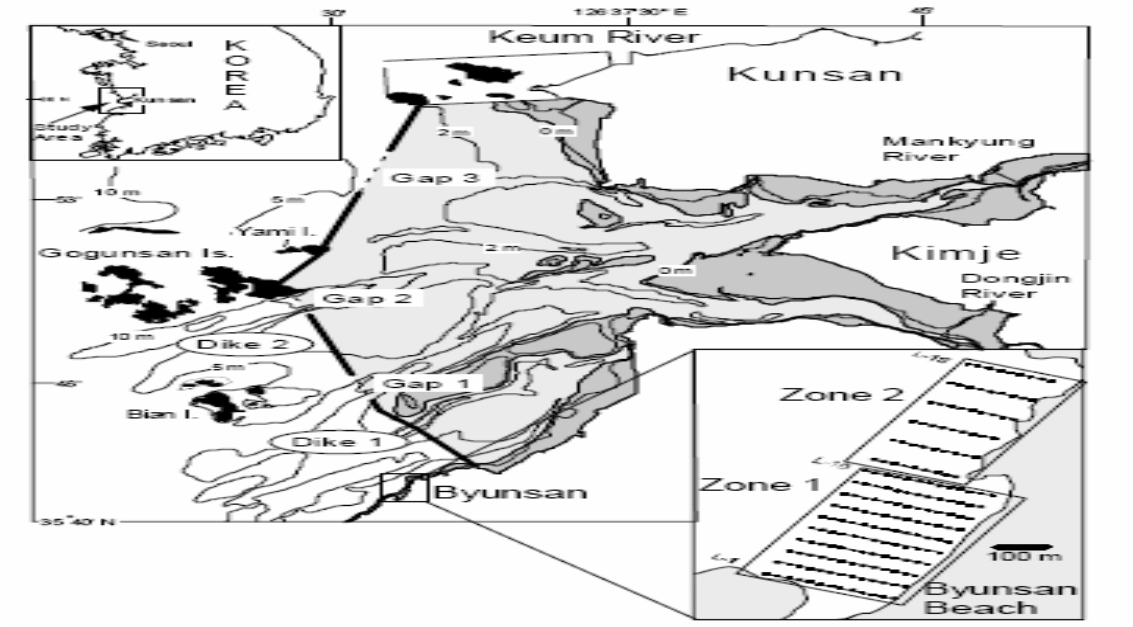
The Saemangeum project initiated in the 1970s and launched in 1991, set out to reclaim part of these tidal flats to make rice fields. The project covers an area totaling 400 ㎢, composed of 280.4 ㎢ of tidal land reclamation and a desalinated reservoir of 117.6 ㎢, including 33Km-long sea dikes.
This project connects Gusan to Buan by constructing sea dikes (sea wall) and two sluice gates. It will create 28,300ha of land and 11,800ha of freshwater lake until 2011. However, once if completed, the sea wall would destroy a 208-square-kilometer ecosystem.

Government goal of Saemangeum reclamation project was having rice field and secure food security in Korea. But, the size of rice field disappearing every year is larger than the size of rice field getting from the Saemangeum after 2011. Among various problems, the first serious concern is habitat destruction of migratory birds. Saemangeum provides the most important feeding ground for hundreds of thousands of shorebirds that migrate between Australia and the Arctic. Among visitors are the Spotted Greenshank (estimated population of 700) and Spoon-billed Sandpiper (estimated population of only 2,000). Second problem from the project is destroying spawning ground for oceanic lives. It is known that more than 70% of fishes in the Yellow sea live in and near Saemangeum tidal flat. Thirdly, Saemangeum purifies huge amount of water, provides most marine products to North Jeolla province, prevents from flood, storm and costal erosion. Therefore it is considered as a “storehouse for biodiversity”[5].
Most hottest and controversial issues regarding the Saemangum project is the possibility of change in beach morphology. KARICO (1988; formerly Rural Research Institute) suggested that environmental conditions might be changed from the deposition-dominated to erosion-dominated after construction of Saemangum Dike. Recently, LEE et al. (2006) reported the local changes in coastal topography outside of Saemangum dikes. At Byunsan Beach, Korea Ocean and Research and Development Institute (KORDI, 2006) also found evidence of beach erosion obtained by the in situ measurements of sediment transport. However, KARICO (2005) reported no serious erosion or even deposition/pro-gradation at Byunsan Beach. Choi and

[5] Jang, Jaehyun , “Nonviolent Factors Found in the Recent Samboilbae Movement”, 2005.

Lim(2007)'s 14-year monitoring of beach morphology demonstrate temporal changes such as reduced wave energy levels and destroyed the natural seasonal cycle of beach morphology. However, it is early to say very certain ecological change,. Therefore further long term study will be necessary.

Figure 3. Saemangum Sea Dikes in 2000



Note; In 2008, Gap 3 was closed, and small sluices are open at Gap 1 and Gap 2.
Source; J.Y. Choi† and D.I. Lim‡, "Morphological Change at Byunsan Beach, West Coast of Korea; 14-years Monitoring During the Saemangum Reclamation Project", Journal of Coastal Research**,** Special Issue 50, 2007.
LEE H.J., JO. H.R. and KIM M.J., 2006. Topographical changes and textural characteristics in the areas around the Saemangum Dike. *Ocean and Polar Research, 28, 293-304* (in Korean with English Abstract)

The project has been the focus of intense criticism and opposition for many years, provoking protests by individual citizens and by NGOs. Between 1999 and 2001, the project was temporarily halted while a specific committee made of government officials and civilians undertook a comprehensive assessment of its environmental impact and economic feasibility. The lower court ruled to suspend the project in 2003. But the high court allowed the project to resume in 2004. The administrative court issued an injunction to cancel or alter the original plan in February 2005. In December 2006, the Supreme Court ruled finally in favor of the government. From 1990-2005, nearly 2

trillion KRW was invested for the project, and 2007 the dikes were completed.

Case Study 3: Sihwa Lake

In June 1987, Korean government had initiated wetland development program around Kyunggi Bay and ended the embankment work for 12.7 ㎞ - long Sihwa dike in June 1994. However, the water quality of Sihwa Lake became rapidly deteriorated. Korean government tried various efforts to improve the water quality of this freshwater lake but did not produce satisfactory results. In 1998, the government decided to allow circulation of the seawater into Sihwa Lake and announced that original plan for freshwater lake will be modified.

After the construction of Shihwa dike, many peoples from two islands, especially fisherman, were experiencing significant environmental changes. Since 1992, Hyungdo island has prepared for a lawsuit against the government to win compensation. They began the suit in 1993 and started procedures in 1994. They won at the district court in June 1997.

On the other hand, residents of both Uhdo and Hyungdo islands have failed to transition to an alternative livelihood in near area or city area even if government failed them for compensation. Residents expected, at first, to benefit from the project since they had seen a lot of visitors before. But tourists stopped visiting after 1994, when the embankment was completed, the fishing field in the ocean had closed and the Sihwa Lake pollution problem became public.

'The Sihwa Lake Marine Environment Improvement Project' had carried out during 2003~2007 focuses on securing institutions, policies and core technologies required for smooth implementation of the Comprehensive Sihwa Lake Management Plan in Phase 1. The phase I Plan was to achieve the COD level of 2mg/L by the end of 2006 with the investment of total USD 952M. In 2005, however, the average COD was not improved better than 4.2mg/L. The COD level in 2006 is 4.7PPM which is similar to 1994 (5.2PPM) level.

Figure 4. View of Sihwa Lake and Death of Passage Birds in Sihwa Lake

Source; KORDI, "Comprehensive Sihwa Lake Management Plan : Phase 2," Ocean Policy Research Annual Report 2007, pp 82-85

In May 2007, the Sihwa Lake Management Committee decided to invest total USD 898M on Phase 2 for the Plan. One of the significant features in the Phase 2 plan is that spatial range of the plan is considered from the inner sea of Sihwa Lake to both the inland and the open seas of the Lake including the neighboring watersheds of Incheon. Four major management fields such as management of water quality and adjacent land environment, management of the ecological system and biological resources, management of coastal area and space use, and improvement of management system and institutions were expanded into the Plan. The other six major fields are also take into account: (1) improvement of environmental pollution, (2) preservation and restoration of the ecological system, (3) management of coastal resources, (4) strengthening of the local capability, (5) consolidated management, and (6) environmental investigation and

estimation[6] with feed-back management system which consists of (1) performance objective setting (2) project design (3) project implementation, and (4) project evaluation,

3. Priority Issues for Sustainable Development

(1) Water Quality Improvement in the Four Major Rivers and Shiwha Lake

Overall, water quality in four major rivers in South Korea has been improved since 1997, as a result of water management efforts made by the Ministry of Environment. Special measures for four major rivers have been implemented since 1998, so as to put in place the river basin management system (e.g., Total Maximum Daily Load Management), expand environmental infrastructure, and reinforce the emission standard. The water quality of the Han River, which is the water supply source of 20 million people in Seoul and metropolitan areas, is at a level of 1.2mg /L on average in BOD base in 2006, similar to the previous year. Water sources of four major rivers are managed at the level of 1~2mg/L. Water quality achievement rate for national rivers were increased 13.8% to 42.3% from 1994 to 2005.

Table 13. Status of BOD in 4 Major Rivers in Korea

(Unit : ㎎/L)

Classification	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
Han(Paldang)	1.3	1.4	1.5	1.5	1.5	1.4	1.3	1.4	1.3	1.3	1.1	1.2
Nakdong(Mulgeum)	5.1	4.8	4.2	3.0	2.8	2.7	3.0	2.6	2.1	2.6	2.6	2.7
Geum(Daecheong)	1.2	1.5	1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.1
Youngsan(Juam)	1.5	1.1	1.3	0.9	0.9	0.8	0.7	0.9	1.2	1.0	0.9	1.1

Source: MOE, “Environmental White paper, “ 2007

However, water quality in Nakdong River was continuously decreased during the past ten years. While quality of the other rivers have not been increased. <See (Figure4)>

[6] KORDI, “Comprehensive Sihwa Lake Management Plan : Phase 2,” Ocean Policy Research Annual Report 2007, pp 82-85

Figure 5. Tap Water Source Quality Change in 4 major rivers

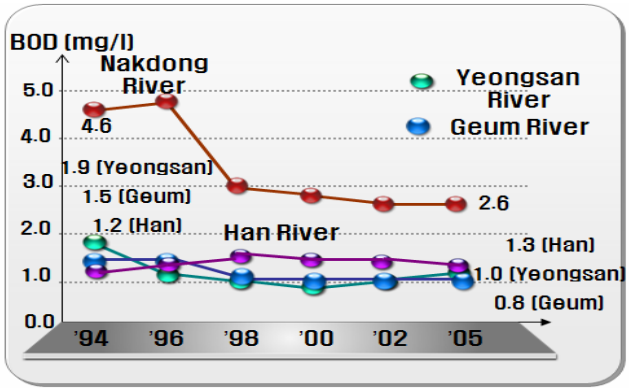
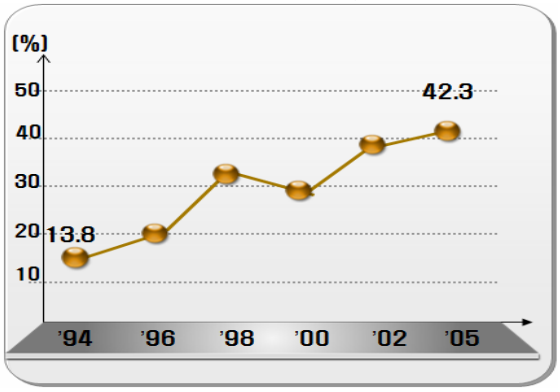


Figure 6. Water Quality Target

Unit; Rate



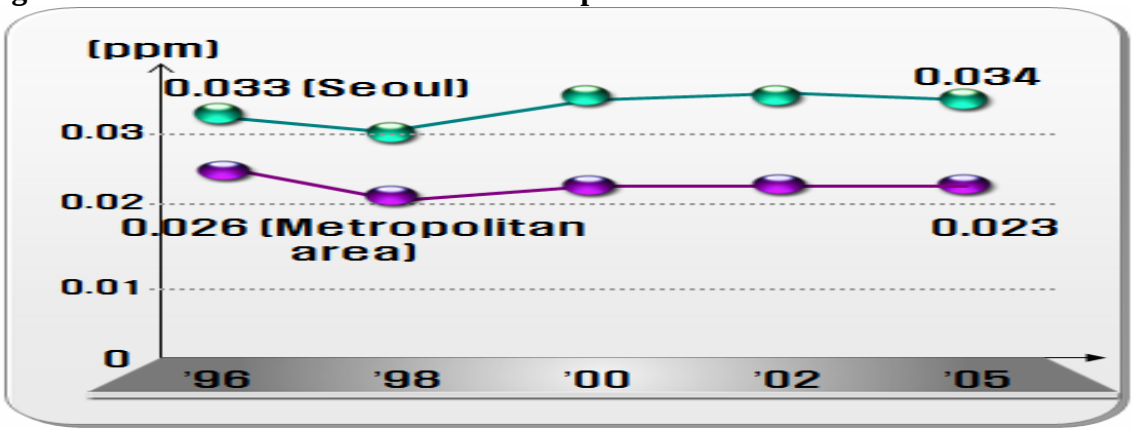
Source: MOE, "Environmental white paper," 2007

Besides, water quality, lack of water supply in southern and northern area is getting worse. Because of water shortage, water right is becoming an important issue in recent years. Construction of large scale hydraulic dam in Nakdong river area is under discussion.

(2) Air Quality Improvement in SMA

Emission of NOx as well as pm10, TSP in Seoul metropolitan area(SMA) shows about 1/3 times more than the other metropolitan areas during the last ten years.

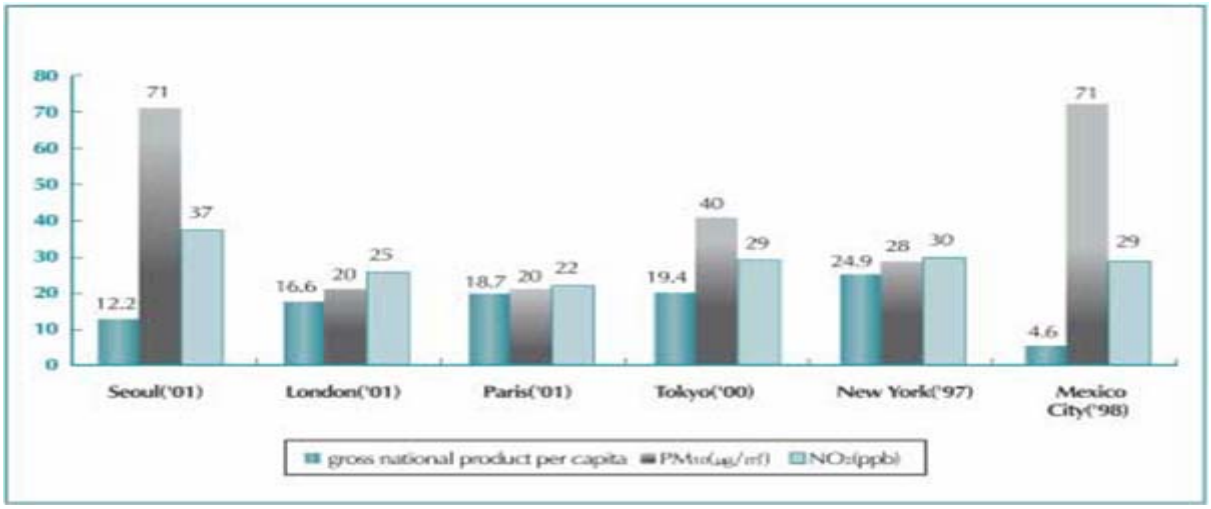
Figure 7. NOx Pollution in Seoul and Metropolitan Areas



Source: KEI, Korea Environmental Policy Bulletin, Issue 3, Volume IV, 2006

Present pollution level of pm10 in Seoul reaches 1.7~3.5 times higher than in major cities of advanced countries while NO_2 reaches 1.7 times higher.

Figure 8. Comparison of Air Pollution Level Both Seoul and Foreign Cities



Sources: Korea Environmental Policy Bulletin, Issue 3, Volume IV , 2006

According to an outcome from a research on health damages due to the atmospheric pollution, the death toll due to PM_{10} is estimated to be 9,641 persons a year in Seoul(Environmental Pollution Research institute, Yonsei University, 2000). An early-dying rate among the population, exposed to atmospheric pollution in Korea, amounts to 0.09%, which is higher than those of the advanced countries including France whose early-dying rate is known to be somewhere between 0.05% and 0.07% [7]. Infant mortality rate is increased by 9% due to the respiratory ailments. (Ewha University, 2002)

Table 14. Comparison of the Chronic Dead due to PM_{10} (1999)

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[7] Main cause of deteriorating atmospheric quality

1) Increase of Population and Vehicles
2) Increase of Energy Consumption
3) Improper Management of Secondary Air Pollutant
4) Improper Pollutants Reduction Measures against Vehicles
   A. Improper Reduction Measures for Emitted Gas against Diesel Vehicle
   B. Insufficient Efforts to Reduce Gas Emission of Gasoline Vehicles
   C. Insufficient Regulation against Non-road Mobile Source
   D. Low Railroad Transportation
   E. Unreasonable Energy Policy
   F. Adverse Meteorological Condition Impeding Atmospheric Circulation

Classification	Austria	France	S w i s s	Seoul	Major 6 cities
The chronic dead (persons)	5,576	31,692	3,314	9,641	20,895
Rate of the early dead among exposed population (%)	0.07	0.05	0.05	0.09	0.09

Source: KEI, " Korea Environmental Policy Bulletin", Issue 3, Volume IV , 2006

(3) Prevention from Forest Land Area to Urban Land Area

Forested areas in Korea was 65,665㎢ in 1992 and changed into 64,885㎢ in 2004. Annually Korean forest decrease about 78㎢. Especially, tidal flats areas in Korea was 3,203㎢ in 1987 but changed to 2,550㎢ in 2005. It's annual decrease was 36㎢. However additional 3,838km² of urban land area is expected to be used in the next 20 years.

Table 15. Change of National Land Development ('92-'04)

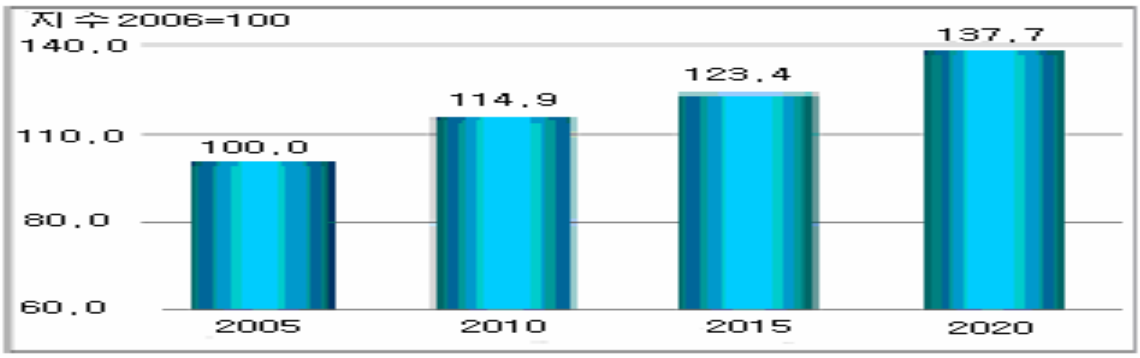
Forested and Area	Farm Land	Urban Land
804 Km^2 ↓	889 Km^2 ↓	1,475 Km^2 ↑

Source: Moon Jung Ho, " Korea Environmental Policy," 2007.6

(4) Reduction of GHGs(Green House Gases) Emission

Since 1990, Korea's CO_2 emissions from energy use have doubled. The 5.4% annual increase has closely tracked the country's economic growth rate; no decoupling of CO_2 emissions from GDP growth has been achieved. Projections of GHGs by the Korean Energy Economics Institute indicate that the country''s GHG emissions (dominated by CO_2) will grow by 1.9% annually until year 2030, an increase of some 38% above 2003 levels. Anticipated GHG emission increases from the power generation and transport sectors are expected to offset decreases foreseen in the industrial and residential sectors between 2003 and 2030. If these projections prove to be accurate, by the year 2013 (when the post-Kyoto period will start), Korea may well be one of the largest emitters of GHG per unit of GDP among all OECD member countries (OECD, Environmental Performance Review, 2006).

Figure 8. Projection of GHGs in Korea (2005-2020)



Source: KEEI, "3rd National Climate Change Report," 2007

4. Existing National Sustainable Development Policy (SDP) for Priority Issues

During the 1970s, Korea government introduced very basic environmental regulation such as minimum environmental regulation to protect public health, and very ineffective enforcement of pollution prevention measures. Between 1970s and early 1980s, Korean government introduced more stringent environmental standards for major pollutants and introduction of emission charges, and environmental impact assessment (See <Table 15>). During the 1990s, Korea government introduced effective implementation of environmental regulation such as extension of the coverage of environmental regulation from local to regional and national environmental issues. More emphases on incentive based policies and measures have been implemented. As a result, much more and improving effectiveness of environmental regulation have been accomplished.

Table 16. Incentive Based Policy Measures in Korea

Types	Starting	Target	Basis	Objective
Emission Charges - Excess - Basic	July, 1983 August, 1997	Air and Water Pollutants from Manufacturing and Production Facilities	Excess Emission Below Emission Standard,	- Discourage the Emission - User Charge
Environmental Improvement Charges	July, 1992	Commercial Buildings and Diesel Vehicles	Water and Fuel Consumption, Engine Size and Age of Vehicle	- Discourage the Emission
Water Quality Improving Charges	May, 1995	Manufacturing and Importing Company Beverage	20% of Market Price 5% of Production Cost	- User Charge
Waste Treatment Charge	July, 1993	Products Generating Excessive Waste	30% of Treatment Cost	- Financing the Treatment Cost
Waste Deposit	January, 1992	Recyclable Products	30% of Treatment Cost	-Encourage Recycling

Source: Chung, Hei-Sung (2002), *Environmental Regulatory Reform Towards a Sustainable Society in Korea*, KEEI.

MOE, “Environmental White Paper.” 2007.

As the environmental awareness among Korean has also raised, needs for the sustainable development has increased in recent years. And so does the demand for improvements to be made in response to emerging environmental problems including the sick house syndrome and hyper-sensitivity to chemical substance from worsening indoor air quality in public facilities, apartments, etc.

Table 17. Key Environment-Related Acts in Korea

Category	Acts
Air Pollution	Road Traffic Act, Atomic Energy Act, Nuclear Liability Act, Petroleum Business Act Energy Use Rationalization Act, Construction Machinery Management Act, Integrated Energy Supply Act, Alternative Energy Development Promotion Act, Act on the Control, etc. of Manufacture of Specific Substances for the Protection of the Ozone Layer
Water Pollution	Prevention of Marine Pollution Act, Groundwater Act, River Act, Public Waters Reclamation Act, Aggregate Picking Act, Public Waters Management Act, Aggregate Picking Act, Act on Construction of Dams and Assistance, etc. to their Environment, Small River Maintenance Act
Forestry	Forestry Act, Erosion Control Act, Forest Management Act

Source; Re-arranged from the MOE, "Environmental White Paper," 2007.

(1) "Special Law for the Improvement of Seoul Metropolitan area Atmosphere (SMA) in 2007

In order to have sustainable development of air quality for SMP area, "Special Law for the Improvement of Seoul Metropolitan area Atmosphere (SMA)" would be carried out as 10 year plans from 2003 to 2012 with investment of 4.73 thousand billion won. The final goal of Special Law is to improve metropolitan atmospheric quality to reach the level of advanced countries such as Tokyo in Japan . In order to achieve the goal, it is planned to reduce emission of PM_{10}, NOx, VOCs, and SOx by 40~70% comparing with 2001. PM_{10} will be improved to 40ml/m same level of Tokyo, and NOx with 21ppb, the same level of Paris.

Table 18. Goal of Atmospheric Quality Improvement in SMA

	2001	2012
$PM_{10(mg/m2)}$	71	40 (Tokyo Level)
$NO_{2(ppb)}$	37	21 (Paris Level)

Source ; MOE, "Summary of Environmental Related Law," Internal paper 2008

"Special Law for the Improvement of Seoul Metropolitan area Atmosphere (SMA)" has 8 chapters and 80 articles. It introduced total emission allowance same as emission trading in Kyoto protocol. Federal government (Ministry of Environment) set the allowance based on the average emission amount fro the past five years, and then local government should implement the reduction target through regular monitoring and some economic incentives. At the first stage starting from January 2007, PM_{10}, NOx, and SOx will be included and 116 first class sites in SMA will be included and from year 2009, about 1,200 sites of second and third class sites

would be included. The affected areas of the Special Laws include Seoul, Incheon, and Gyeonggido. If a company meets the required target, then emission charges and usage of low sulfur fuel will be excluded. Besides, 174 first class sites have less regulated emission standard according the air quality law. If a company reduced more than designated allowance amount, they can sell the reduction credits.

Table 19. Total Emission Allowance for SMA

		SOx	NOx	PM_{10}	VOC
Emission Allowance (Ton)	Total	43,025	145,412	8,999	160,900
	Seoul	6,375	46,148	2,702	54,274
	Inchun	10,030	28,286	1,574	33,120
	Kyunggi	26,621	70,977	4,724	73,506

Source; MOE, "Summary of Environmental Related Law," Internal paper 2008

Figure 9. Total Regulated Area in the Special Law for the Improvement of Seoul Metropolitan area Atmosphere

Note; Inside of red area are is the special zone for the law.

Yellow area is Seoul Metro area, Blue is Inchun area, and Green is Kyunggi Area.

Source; MOE, "Summary of Environmental Related Law," Internal paper 2008

In addition to these important incentives "Special Law for the Improvement of Seoul Metropolitan area Atmosphere (SMA)" has some policy instruments;

a) Supply of Low Emission Vehicles

Emission from vehicles account for roughly 51% of NOx, 58% of PM_{10}, and 85% of CO concentration in the metropolitan area, making emission reduction measure for vehicles and the supply of low emission vehicles(LEV)/zero emission vehicles(ZEV) are an important key to improving the ambient air quality. The Special Law categories the LEV /ZEV into type one and two according to the level of pollution reduction level. Starting from 2005, nearly all government bodies in the metropolitan area required to purchase a certain portion of newly purchased vehicles with LEV/ZEVs. On the automobile manufacturer side, automakers selling more than 3000 vehicles for 3year in the metropolitan region are advised to supply LEV/ZEVs at a certain ratio which set together with the government. Local government having more than ten cars should purchase at least 10 percent of low emission vehicles (LEV)/zero emission vehicles(ZEV)

b) Fuel Quality Improvement

Starting from October 2004, through tax incentives, only low-sulfur fuel was supplied in the Metropolitan area. Current national fuel standards on sulfur contents are 430ppm.

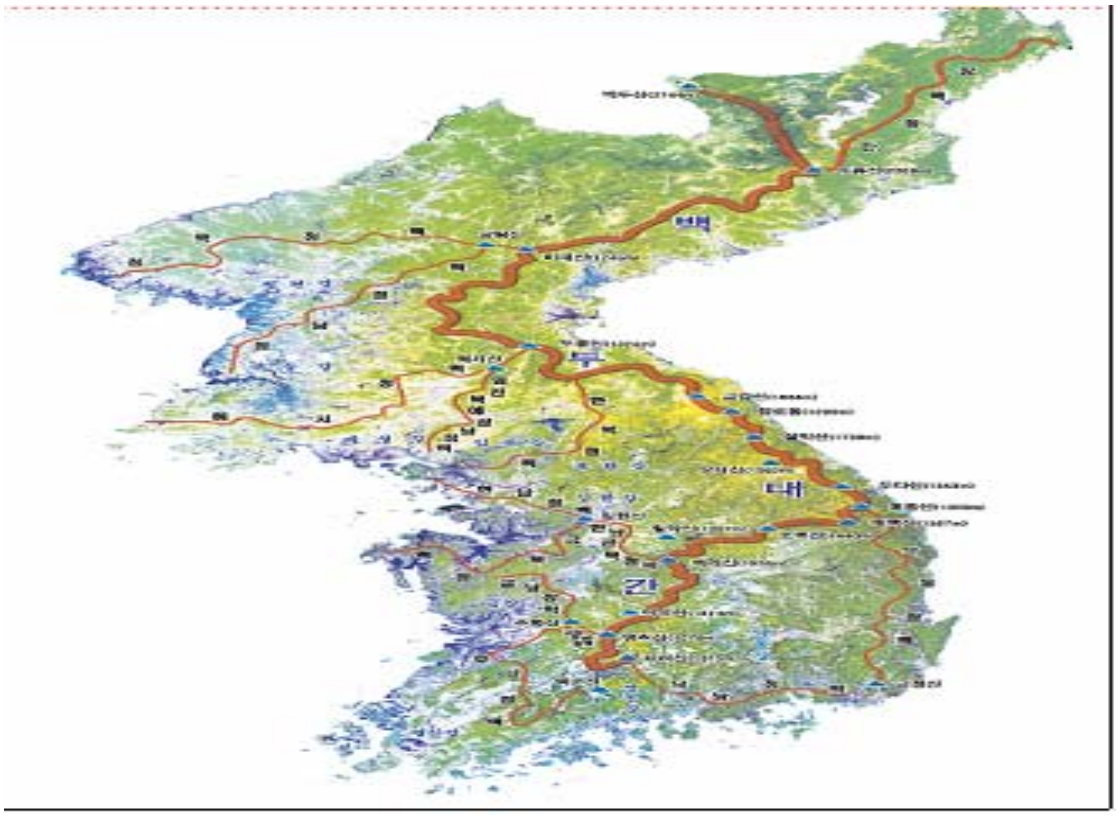
(2) Law of Protection for Baekdu Daegan Mountain in 2003

Baekdu Daegan Mountains boasts a great diversity of species. 1,528 wildlife species (123 mammals, 457 birds, 43 amphibians/reptiles, and 905 fishes) known to be lived in the Korean peninsula, most of species are living in the Baekdu Daegan except for some indigenous species (e.g., crocidura russula quclpartis, micromys minutus hertigi, etc.) on Jeju island. Korean government initiated the “Law of Protection for Baekdu Daegan Mountain” in 2003 and there are 16 articles. The law was firstly suggested from Ministry of Environment and Agency of Forestry together. Among 2,634 ㎢ key protected area is 1,699 ㎢(65%), and buffer zone area is 935 ㎢. 48 percent of national park is in Baekdu Daegan Mountains. In order to protect Baekdu Daegan Mountains, both government bodies set up 10 year plan and will have various activities including North Korean cooperation with tree planting. Based on the Law, they will purchase degraded land area and try to make original shape of mountain.

Especially, The Forest Land Management Act (2002) applies stricter standards to prevent indiscriminate development and reckless forest destruction, and requires large-scale development projects to conduct a prior environmental assignment review. To secure ecologically sustainable forest resources, Korea has increased the number of plant species for afforestation to 78 species, resulting in an average annual planting of 53 million trees

and afforestation of 210 ㎢. The *Act on Arboretum Constitution and Promotion* (2001) provides a legal basis for supporting the National Arboretum as well as six regional arboretums that conserve various forest genetic resources. An *ecological forest* building project is being conducted with a focus on Korea's native flora [e.g. Hanlla Ecological Forest (2000-04) and the Ecological Forest in the Baekdu Deagan Mountain (2001-09)].

Figure 10. Map of Baekdu Daegan Mountain



Source; MOE, "Summary of Environmental Related Law," Internal paper 2008

Korea had just finished ***Fourth National Forest Plan*** (from 1998 to 2007), which incorporated *sustainable forest management*. The plan aimed to:) implement environmentally sound forest management in a sustainable way,) increase the competitiveness of the forestry and forest industry, and) enhance social benefits, *The Framework Forest Act* (2001) shifts forest management to focus on sustaining a healthy ecosystem and a balance between generations of trees.

Table 21. Baekdu Daegan Mountain by Region

(Unit : ㎢, %)

Classification	Total		Core region	% (Core/Total)	Buffer Zone	% (B.Z/Total)
	Area	%				
Total	2,634	100.0	1,699	65	935	35
Gangwon	1,339	50.8	941	70	398	30
Chungcheong	356	13.5	120	34	236	66
North Jeolla	179	6.8	143	80	36	20
Sough Jeolla	52	2.0	34	65	18	35
North Kyungsang	478	18.2	320	67	158	33
South Kyungsang	230	8.7	141	61	89	39

- Date of Designation: September 9, 2005
- Legal Framework: Article 6 of Act on the Protection of Baekdu Daegan Mountain System
- Area : 2,634 (Core Area: 1,699 (65%), Buffer Zones: 935 (35%))
- Location : The peak of Hyang-Ro (in Gosung, Gangwon Province), the Cheonwang Peak of Mt. Jiri
(in Sanchung, South Kyungsang Province)
- Ownership: Public (86.8%), Private (13.2%)
- Current Status of Land Use: Forest/Fields (99.6%), Ranches (0.13%), Roads (0.16%), Farm (0.1%)
- Range: 6 Provinces, 32 Cities/Counties(Gun)(12 cities, 20 counties), 103 Towns (Eup/Myeon/Dong) note; 7 National Parks and Two Provincial Parks Included.

(3) "Special Law of Water Management for Four Rivers in 1999 and 2003

To establish clean and safe water supply system, Korean government planed to supply clean water for citizens from 55% in 2007 to 88% until 2012 including rural areas. At first, the Han river was mainly controlled. However, the water quality of the other main rivers such as Nakdon, Kumkang, and Youngsan was getting worse. Therefore Korean government extended Han rive related law to the other three rivers in 2003. Over the past four years from 2003 to 2006, there were many debating among the stakeholders. Since the law has very unique figures such as total wastewater allowance, application of beneficiary pays principles, and operation of four river fund.

According to the ***"Special Law of Water Management for Four Rivers***," Korean government introduced total emission allowance charges, water shore area management, and clean water use charge system. Here, clean water use charge system means that based on beneficiary pays

principles, people lived in lower river stream area have to pay some amounts of fees out of regular utility bill to the government. The charges set by the special committee for Han River have gone into special water fund every year. With the water fund, many projects have been conducting such as purchasing of water shore land, social activity support in upper area, monitoring and maintenance for river, etc.

Table 22. Expenditures of Fund for Han River Stream Management

(Unit: million won)

Rivers	Total	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	4,267,670	27,704	203,516	274,762	352,530	583,695	687,215	722,579	740,876	674,793
Han	2,627,447	27,704	203,516	274,762	310,823	335,588	333,418	376,010	396,335	369,291
Nakdong	893,301	-	-	-	26,852	149,149	196,848	185,064	174,311	161,077
Kumkang	417,128	-	-	-	7,029	52,110	79,451	91,785	98,718	88,035
Youngsan	329,794	-	-	-	7,826	46,848	77,498	69,720	71,512	56,390

Source; MOE “Internal Report,” 2008

(3) Reduction of GHGs to Stop Climate Change (Low Carbon, Green Growth Law)

Korean government need to prepare for the reduction of greenhouse gases even if it has not obligate to reduce the GHGs until 2012. In order to prepare effective climate change policy, Korean government have invested several areas such as development of renewable energy technologies, development of green IT and green building, enhancement of energy efficiency, introducing new policy measures, and strengthening public communication

Korea's climate change policy began to emerge in 1997 with the establishment of an inter ministerial committee on the UNFCCC, headed by the Prime Minister. The First Comprehensive Action Plan (1999-2001) was followed by a second and a third action plan (covering 2002-04 and 2005-07), which have been increasingly comprehensive and detailed. Korean government started 4th National Climate Change Action Plan in year 2008. President Lee already announced during the G-8 meeting in 2008 that Korea will make voluntary reduction targets in 2009. Key implementation action plans are;

1. Korean government will initiate the “Climate Change Prevention Law” and introduction of carbon tax as well as emission trading system would fully operating, which may cause new emerging carbon market as a whole. The use of carbon taxation and a well-designed domestic GHG emissions trading system could also markedly advance Korea's climate change goals, as well as serve as a model for other countries in the Asian region. The inclusion of specific objectives and precise measures in the Fourth Comprehensive Action Plan (2008-10) should also be pursued to reduce the rate of growth of GHG emissions in order to participate actively in the UNFCCC process.
2. In relation to the Climate Change Prevention Law, sector based reduction target will be made and GHGs registry also will be made. The portion of renewable energy will be increased from 2.39 % to 11% in 2030. And percentage of nuclear energy supply out of total energy will increase. In order to have the most advanced technologies such as solar thermal power, fuel cell, wind power, even hydrogen energy until year 2012, Korean government is planning to invest about 9000 billion Korean won for R & D, distribution, and marketing. Therefore promotion and development of various technologies related to automobile manufacturing are strongly activated.

Table 23. Yearly Budget to Attain Renewable Energy Supply (2004-2012)

(Unit: 100million)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	total
R&D	950	1,130	1,405	1,625	2,025	2,460	2,895	3,335	3,820	19,645
Supply	1,670	2,110	3,412	3,824	5,352	7,217	8,888	12,108	14,280	58,861
Sub tot.	2,620	3,240	4,817	5,449	7,377	9,677	11,783	15,443	18,100	78,506
Finance	900	1,340	1,800	2,280	3,300	4,100	6,300	10,600	9,600	40,220
Total	3,520	4,580	6,617	7,729	10,677	13,777	18,083	26,043	27,700	118,726
Private investment	1,300	4,900	7,000	9,000	12,400	18,300	21,700	28,500	30,100	133,200

Source; KEMCO, “Renewable Energy Supply Plan,” 2008

3. To make progress, the government will need to raise public awareness, provide clear and strong incentives to industry, and invest substantially in R&D such as CCS(carbon Capture and Storage), fuel switching, and energy conservation.
4. There is serious warning for the climate change because of weather risk. Korea is experiencing high economic costs. Therefore, long term adaptation plan is also under progress
5. Federal and local government cooperation body will be made
6. Korean government will integrated the other policies for the protection of the Korean environment. Therefore, ministry of environment, trade and construction, urban planning, and agriculture will work together. Role of financial sector will be very important sector in the Action, hence climate change related various products for risk insurance and banking will play a major role in CDM project in the future. Hence, Korean government try to make carbon funds from public and private sector to share some carbon markets since the size of carbon market in the world will increase two times than before in 2030.

Table 24. Projection of Carbon Market until 2012

Year	Market	Trade (billion US$)	Volume (million ton)	Price (US$/ton)
2006	CDM	5	475	11 (6-27)
	JI	<1	16	9
	EU ETS	24	1,101	22 (5-40)
2010	CDM/JI	5-25	400-600	24 (14-34)
2030	CDM (Low)	5-25	400-600	24 (14-34)
	CDKM (High)	90-125	4,000-6,000	24 (14-34)

Source; Point Carbon , "Current Status of Carbon Market and Future Perspective," 2007

5. Problems of Implementation for Sustainable Policy and Law

Even if Korean government initiated ambitious environmental policy at the end of the 1980s, there are still some more work to do in the future.(See <Table 24>). In this study, we will discuss about some problems of priority issues in order to implement for the policy.

Table 25. Some Indicators of Sustainable Development as of 2007

	2003	2005 and 2007
Human Development Index Ranking(Value)	30th (value 0.88)	26th (value 0.921, 2005)
Environmental Sustainability Index	135th	122th (2005)
CO2 Emissions from Fuel Combustion (2001)	436 million ton of CO2(2001)	591 million ton of CO_2 (2005)
GDP (PPP, 2001)	674.9 billion 1995 US $(2001)	969.3 billion US$ (2007)
GDP per capita (PPP, 2001)	14,268 1995 US $ (2001)	20,045 US$ (2007)

Sources: *CIA World Fact Book, 2003, UNDP 2003, Yale University and Columbia University* 2002, OECD/IEA CO2 Emissions from Fuel Combustion 1971-2001, 2003 Edition

(1) Special Law for the Improvement of Seoul Metropolitan area Atmosphere (SMA)

Even if Ministry of Environment and Local government (SMA, Kyuggi Do, Inchun) and professional research groups work together for three years, and did some pre-test period,

business groups and local government officer could not understand the system well and did not prepare very core basic statistics such as registry for SOx, NOx data and allocation principles from the federal government. Industry sectors have complaint about the allocation and boundary of targeted area and require strong institutional and financial incentives.

Therefore, when the Law was discussed several years ago, PM_{10} was included after 2009, but at current, PM_{10} will not be included until the Law is stabilized.

(2) Law of Protection for Baekdu Daegan Mountain

This Law is operated with Korea Forest Service and MOE after 2005. However, 70% of owner of forest in Baekdu Daegan Mountain Area is from private owner. Even if there is a Law and some support for the protection of forest area, very weak financial support goes to the private owners. because of far lacking support and budget[8] in Korea Forest Service.

Hence, private owners and Korea Forest Service have insisted the introduction of direct payment from the various forest services for the protection of Baekdu Daegan Mountain Area same as direct payment for agricultural rice field in Korea and in abroad such as U.S.A and Japan for example.

(3) "Special Law of Water Management for Four Rivers

According to the ***"Special Law of Water Management for Four Rivers***", Korean government introduced total emission allowance charges, however, it is very hard to find and allocate total emission for the non-point source because of data availability. Scattered animal farming houses for pig and cattle, small scale company and many hotels around the restricted water reservoir area are the main source of polluters. Based on the rule of beneficiary pays principles are also under target. There is not transparent and subjective rule for the water use charge, it depends on the special river management committee decision every year.

(4) Management of GHGs to Stop Climate Change

In recent years, Korean government is dramatically and strongly changing their plans and strategies for the mitigation of climate change in Korea. However, still some energy intensive

[8] The yarely budget for the agency is 1300 billion Korean won in 2008.

industry sectors are unwilling to participate for the government policy and criticize the introduction of emission trading with cap and trade system, and carbon tax. Some sectors like household and commercial sector, transportation sectors need more work for the energy efficiency improvement and have lots of rooms for the GHG reduction in the future.

Korean government need to participate actively for the Asia Pacific Partnership (APP) in the future. Now six countries such as Korea, U.S.A., China, India, Australia, Japan EPA, and USA CH4 reduction partnership are involved in APP. Environmental sector need to be regarded as one of the main topic. At the same time development of negotiation strategy and public communication is quite important for the people and for the 2nd commitment period from 2013-2017.

6. Road to Ahead – need work for the 2nd Pahse

The Republic of Korea has continually implemented strategies for Sustainable Development since the Rio-Summit in 1992. The most important strategic plans are: a) The ten-year plan of *Green Vision 21* (1996-2005), where currently work is undertaken to formulate the second long term plan, b) the *Mid-Term Plans* for putting the long-term planning into practice, where currently the third Mid-Term Plan is in action (2003-2007) and c) several strategic plans in different sectors. Green vision 21 (http://www.gef.or.jp/20club/E/seoul_e.pdf)

The *Green Vision 21* obliged ministries to adopt sectoral environmental plans. For example, the Ministry of Knowledge and Economy (MKE) has developed the 10-year *National Plan for Energy Technology Development and* two 5-Year *National plans for Energy Conservation*. The Ministry of National Land and Marine (MOCT) adopted the “plan first, develop later” concept of development for the whole country including urban and agricultural areas. In order to promote sustainable development of the national territory, MOCT also enacted the *Act on Planning and Use of National Territory* effective as of January 1, 2003, combining the *Urban Planning Act* and the *National Territory Use Act*. Under the Fourth Comprehensive National Territorial Plan (2000-2020), which is the highest-ranking national plan on territorial development and which was formerly called the Comprehensive National Development Plan, MOCT paid greater attention to *Green Vision 21,* making integration of development and environment one of the 3 keynotes of the plan. The Ministry of Knowledge and Economy has also set up a plan *Environmental Policy in Agriculture, Forestry and Fisheries for the 21st Century* that aims at policy integration and contains specific targets for the development of

technologies for reducing the use of chemical fertilizers and synthetic pesticides by 30% until 2004, and by 40% and 50% respectively until 2010 (basis year 1993) (UN 2002).

2015, when a comprehensive national environment plan is expected to be completed, will make Republic of Korea join the ranks of the advanced nations in the field of the environment. Main indicators in Korea, signaling the quality of natural surroundings and living environment, will be upgraded to the level of those in the OECD. For instance, the concentrations of nitrogen dioxide in Seoul will be improved from 38ppb in 2003 to 22ppb in 2015. Sectoral environmental plans and municipal environmental conservation projects will make great contributions to the embodiment and implementation of the comprehensive national environmental plan, so as to realize the blue print for making Korea an advanced environmental country.

Figure 11. Target of Environmental Improvement in 2015

Source: MOE, “ Green Vision 21, “ 2005

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Appendix 5

Lao PDR Country Review

A.5 Water Sector and Sustainable Development in Lao PDR: Mainstreaming Water Resources Development Management towards the More Integrated Manner and Sector-based Approach

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1. Introduction

Lao PDR classified as the most abundant on water resources per capita in ASEAN by the annual providing capacity of surface water to each of its individual citizen of 55,000 m^3 per capita, while ground water is considerably untouched. Both surface and ground waters are generally in the save status. Around 80% of the country's area lies within the Mekong River Basin. The remaining 20% drains through Viet Nam directly to the South China Sea. The total annual flow of water from the Mekong tributaries within the territory of Lao PDR is estimated at 270,000 million cubic meters, equivalent to 35% of the average annual flow of the whole Mekong Basin. Besides the major tributaries of the Mekong, there are hundreds of small streams which mostly have a torrential regime during the rainy season and have a very low or no flow during the dry season. The monthly distribution of the flow of the rivers in Lao PDR closely follows the pattern of rainfall: about 80% during the rainy season (May-October) and 20% in the dry season, from November to April. For some rivers in the central and southern parts of the country (particularly Se Bang Fai, Se Bang Hieng and Se Done) the flow in the dry season is less: around 10 to 15% of the annual flow.

Main rivers of the Lao PDR dominantly consist of the first and second tributaries of the Mekong River. There are about 39 main tributaries in the Mekong river basin, in which 11 main rivers that have catchments areas of more than 5,000 km^2 are originated and/or passed through the Lao territory. Total watershed area of the main tributaries is estimated at about 183,000 km^2. There are only 2 main rivers, namely Nam Ma and Nam Ka rivers, are located outside of the Mekong River Basin and expanded in the eastern area of Houaphan and Xieng Khuang provinces. Both drain through Viet Nam directly to the South China Sea (DMH, 2007). The limited information on these rivers restricts assessment of their potential.

Water is an essential part of the life and culture of Lao people, and also contributes to the socio-economic development goals of the country. Ultimately the welfare of Lao PDR is bound up with water and all development plans will depend on water resources in some way. Country's water consumptions and uses are mostly extracted from numeral steams, tributaries as well as the mainstream itself of the Mekong River, which are considerably in good quality, excepted in some spots. Contributions of the water sector have been examined through related development agencies, including irrigation, hydropower, navigation, fisheries, urban and rural water supplies and sanitation, tourism, cultures, etc.

Sustainable development emerged as a new development paradigm and has been adopted by international community as an overarching development goal since the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro in 1992. The key principle adopted was 'sustainable development' after the report by Brundtland to the United Nations. Lao PDR is committed to Agenda 21 as well as to the conventions adopted at the Conference including the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity and the UN Convention to Combat Desertification. The Lao PDR agreed to other key international commitments in the area of sustainable development including the Human Rights, the Millennium Development Goals (MDGs) and other Multi-lateral Environmental Agreements (MEAs).

Ten years later in 2002, in Johannesburg, a follow-up conference produced the millennium development goals. In line with other states, the Lao Government adopted the Johannesburg Plan of Implementation (JPOI), which called upon countries to take immediate steps to make progress in the formulation and elaboration of the National Sustainable Development Strategy (NSDS), and begin implementation by 2005. One of particular targets of the JPOI is to apply the Integrated Water Resources Management (IWRM) approach as a component of NSDS of the country.

The objectives of the paper aim to

- identify major existing and potential issues on water resources management, influencing to the socio-economic development of the country;
- evaluate legal and institutional evolution in line with national policy support for the more integrated management of the water resources; and

- address major capacity development needs to overcome existing and potential issues toward sustainable development.

2. Serious problems from economic growth

The integration of water resources management and improvement of multi-sectoral coordination and management has been initially implemented in the last ten years, in order to ensure that the water and other key natural resources have been used and managed wisely. During the period, the country has made considerable progresses in achieving its strategic goals on the IWRM and continuously steps upward to the more consistent management approach by the means of local, national, regional and international integrations. Along with these implementations, more challenges and opportunities are being the key factors influencing to the IWRM goals of the country. In parallel to the national arrangement, water resources management by applying river basin administrative approach is also being introduced and scaled up. Behind this institutional evolution, some logistic backgrounds, which were considered as significantly historical changes in the water sector in Lao PDR, will be briefly reported.

Even though the country is reach in water resources, however, the National Water Sector Profile (1998) reported that some minor competitions within a single water sub-sector and between sub-sectors were existed. Due to the high level of socio-economic development, the need for natural resources uses, especially the core resources of land, forest and water, is also raised along, and then some signs of conflict observably have occurred. Observable information from many studies indicated that competition among users were occurred in specific areas: decrease of fish capture in the river downstream of dams; rainwater leaching the salt mining areas into water courses; competition among irrigators and other users pumping from the same stream; no enough or too much overflow water in seasons to supply for series of hydropower dams in the same river systems in some basins or sub-basins; water pollution problem occurred in some dense domestic dwellings and tourism destination towns, etc.

The National Human Development Report (CPI, UNDP, 2006) also reported that key possible negative impacts from the development, regarding international trade of the country are commodity price cycles, treats to the environment and quality of life, some mistreatment of workers, threats to Lao culture, threats from external shocks and threats to employment. For the threats to environment and quality of life, the projects may lead indirectly to illegal logging because of new road construction and transmission line rights-of-away. There is some loss of

habitat. And, in some cases, there may also be lower quality of life in the resettled villages if promises made are not kept and resettled households cannot find adequate new livelihoods. For the more specific threats to water and aquatic resources, hydroelectric projects can create some risks, including downstream effects on fishing and farming. Some mines also have downstream effects on fishing from tailings, erosion and leakage of chemicals used in processing including cyanide from gold mines. Tourism can have negative impacts by degrading environment in different aspects, including overbuilding in areas important for biodiversity conservation and increased air and water pollution, due to increased transport, higher amounts of solid waste and higher grey water discharges.

It is fortunately that the Lao PDR has generally abundant water and other natural resources, relatively low development status and less population, comparing to its neighboring countries, but its overall water resources management is considerably fragile. With the high ratio of socio-economic development growth rate (by 7.5% of GDP per year in 2008), its natural resources management should not following too far from development.

3. Identification of priority issues in order to promote sustainable development

At the end of the twentieth century, especially, since 1986 when the country has been approaching more market oriented socio-economic development, the rational growth of the country has considerably raised. The National Gross Domestic Products have averagely been growing by 6.1% from 1991 to 2004 (National Statistics Center, 2005).

Market-based orientation for the national economy has evidently observed, in which foreign/domestic investment has been raised along with business oriented public enterprises. On the other hand, public administrative authority has been decentralized for the more self-based responsibility, especially to the provincial level. In coping with the new economic mechanism, legal and institutional development, and capacity building have been seen as the urgently national priorities.

Within the National IWRM Support Program[1], one of the key elements is to develop the

[1] *The National Integrated Water Resources Management Support Program includes (1) National IWRM Capacity Building; (2) Upgrading of National Water Sector Policy and Strategy; (3) Revision of the Law on Water and Water Resources; (4) River Basin Management; (5) Water Quality and Ecosystem Management; (6) Strengthening of Groundwater Management; (7) Support for the Department of Meteorology and Hydrology; (8) Bachelor Degree's*

National Water Sector Policy, Strategy and Action Plan, which would be submitted to the Government for consideration and approval in late 2010. The draft Framework of National Water Sector Policy encompasses the IWRM principles in incorporating to the national priorities and needs. These include: (i) Water Resources Planning and Coordination (investment priorities to support national goals; national, river basin and sector planning; national to international coordination; and disaster management); (ii) *Water* Legal and Regulations (conjunctive water allocation and sharing; water pollution management; and drought management); (iii) Water and Water Source Protection (watershed management; river bed excavations / filling and other disturbances; groundwater protection); (iv) Water Environment Management (rivers, lakes and wetlands; flood plains and flood management; Riverine vegetation); (v) Organization and Funding (organizational structure and responsibilities; awareness and public participation; human resource development; and investment in water resource management); and (vi) Knowledge Management (data and Information management; modeling; and indigenous knowledge).

The National Water Sector Policy, Strategy and Action Plan will be a strong basis for cross-sectoral integrated water resources management and pave the way for legal and institutional strengthening in the future. The Development of these principle documents will bring the national integrated water resources management to the sector-based approach.

4. Existing relevant national policy, legal and strategies

The National Constitution, set out the political and legal frameworks for overall legislative based development and management. The Article 17, 1991 Constitution and Article 19 of amended Constitution 2003 of Lao PDR provides that “all entities and people shall protect the environment, conserve natural resources such as land, forest, wild-life, watershed and air”. These policy statements provide a concrete foundation for natural resources and environment management as a whole, for water resources management in particular.

The long-term national development goal for Lao PDR, set in 1996 by the 6th Party Congress,

is to rise above the status of a Least Developed Country (LDC) by 2020 through sustained equitable economic growth and social development, while safeguarding the country's social, cultural, economic and political identity. The foundations for reaching this goal have been laid by moving consistently towards a market-oriented economy, building up the needed infrastructure throughout the country, and improving the well-being of the people through greater food security, extension of social services and environmental conservation while enhancing the spiritual and cultural life of the Lao multi-ethnic population.

The 7th Party Congress (March 2001) set the objectives of sustained economic growth with equity at an average rate of 7% per year and a reduction in poverty by one half by 2010 and eradication of mass poverty by 2020. It also indicated that shifting cultivation should be phased-out by 2010.

The National Long-Term Development Framework incorporates guidelines from the 6th and 7th Party Congresses and lays out five and ten-year objectives to reach the 2020 mass poverty elimination goal and systematically improve social well being.

The National Growth and Poverty Eradication Strategy - NGPES (2004) is the strategic framework under which all of the Government's future growth and poverty eradication programs will be developed and implemented. NGPES is a comprehensive framework for growth and development. It defines four main sectors (agriculture / forestry, education, health, and infrastructure – especially roads), supporting sectors (energy and rural electrification, agro-forestry, tourism, mining and construction materials) and cross-sectoral priorities (environment, gender, information and culture, population and social security).

The Millennium Development Goals Progress Report – Lao PDR, January 2004, which was jointly prepared by the Lao Government and the United Nations, classified as the high level document that set the issues of "Promote Gender Equity and Empower Women", and "Ensure Environment Sustainability" among others as the key components of the document. More particularly, the document has set the target for population to access to safe drinking water by 80% and improve sanitation in the urban area by 70% in 2015.

Among other socio-economic development sectors, the national policy framework takes account water resources management as a cross-cutting issue and substitute to the natural resources and

environment. These functions have been guaranteed by the national constitution that all agencies and individuals obligate to protect the environment.

Further extensions from the constitution, other legislations and regulations in relation to natural resources and environment management have been passed through over the last ten year period. In October 11, 1996, the Law on Water and Water Resources (LWWR) has been passed. Main function of this legislation is to determines necessary Principles, rules, and measures relative to the administration, exploitation, use and development of water and water resources in the country to preserve sustainable water and water resources[2] and to ensure volume and quality providing for people's living requirements, promoting agriculture, forestry, and industry, developing the national social-economy and ensuring that no damage is caused to the environment. The Prime Ministerial Decree to implement the LWWR has also issued in October 9, 2001. The decree disseminates more detail roles and responsibilities of line agencies and provinces. Other roles are also provided through decrees and regulations, including the coordination roles of each agency at national and local levels on the development and management defined in the Prime Ministerial Decree to Implement the Law on Water and Water Resources, 2001. Other relevant legislations and subsidiary regulations have also been passed during the same period. These include the promulgations of Environment Protection Law in April 3, 1999, Decree on the Implementation of Environment Protection Law in June 4, 2001, Forestry Law in October 11, 1996, Land Law in April 12, 1997, Agriculture Law in October 10, 1998, Industrial Processing Law in April 1999, Mining Law in 1995, Hygiene and Disease Prevention Law in April 10, 2001, etc.

According to the provisions of those existing legislations, subsidiary regulations, guidelines and other forms of disseminations have been developed by relevant agencies and used as their basis for implementation and coordination. Moreover, some functions and even agencies have been created to fulfill the requirements of those legislations. These include the subsidiary role of Ministry of Agriculture and Forestry on the survey and inventory of water sources and watershed, and the establishment of the Water Resources Coordination Committee in 1999 for functioning as national water apex body.

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[2] *The Law on Water and Water Resources defines that (i) Water is one type of liquid natural resources which is the most basic and principal of resources among water resources: (ii) Water resources are natural resources which are comprised of things inhabiting in water or water resources which do or not have life e,g: plants, marine animals, rocks, minerals, sand, mud, stones, etc*

In April 8, 1998, the Government approved the establishment of the Water Resources Coordination Committee (WRCC) and its Secretariat (WRCCS). The members of this committee had been recruited from water related agencies. The Chairman of the Committee was the Vice Minister from the former Science Technology and Environment Agency (STEA), while Vice Chairman and Members were the director or deputy director levels, representing water related agencies[3].General mandate of the WRCC was to provide the advice to the Government on matters relating to water and water resources. It also had the mandate to coordinate the planning, management, follow-up, inspection and protection of water and water resources aimed at sustainable development and utilization of water and water resources in line with the government policy of socio-economic development.

In July 2007, the Lao Government undertook a significant step by establishment of the Water Resources and Environment Administration (WREA) under the umbrella of the Prime Minister's Office. The WREA constitutes of line agencies, including the Department of Water Resources, Department of Environment, Lao National Mekong Committee Secretariat, Department of Hydrology and Meteorology, Water Resources and Environment Research Institute, and its administrative Cabinet, which also include the Greater Mekong Sub-region focal point unit. These agencies have the functions to be the national advisory bodies to the Government on matters relating to water resources and environment. The agencies also have the roles to holistically coordinate with other development agencies in particularly adverse problems occurred along with development activities. The Provincial Water Resources and Environment Offices and the District Water Resources and Environment Units are also being established and consolidated, which functioned as the WREA local counterparts and carry out the same roles in their respective local situations.

More particularly, the setting up of Department of Water Resources (DWR) aims to centralize the macro water resources management in a public administration system and integration among

[3] *These agencies include Ministry of Agriculture and Forestry (MAF) functioned as water use for agriculture, livestock and fishery purposes; former Ministry of Industry and Handicrafts (MIH) functioned as uses of water for hydropower development and industry purposes; Ministry of Public Health (MPH) functioned as water uses for rural water supply and sanitation as well as drinking water quality control; the Lao National Mekong Committee Secretariat (LNMCS) represented the Lao PDR in relation to other riparian members of Mekong River Commission; former STEA functioned as water environment and ecology issues; Ministry of Justice (MoJ) functioned as coordinator for legal development, Lao Front for National Construction (LFNC) represented diversified ethnic groups and community of the country; Lao Women Union (LWU) shared the importance of women on water related issues; and the Office of National Assembly (NA) played the role as legislative body in which water resources legislation is a part*

water user agencies. The institutional arrangement for a national water apex body is being considered to be setup at the ministerial level to replace the existing WRCC. It comes up with two options on putting additional roles to the existing Lao National Mekong Committee (LNMC) in which the Minister of WREA is already shared with the memberships at vice-ministerial level or incorporating water resources management function to the National Environment Committee (NEC) at where the Vice Prime Minister shares with the memberships at vice-ministerial and provincial vice-governor levels. One of the DWR mandate is to act as Secretary to the new nation water apex body upon its establishment.

Further more, the Government of Lao PDR has taken many significant steps to introduce and strengthen IWRM into the water sector, which include preparation of a National Water Sector Strategy and Action Plan (1998), the Draft Water Sector Policy (Sep. 2000), the passage of Prime Ministerial Decree on the Implementation of the Law on Water and Water Resources (2001), the update of the National Water Sector Profile (2007), the preparation of the Nam Ngum River Basin Profile, Integrated River Basin Planning and preparation to establish the Nam Ngum River Basin Committee and other related legal and institutional steps are being progressively undertaken at the moments. The integrated water resources management and planning for Nam Theun/Nam Kading and Xedone Basins are also being initiated.

Simultaneously, capacities of different agencies have been built to cope with new socio-economic situation since the previous decade. Capacity buildings for water related agencies have been carried out in different forms, including short-term and long-term trainings in both in-country and abroad, on-the-job trainings and seminars with the topics designed to fit the particular needs of each agency (IWRM Training Plan, 2005). The more comprehensive training activities on IWRM for all water related agencies have been initiated since 2005 through the IWRM Training Plan. Implementation of this Training Plan is still going on.

5. The problem from implementation of existing relevant policy, legal and strategies

Based on the national assessment, the country's legal and institutional arrangements, including its technical and personnel capacities on water resources management were considerably at the primary level and insufficient to cope with existing circumstances, which turned the uses and management of water and other key natural resources into challenges and unsustainability (WRCCS, 2006).

The current institutional problem in the water sector mainly relates to lack of co-ordination between agencies within the sector and with those of other sectors, and loose line of communication and co-ordination between the national agencies and their provincial counterparts. There has gradually been, especially since the last decade, a sign that the large number of agencies involved in water and water resources requires coordination to ensure the outcomes sought by government are achieved without adverse interactions. However, at that time, there was no formal structure for such coordination and it relied on informal arrangements developed on a case by case basis. Further more, there is a lack of legal backup to implement various key functions of IWRM. This has not resulted in many significant problems because of the low level of development.

Since the formal IWRM has been introduced the last decade, there were a lot of efforts the water sector has been dealt with in the context of the more holistic water resources and cross-cutting issue management. However, it was appeared that more affordable to reach the objectives were still required.

To date, it is analyzed that the activation of IWRM still faces several important issues and challenges. Major outstanding issues which need to overcome in the future are as follows:

- The Law on Water and Water Resources (LWWR) and the Prime Minister's Decree on Implementation of the LWWR have introduced some aspects of IWRM, including ownership of water resources, national and river basin planning, monitoring and assessment of water resources, water resource allocation according to integrated river basin plans, a specialized funding mechanism, public consultation requirements and watershed protection. Implementation of the LWWR, however, remains quite limited. As they are the master regulation, the law and its implementation decree can only give broad principles that being a guideline for further disseminations. Poor implementation is the result, in part, of incomplete policies and secondary legislation as well as gaps and areas of the law which are unclear.
- One of the weaknesses of the LWWR is its delegation of water resource policy and regulatory functions to water development ministries. These functions will conflict with the water development and service delivery roles of these ministries and their agencies. There is not a sufficient understanding of the need for separation of state management of water and water service levels at all levels. The 'decentralized' implementation approach relies on a 'coordination' role for the former Water Resources

Coordination Committee and Lao National Mekong Committee, which was unrealistic given their small size and limited capacity, as well as the lack of clarity on the respective roles of these two agencies.

- In comparing the existing IWRM principles and ToolBox, the LWWR also appears to have gaps with respect to such things as information management, the coordination of water resource and environmental management, international coordination and management of water resource development, conflict resolution, the role and administrative requirements for water resource management by provinces and other local authorities and mechanisms for water resource management and coordination at the river basin, provincial and lower levels, the management of natural disasters and public safety (such as dam safety).
- A national water sector policy, has been drafted in the last decade but not approved; national strategy and action plan was also prepared but implementation was very limited. These principal documents are being updated by the DWR and will be submitted to the Government for consideration and approval by the end of 2010.
- Planning is largely driven from districts and provinces or by major national agencies; however, plans are project-oriented and are not integrated within basins or across sectors.
- The Water Resources Coordination Committee exists with a mandate to advise government and coordinate water sector activities; WRCC still has low level membership and low capacity (chaired at vice-minister level, with technical level members; limited staff capacity and resources) and is largely dependent on donor funding. LNMC has a responsibility to advise Government and coordinate national agencies with respect to MRC activities and Mekong Basin water resources; duplication and confusion with WRCC mandate exists. Both agencies serve as coordination agencies in the Lao water sector. The WRCC mandate is directed toward national water resource management while the LNMC deals more with international aspects, although this is not a clear separation. Both agencies are relatively small and have inadequate legal powers and inadequate capacity to carry out coordination (regulation) of other ministries and agencies. International coordination of water resource management is mainly through the Mekong River Commission and the National Mekong Committees of the member countries under the 1995 Chiang Rai Agreement. It is difficult to separate national and international aspects of water resource management since Lao PDR is affected by, and affects, water management in other countries in the Mekong Basin.

- Basic principles of IWRM have been incorporated in the mandate of DWR and its provincial counterparts, but for facilitation of practice, legal back up needs to be developed soon.
- Agency responsibilities for water resource management are fragmented and many gaps exist; no lead water resource management agency exists.
- Water resource management is largely driven by hydropower development with limited reference to multi-sectoral water management issues.
- A national policy of decentralization is being actively pursued; however, provincial capacity for integrated water resource management is very low.
- No river basin organizations exist yet. Based on the national agenda, the setting of river basin organizations for Nam Ngum and Nam Theun Nam Kading Basins in the near future will be the models for other basin institutional arrangement of the country. On the other hand, river basin planning process will be created in incorporating to the national and provincial administrative planning.
- Some steps are being taken to develop a national water resource information management system; however at present data fragmentation, access and other issues limit the use of information in decision-making.
- Some IWRM training has been carried out, but is fragmented and has not resulted in a general understanding of IWRM or implementation of necessary functions
- Some steps are being taken to develop a national program for public awareness and participation.
- Funding for particularly IWRM of the country is limited and mostly received from donors in the form of project bases. The on-going water use tariff, eg. collected by domestic water supply sector, aims for only sustaining its business operation and maintenance, nor for maintaining and rehabilitating water sources and watershed. Other forms of fee collection from water resources development are done through investment and concessional charges by national and local administrations, while there is no systematic procedure to allocate these taxes for the water resources management purpose. At the time being, the more sustainable finding for water resources management is being discussed which is possibly obtained through water loyalty. Proportion of water fee for each development project will be studied and set as national water loyalty procedure. Some hydropower projects is considerably targeted as models for contributing reasonable proportion of their revenue to water resources management

fund, before extending to other beneficial water resources development projects in different sectors.

- Planning and monitoring take place through normal government processes but a coordinated and strategic approach is still lacking with respect to the water sector.

6. The Way Ahead

Sustainable water resources development needs effectively comprehensive water resources management. The incorporating of IWRM into the existing institutional, legal and implementation frameworks is the main and not easy task for the Lao PDR. To achieve this task, a great attempt has to be pursued. These include the institutionalization of the more effective coordination mechanism from both vertical and horizontal administrations for the respective national, local institutions and among their counterparts and other relevant organization, including clear roles and responsibilities of water service providers, managers and regulators; and enhancement of legal and regulatory systems. In supporting these, institutional and human capacity, including IWRM awareness should be built; data and information management system should also be strengthened.

Abundant water both quantity and quality of the country will be a great opportunity for the county for their socio-economic development, especially its industrialization in the future. There for well managed of water resources through their effective management arrangement will be for key factors determining the success of the country in the future. Further direction on the Lao IWRM implication includes:

- Dissemination from the more centralized authorization at central level to the more decentralized and integrated water resources management arrangement at locality, and from more realized locality to appropriately define national policy setting;
- Restructuring from the fragmented water resources management in line with water resources development to the more particular and professional water resources management arrangement;
- Shifting from the administrative boundary-based water resources management to the more cross-administrative / basin based-management approach;
- Shifting from project based-approach to program; and
- Shifting from program based-approach to sector;

7. Summary

Lao PDR classified as the most abundant on water resources per capita in ASEAN (55,000 m3/person/year). Around 80% of the country's area lies within the Mekong River Basin, while the remaining drains through Viet Nam directly to the South China Sea.
The total annual flow of water from the Mekong tributaries within the Lao territory is at 270,000 million m^3, equivalent to 35% of the average annual flow of the whole Mekong Basin. The monthly distribution of the flow of the rivers closely follows the pattern of rainfall: about 80% during the rainy season and 20% in the dry season. Water quality is considerably in good condition.

Water resource is important for contribution to achievement of the national socio-economic development goals, which aims to shift from least development status in 2020. Water consumptions and uses are mostly extracted from numeral steams, tributaries as well as the mainstream itself of the Mekong River for mostly agriculture and negligible uses for other purposes comparing to its renewable availability.

Lao PDR is committed to principal international agreements on environment, especially the UNCED in 1992 and ratified to its subsidiary conventions. Dissemination and implementation of these agreements need to be strengthened.

The objectives of the paper aim to (i) identify major existing and potential issues on water resources management, influencing to the socio-economic development of the country; (ii) evaluate legal and institutional evolution in line with national policy support for the more integrated management of the water resources; and (iii) address major capacity development needs to overcome existing and potential issues toward sustainable development.

It is found that there is a high variation of seasonal water distributions, flood and draught, water pollution and watershed degradation and sedimentation, occurred at some spots or areas, caused by human activities. It is consider yet a major problem now, but could escalate in the future, if without appropriate management. The existing management arrangement is yet sufficient to support the sustainable water resources developments by different sectors, which needs strengthening.

Over a decode, the country has made a number of achievable progress, which extended from the more centralized authorization at central level to the more decentralized and integrated water

resources management arrangement at locality, and from more realized locality to appropriately define national policy setting; the fragmented water resources management in line with water resources development to the more particular and professional water resources management arrangement; the administrative boundary-based water resources management to the more cross-administrative / basin based-management approach; and project based-approach to program-based and pursue to the sector-based approach in the near future.

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Appendix 6

Philippines Country Review

A.6 Economy and Environment in the Philippines: Issues and Imperatives

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1. Introduction

With its rich and vast array of natural resources, the Philippines should be among the most affluent countries in the world. But like most other similar naturally-endowed countries, it appears to have fallen victim to the "natural resource curse,"[1] the phenomenon whereby countries and regions with an abundance of natural resources tend to have worse development outcomes than those that are less endowed (see Auty 1993; Sachs and Warner 1995).

A richly-endowed archipelagic country of around 7,100 islands, the Philippines traces a long history of geological formation that has yielded a unique assemblage of bio-physical ecosystems teeming with biological and natural resources. Its 30 million hectares (300,000 square kilometers) of land area, which had 70 percent forest cover just over a century ago, hosts an extremely rich and diverse array of plant and animal species that has put the country among the top mega-diversity countries in the world. Similarly, its 36,289 kilometers of coastline and its abundant inland waters endow it with an extremely rich array of marine and freshwater resources acknowledged to be among the richest and most diverse in the world. Conservation International (CI) reports that the Philippines possesses more than 50,000 documented plant and animal species, more than 65% of which are found nowhere else on Earth. Furthermore, more new species are discovered in the country every year than in any other country in the world.

The country's mineral resources are similarly among the richest in the world. In terms of minerals per unit of area of land, it is considered to be the fifth most mineral-endowed country in the world. While it does not have the substantial petroleum resources of its Southeast Asian

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1 This observation has also been described as the "paradox of plenty."

neighbors Indonesia and Malaysia, it is the world's second largest producer of geothermal power, with its available capacity of 1,900 megawatts supplying 16% of the country's installed electric power generation capacity. Sources of water are likewise abundant, with potential water supplies well beyond the country's requirements.

With such abundance of natural wealth, the Philippines possesses all the necessary basic elements that should be able to support broad-based industrialization, self-sufficiency, and prosperity. But instead of harnessing its superior natural wealth to fuel a dynamic and broad-based economic development over the years, the country found its economy lagging behind most of its neighbors for more than four decades. The economy found new dynamism in the 1990s amid aggressive reforms under President Fidel V. Ramos, but the Asian financial crisis of 1997-98 cut short what appeared at the time to be a building momentum of growth. Subsequent reversals in the quality of politics and governance set the country back once again in its efforts to keep in step with its dynamic East Asian neighbors.

The relative weakness of the Philippine economy through the years has translated into weak human development and environmental indicators as well. Nearly a decade after the turn of the 21st century, it faces the challenge of persistently narrow, shallow and hollow economic growth,[2] which has been accompanied by worsening poverty,[3] and continued degradation of the environment and depletion of the nation's natural resource base.

This paper takes stock of the environmental situation in the Philippines amidst its mixed record of economic development. Section 2 reviews the environmental consequences of the country's economic growth experience. Section 3 highlights priority policy issues and thrusts to achieve proper balance among the social, economic and environmental dimensions of development in the country. Section 4 describes institutional and other implementation hurdles that must be overcome to ensure proper translation of the priority policies and measures into action and achieve their desired impacts. The concluding section provides a summary and draws attention to priority areas for future action.

2. Economy and the Environment: Past Record

[2] See Habito (2005).

[3] Latest official data report poverty incidence in the country to have risen from 24.7 percent of families in 2003 to 26.9 percent in 2006.

The World Bank's 2004 Philippine Environmental Monitor (PEM 2004) described the Philippine economy as one that "remains acutely dependent on natural resources. The rural sector employs some 11.2 million people, and is a substantial contributor to national gross domestic product. In 2003, it generated 632 billion Philippine pesos (PhP) through agriculture, fisheries, and forestry-based industries." In terms of contribution to total output, services now actually dominate the Philippine economy, accounting for about half (49 percent) of total output, with industry accounting for 31 percent (21 percent from manufacturing), and agriculture providing the remaining 20 percent. However, the share of agriculture in total employment, at 37 percent, is much larger than its output share, while services and industry account for 49 and 15 percent, respectively. This implies that labor productivity in agriculture is low relative to the other major sectors. One direct consequence of this is a much higher incidence of poverty in the rural areas, which account for about 70 percent of poor Filipinos.

Over the past two decades, and especially in the 1990s, the Philippines undertook aggressive reforms in the form of liberalized trade and investment policies, privatization, and deregulation of key industries including the oil, banking and finance, telecommunications, domestic air transport, and shipping industries. Economic progress attained in this period, especially in the 1990s, is largely attributed to such market-based policies and the increased participation of the private sector in the development process, all aimed at enhancing growth and competitiveness of the Philippine economy, as espoused in the Medium-Term Philippine Development Plan. However, Philippine Agenda 21 (PA21), the planning document embodying the country's national sustainable development strategy, observes that

> "....while there is an acceleration in economic growth, there is evidence that environmental quality is fast deteriorating, as dramatized by the increased incidence of environmental disasters such as problems associated with mine tailings, deforestation, pollution, salt-water intrusion and a host of other destructive activities. The regenerative capacities of already fragmented areas in various bio-geographic zones are similarly threatened."

The problem with environmental degradation that accompanied the economy's growth lies in its close interlinkage with what remains the country's paramount challenge of widespread poverty. One in every three Filipinos (33 percent) is poor, and 70 percent of the poor live in the rural areas. PA21 continues:

> "The harm from environmental degradation invariably falls more heavily on the poor. At the same time, poverty drives people into environmentally degrading economic activities, as

in the uplands, the coastal fisheries, or small-scale mining. The poverty-environment nexus is thus a critical front in the pursuit of sustainable development, making poverty reduction a critical concern in the country's sustainable development agenda."

Thus, the pattern of economic growth over the years has dealt the country's poor a double blow: the economy's narrow, shallow and hollow growth has provided them little benefit and led them to left farther behind; at the same time, the harm from the attendant environmental degradation has fallen more heavily on them as well.

In examining the impacts of the country's economic development experience on the environment, these may be grouped into the green (biodiversity and forestry-related), blue (coastal and marine resources-related), and brown (solid waste, air and water quality, and mining-related) environmental issues. Each are discussed in turn below.[4]

2.1 Green Environment Issues

2.1.1 Forest Depletion

The Philippines' forest cover is estimated to have declined from 21 million hectares (or 70 percent of its total land area) in 1900 to just around 7.2 million hectares (24 percent) as of 2005, with less than a million hectares left in primary forests. On the other hand, biologists estimate that forests must comprise more than half the land area of the Philippine archipelago for the interrelationships of ecosystems to be sustainable. With such rapid pace of forest depletion in just over a hundred years, per capita forest cover in the Philippines is now the lowest in Asia (World Bank 2004), with the remaining primary or intact forests continuously under threat. All this has resulted from land conversions, swidden (slash-and-burn) farming, and illegal logging, apart from destruction due to forest fires and natural causes such as pest infestations, and typhoons. Between 1990 and 2005 alone, an estimated 3.2 million hectares of forest cover was lost, and it is estimated that the country continues to lose its forests at the rate of 157,400 hectares or 2% per year.[5]

[4] The following sections draw liberally from World Bank (2004), ECP (2005), PCSD (2006) and Ibon Foundation (2006).

[5] Data are estimates by Haribon and other NGOs, as cited in World Bank (2004) and Ibon Databank (2006). DENR estimates tend to be lower.

In the early 1960s, the timber industry was the country's largest foreign exchange earner. From being the world's biggest exporter of tropical hardwoods in the 1970s, the Philippines had turned into a net importer of forest products by the 1990s. It is estimated that the country now imports 60% of its wood requirements. At the height of commercial logging operations in the country, there were 420 logging firms who had been given licenses to extract timber form the majority of the forested areas. As a result of unsustainable management and massive deforestation, estimated to have peaked at 300,000 hectares per annum in the late 1960s, the industry began to decline in the 1980s. At present, forestry accounts for less than 1 percent of GDP.

Figure 1 is a visual depiction of the dramatic depletion of the country's forest cover through the past century, from 70% cover in 1900, to 24% as of 2005.

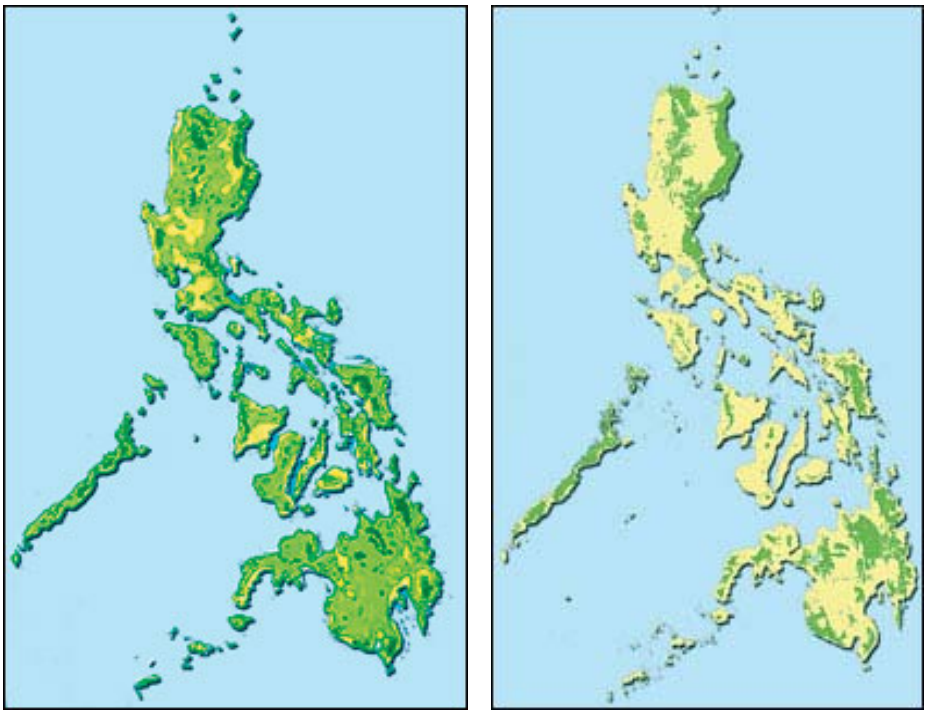
2.1.2 Biodiversity Loss

The Philippines is one of the world's 18 "mega-diversity" countries, which together account for between 60 and 70 percent of global biodiversity. It has also been identified by the International Union for Conservation of Nature (IUCN) as a biodiversity "hotspot" – that is, a country where biodiversity is subject to extreme threat from deforestation, conversion, fragmentation of natural habitats, unregulated trade, and overall low environmental quality.

Animal diversity is very rich in the country, with over 1,000 species of non-fish vertebrates identified, 48% of which are endemic to the country. For mammal species, 64% are endemic, while 70% are endemic for reptiles, 75% of amphibians, and 44% of birds. Nearly 200 vertebrate species are now threatened by extinction. Endemic species such as the Cebu flower pecker, the golden-crowned flying fox, the Philippine cockatoo, the Negros forest frog, and the Philippine eagle are barely surviving in remaining small forest fragments.

Forest destruction has been the single biggest threat to biodiversity in the Philippines. Hunting for trade, trophy or meat, especially of birds, is a major threat to the country's animal biodiversity. Still another threat is the reckless introduction of exotic species to the islands. The risks associated with biotic invasions have increased enormously in the past 40 years. Among the most damaging invasive alien species in the Philippines have been the giant cat fish, black bass, the golden snail, toads including the marine toad, and the American bullfrog. Aquatic plants like the water hyacinth and water fern have also had a significant adverse impact on wetland biodiversity.

Figure 1. Philippine Forest Cover, 1900 & 2005



1900 **2005**

Source: Ibon Foundation (2006)

2.2 Blue Environment Issues

Water comprises more than four-fifths of Philippine territory, based on the 200-nautical-mile exclusive economic zone covering some 2.2 million square kilometers defined by the government in 1976. The Philippine archipelago lies in the "coral triangle", the center of the most diverse habitat in the marine tropics. Philippine coral reefs comprise about 26 percent of the total reef area in Southeast Asia, and are recognized to be among the richest and most diverse in the world, with about 464 species of hard corals and more than 50 species of soft corals identified. However, over 30 percent of the coral reefs in the country are considered to be in poor condition. Moreover, there has been a steady decline in the quality of the coral reefs, with only a tiny 0.24 percent reported to be in excellent condition in 2004, against 4.3 percent in 2000 and 5.3 percent in 1991. Ninety-eight percent of these reefs are under medium or high

threat.[6]

An estimated 60 percent of the Filipino population of 89 million live within the 832 municipalities lying along the archipelago's 36,289 kilometers of coastline. Coastal fishing activities account for an estimated 40-60% of total fish catch, with the fisheries sector accounting for 4.3% of GDP. Exports of fishery products amounted to PhP26 billion in 2002, with the top commodity exports being tuna, shrimp, and seaweed. The Philippines is also the largest producer of aquaculture products in Southeast Asia, dominated by seaweed production. In 2002, a total production of 3.4 million tons of seafood was recorded, with an average annual rate of production increase of 2.5 percent between 1990 and 2002. The fishing industry provides employment to about one million people (3.3 percent of the country's labor force), of which 68 percent is accounted for by the municipal fishing sector, 26 percent by aquaculture, and the remaining 6 percent by commercial fishing.[7]

Apart from fish and seafood, coral reefs, mangrove forests, and sea grass beds contribute to the richness, diversity and productivity of coastal and marine resources. These resources also attract tourists, creating local business opportunities and thereby generating further income and employment.

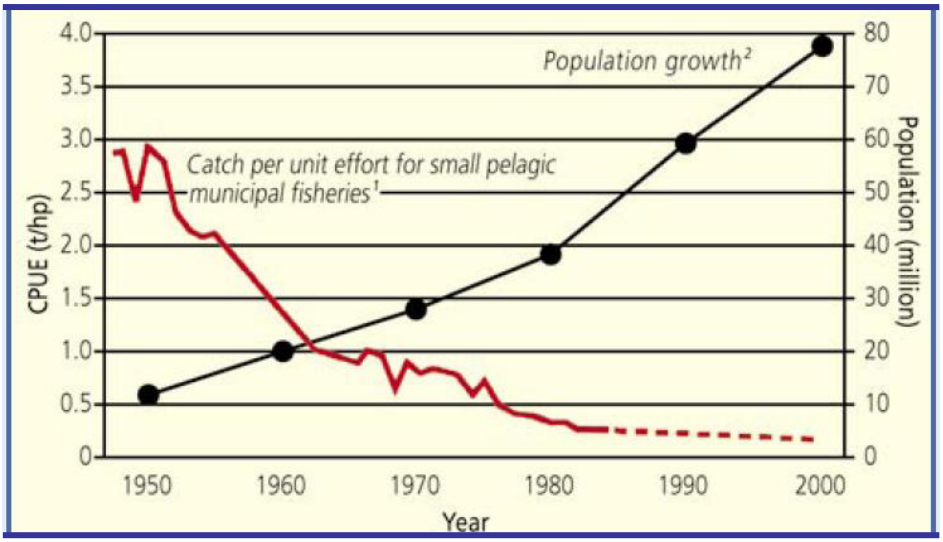
The country's rich endowment of some of the world's most unique marine ecosystems has been increasingly threatened by over-fishing, pollution, and other human economic activities. Rapid population growth especially in coastal communities has put strong pressure on the country's coastal fisheries. The average annual fish catch exceeds 2 million metric tons, with nearly half made by municipal and subsistence fishers who operate small boats in shallow coastal waters.

While municipal fisheries dominated the sector in the early 1980's, contributing more than half the national output, its share had gone down to 30 percent by the 1990s. Furthermore, there was an observed slowdown in growth of total production of commercial fisheries, suggesting resource limitations in fish capture and threats on its long-term sustainability. There has been clear evidence that over-fishing is occurring in important fishery areas of the country, manifested in increasing effort required per kilogram of fish catch (see Figure 2). This decline of fishery resources in the country appears to be the combined effect of excessive fishing effort,

[6] Data cited from various authors in World Bank (2004).
[7] Data cited from various authors in World Bank (2004).

inappropriate exploitation patterns, and coastal environmental degradation.

Figure 2. Declining Fish Catch in the Philippines, 1950-2000



Sources: Dalzell et al (1987) and NSO (2000), cited in http://www.oneocean.org.

There has also been massive loss of coastal mangrove forests over the years. Conversion to fishponds, charcoal-making and over-harvesting has historically been the cause of the dramatic loss of the primary mangroves in the Philippines. The most rapid decrease occurred during the 1960s and 1970s when the aquaculture industry expanded rapidly in response to favorable government policies. As of 2004, fishponds were estimated to cover about 289,000 hectares, 80 to 90 percent of which were in areas formerly covered with mangroves. This expansion occurred largely during a period when real prices for fish and shrimp were steadily rising. Between 1980 and 1988, the rate of conversion was still about 8,200 hectares/per year, in spite of a 1980 government ban on further conversion of mangroves to fishponds, and rules mandating the reversion of idle fishponds back to mangroves. Besides fishpond conversions, illegal cutting of mangroves for fuel wood, charcoal-making, and construction have also been major causes of the loss of the resources.

The vast majority (95%)of the remaining mangroves in the country are secondary growth areas. Only five percent are old or primary mangroves, and these are mostly found in the island of Palawan. While there now exists an official policy for mangrove protection, cutting of mangroves remains rampant all over the country.

2.3 Brown Environment Issues

Emissions into the atmosphere by both mobile (motor vehicles) and stationary sources (factories, power plants) have rendered the atmosphere hazardous to health in urban centers, especially Metro Manila, apart from contributing to the worsening climate change problem. Lack of public facilities for both solid waste and wastewater disposal amid growing urban populations has led to pollution and contamination of waterways and groundwater, again to the detriment of public health. Many years of intensive monoculture farming have degraded the quality of the soil in agricultural areas, and massive amounts of topsoil are lost yearly due to erosion from flooding brought by frequent natural disasters, exacerbated by deforestation and destruction of the nation's watersheds.

Alongside industrialization, the mining industry grew rapidly in the 1970s with active government efforts to promote the industry. After declining in the mid-1980s with the fall in world metal prices, the industry is again being promoted by the government as a major potential source of wealth for the economy in the years ahead. However, there is strong resistance to the policy from oppositors who see mining as a major source of environmental and social problems.

2.3.1 Solid Waste Management and Water Pollution

Solid waste has emerged to be one of the most pressing environmental challenges in the Philippines. Urban-dwelling Filipinos are estimated to generate an average of 0.5 kg of waste per capita/day, while their rural counterparts generate 0.3 kg.[8] Metro Manila alone generates one quarter of the total garbage generated annually nationwide. A recent study by the Asian Development Bank estimated that 6,700 MT of waste is generated daily in Metro Manila alone, and annual waste generation is expected to grow 40 percent by 2010. Metro Manila's garbage is currently disposed of in six controlled dumps. However, these sites are expected to reach their capacity within two years.

The 1998 National Demographic and Health Survey reported that only 30 percent of Philippine households had access to solid waste collection services at varying frequencies, ranging from twice a week to once every two weeks. More recently, the

[8] Estimates by the National Solid Waste Commission.

National Solid Waste Management Commission estimated collection efficiency at 70 and 40 percent in urban and rural areas, respectively.

Where residents lack access to solid waste collection, garbage continues to be thrown indiscriminately or burned. The most common disposal system is open dumping, burning or throwing into rivers. It is estimated that 145 million liters of used oil are being dumped into rivers yearly. Last year, the Marilao River in Bulacan – which is among the sources of drinking and agricultural water supplies for around 250,000 people – was identified by the US-based Blacksmith Institute be among the world's 30 dirtiest rivers and worst polluted places. Pollution of the river has resulted from years of indiscriminate and continuous waste dumping by tanneries, gold and precious metals refineries, the largest lead smelter in the Philippines, and numerous municipal dumpsites. Similarly, Laguna de Bay, one of Southeast Asia's largest freshwater lakes situated just south of Manila, is projected to become biologically dead within a few years unless rampant pollution due to domestic and industrial waste is arrested. The lake produces about a third of Metro Manila's supply of milkfish and other edible fish, helps generate electricity and serves as a key transport route.

Another major reason for degradation of water quality in urban areas has been the indiscriminate disposal of domestic wastewater. Only one percent of the country's total population is connected to sewer systems (Table 1). Sewerage services outside Metro Manila are almost non-existent, leaving the non-Manila-based urban poor with no access to sewerage services. The common method of household sewage disposal has been through individual septic tanks, where seepage to groundwater sources is common and collected sludge often indiscriminately disposed of in waterways.

The World Bank estimates the total annual economic loss resulting from water pollution at PhP67 billion (US$1.3 billion). This figure includes, PhP3 billion for health costs, PhP17 billion for lost fisheries production and PhP47 for lost tourism revenues.

Table 1. Sewage Disposal in the Philippines

	Population (millions)	Access to Sanitation Services (%)		
		Sewerage	On-Site	None
Metro Manila (MWSS)	**13.3**	**4.0**	**41.0**	**55.0**
Other Urban and Rural	**63.0**	**0.0**	**88.0**	**12.0**
National	**76.3**	**1.0**	**74.0**	**25.0**

Source: Robinson (2003)

Overall, waste generation is increasing rapidly as consumption rises. Meanwhile, collection efficiencies are dropping as service levels deteriorate due to insufficient and inappropriate equipment and inability to reach households or collection stations. Improvements in recycling, collection, and disposal have become critical challenges as garbage production continues to increase with population growth and economic development.

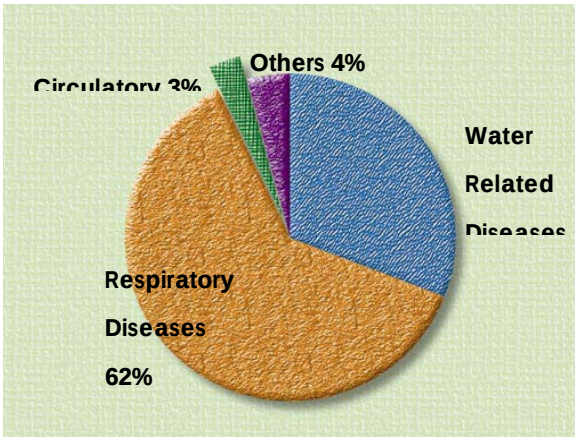
2.3.2 Air Pollution

Air pollution is one of the major environmental threats affecting public health in the Philippines. Metro Manila has been ranked by the World Health Organization (WHO) as one of the five most polluted cities in the world. The problem is also felt in most major cities in the country where urbanization has resulted in more factories, rising population density, and increasing vehicle registration. The largest contributors to air pollution are fossil fuel combustion from industries and vehicle exhaust. Exhaust emissions from buses, jeepneys, utility vehicles, and trucks are estimated to be the largest contributor to urban air pollution, and are also recognized carcinogens. Despite a significant drop in ambient lead levels in the last few years because of the phase out of leaded gasoline, other air pollutants such as particulate matter, sulphur dioxides and total oxidants still tend to exceed safety standards and remain a major concern.

The health costs of particulate matter pollution in the four cities of Metro Manila, Davao, Cebu, and Baguio (representing 28.4 percent of the total urban population) were estimated to reach

more than US$400 million in 2001. These costs account for 2.5 to 6.1 percent of per capita income in these cities, equivalent to 0.6 percent of the country's GDP. If the rest of the country's population is assumed to be exposed to pollutant levels similar to those in these four cities, a high annual estimate for urban health cost for the country would amount to over US$1.5 billion.[9] The World Bank estimates that 6,000 Filipinos die each year due to air pollution-related diseases. Air pollution also accounts for 20% of deaths among children under 5 years old. (see Figure 3)

Figure 3. Incidence of Diseases By Type, 1992-2000



Source of Data: Department of Health, National Epidemiology Center

2.3.3 Issues on Mining

The Philippines is naturally endowed with abundant deposits of copper, chromium, gold, and nickel, plus smaller deposits of cadmium, iron, lead, manganese, mercury, molybdenum, and silver. Industrial minerals also present in the country include asbestos, gypsum, limestone, marble, phosphate, salt, and sulphur. The Philippines ranks third worldwide in abundance of gold deposits (and second to South Africa in terms of gold production), fourth in copper deposits (and third in copper production), fifth in nickel deposits, sixth in chromite deposits, and so on. The richness of the country's mineral resources is well-known to the international mining industry, and many firms have been keenly interested in taking part in tapping the nation's mineral wealth. The Philippine Congress enacted a controversial Mining Act in 1995, which eased rules for foreign participation in the industry. Meanwhile, small-scale miners,

[9] Clean Air Initiative for Asian Cities (http://www.cleanairnet.org/caiasia).

especially those mining for gold, have traditionally operated in certain rich mining grounds, often practicing unsafe and unsustainable mining methods.

The environmental threats from mining include risks of major spillage of mine tailings in the case of medium to large-scale mining operations, and mercury pollution, soil erosion, sedimentation of water bodies, and non-reclamation of land after mine closure in the case of small artisanal mines. It is estimated that some 131 million metric tons of metallic mine waste and about 136 million metric tons of mine tailings were generated in the Philippines from 1990 to 1999. Table 2 lists the various adverse environmental effects that can arise from different mining processes.

Table 2. Environmental Damage from Mining Processes

Activity	Potential Effects
Excavation and ore removal	▪ Destruction of plant and animal habitat, human settlement, and other surface features (surface mining) ▪ Land subsidence (underground mining) ▪ Increased erosion; silting of lakes and streams ▪ Waste generation (overburden) ▪ Acid drainage (if ore or overburden contains sulphur compounds) and metal contamination of lakes, rivers, streams, and groundwater
Ore concentration	▪ Waste generation (tailings) ▪ Organic chemical contamination (tailings often contain residues of chemicals used in concentrators) ▪ Acid drainage (if ore contains sulphur compounds) and metal contamination of lakes, rivers, streams, and groundwater
Smelting and refining	▪ Air pollution (sulphur dioxide, arsenic, lead, cadmium, and other toxic substances) ▪ Waste generation (slag)

Source: Ibon Foundation (2006)

Apart from environmental effects, mining is also commonly associated in the Philippines with

the social problem of displacement of indigenous peoples and upland settlers by commercial mining interests.

3. Reconciling Economic and Environmental Goals

3.1 Philippine Agenda 21: Broad Thrusts

The challenge facing the country lies in mitigating the above-described problems in the green, blue and brown environment contexts even while attaining ample broad-based and sustained economic growth in order to reduce widespread poverty. This entails an economic strategy that integrates sound environmental management with sound economic management. Philippine Agenda 21 (PA21) espouses a poverty reduction agenda that seeks to create an enabling economic environment for sustained, broad-based and ecologically-sound growth that improves employment, productivity and incomes and ensures food security. In its recently-enhanced form,[10] PA21 identifies five broad goals, namely: (1) Poverty reduction, (2) Social equity, (3) Empowerment and good governance, (4) Peace and solidarity, and (5) Ecological integrity.

To these ends, PA21 defines a broad strategy that will:

- ensure the **enforcement of or compliance to domestic and international environmental laws** through collaborative efforts of government, business and civil society
- promote the wider adoption of **ecosystems and communities as the basic units for natural resource management**
- promote proper pricing and valuation of resources through the **wider application of market based regulatory instruments**
- expand availability of **alternative livelihood opportunities** for sectors that have traditionally relied on natural resources for their economic survival
- institute proactive measures to **redress the degraded state of many natural resources** and **thwart imminent threats to protected areas** and other critical environmental systems

[10]Philippine Agenda 21 was officially promulgated by the Philippine Council for Sustainable Development (then chaired by the author), on September 26, 1996, after two years of wide consultation. It has recently been updated, modified and enhanced into what is now known as the Enhanced Philippine Agenda 21.

- harness the full potentials of **science and technology and indigenous knowledge systems** in achieving greater efficiency in resource use while **adopting the precautionary principle** in managing environmental problems, and
- propagate the view of **environment as a common heritage**, intricately woven into the fabric of the Filipino way of life, culture and traditions.

PA21 lists various initiatives and reforms to pursue the five broad goals listed above. It now integrates the action agenda of government, civil society and the private business sector, after explicit efforts were made to incorporate the Business Agenda 21 prepared by the business community. Given the hierarchy of sustainable development challenges facing the nation, especially at this time of global financial crisis and economic downturn, there is need to define a focused set of priority concerns and corresponding actions to address both short-term and medium to long term objectives.

3.2 Priority Initiatives

Along with addressing the priority green, blue and brown environmental challenges described above, initiatives to mitigate and adapt to climate change have also become urgent and critical, and must now form part of the national and local agendas for sustainable development.

The following form part of the priority agenda over the next five years and beyond:

3.2.1. Green environment initiatives

Apart from tighter enforcement of existing forestry laws and proper pricing of forest resources, the following are the imperatives:

- **Continued replication of community based forest management (CBFM) schemes**, which has been adopted as the national strategy for reversing the destruction of Philippine's remaining natural forests.

- **Further expansion of reforestation activities** both by the public and private business sectors, i.e., via government and industrial plantations and private tree farming.

Both have already shown positive results in past years, and are credited with the recorded

increase in forest cover from its lowest point in 1988, when forest cover had been estimated at only 5.4 million hectares or 18.3 percent of total land area, to the current estimate 7.2 million hectares (24 percent).

3.2.2. Blue environment initiatives

The Coastal Environment Program (CEP) of the Department of environment and Natural Resources (DENR), which integrates programs, projects and initiatives related to or concerning coastal environments, must be faithfully and aggressively implemented. Its primary thrust is promoting **community-based management and sustainable use of resources in the country's coastal areas** by encouraging the use of environment friendly technologies, providing livelihood opportunities to coastal communities, promoting equitable access to resources, and building DENR capabilities in the management of coastal areas.

In numerous occasions, citizens have expressed the view that the most successful "blue" initiatives are those that empower communities and their respective local governments to enforce laws and manage resources within their jurisdiction. There is growing use of community-based management in the **establishment of marine sanctuaries**. A key element for success in such sanctuaries is effective partnership among the local governments, the local business sector (including owners and operators of beach resorts), and the coastal communities.

3.2.3. Brown environment initiatives

There is need to **strengthen the capabilities and accountabilities of the local multi-sectoral Solid Waste Management Boards** established in provinces and municipalities according to law.[11] The Ecological Solid Waste Management Act (Republic Act No. 9003), passed by the Philippine Congress in 2000, defines the roles of the different levels of local government in the various aspects of solid waste management. The law mandated the shift to sanitary landfills by February 2004, but at the end of 2004, there were only two operating in the country. As of December 2004 there were only 125 controlled dumpsites and 866 open and non-controlled dumpsites nationwide, representing only about 65% of all municipalities.

[11] The Ecological Solid Waste Management Act (Republic Act No. 9003), passed by the Philippine Congress in 2000, defines the roles of the different levels of local government in the various aspects of solid waste management.

A stronger and more active role for private sector participation in the management of solid wastes nationwide also needs to be promoted.

3.2.4. Climate change initiatives

With its extensive coastline, climate change and global warming are critical issues for the Philippines, which ratified the Kyoto Protocol in 2003. There has emerged widespread awareness of the climate change threat in the country, whose agriculture sector and food security are particularly vulnerable to changing climate patterns.

The Inter-agency Committee on Climate Change (IACCC) chaired by the Secretary of Environment and Natural Resources had been established in 1991, and is tasked with coordinative, development and monitoring functions with respect to climate change-related activities in the county. The country has also been an active and early participant in the Clean Development Mechanism (CDM), and established the Prototype Carbon Fund (PCF) to pioneer emission reduction purchase transactions, and to support projects that generate high quality certified emission reductions (CERs) suitable for registration with the United Nations Framework Convention on Climate Change (UNFCC). CDM projects for which certified emission reductions (CERs) have been traded include a wind power generation project, sugarcane bagasse co-generation projects, and commercial piggery biogas power generation projects.

An action plan for climate change adaptation is also under formulation through the IACCC.

3.3 The Global Downturn: Challenge and Opportunity

The current global economic downturn poses the special challenge of ensuring that short-term responses adopted to stabilize economies in the short term will not undermine longer-term sustainability. This challenge came to the fore during the East Asian financial crisis of 1997-98, when immediate “fire-fighting” responses by governments (including those prescribed by multilateral financial institutions, especially the International Monetary Fund) and by individual firms tended to set aside environmental concerns. On the part of governments, such short-sighted responses included postponement or actual cancellation of budgetary allocations for environmental concerns, and easing of environmental standards in the effort to stimulate immediate economic activity. On the part of individual firms, there was an observed tendency

to defer investments in environmental control equipment, and in the effort to cut costs, not operate those already in place. Such tradeoffs that become more acute in times of crisis make the task of planning and defining an action agenda for sustainable development more sensitive and difficult at this time.

There is, on the other hand, an opportunity that the current economic downturn presents. A major difference between the Asian financial crisis episode and the current global downturn is the opposing nature of fiscal policy prescriptions for responding to the respective crises. Whereas Asian governments were called upon to exercise fiscal prudence and undertake spending cutbacks in 1997-98,[12] the unanimous call at this time is for fiscal stimulus. This implies a substantial ramp-up in government spending to provide the demand for goods and services that is not forthcoming from private consumers, export markets, and business investors. In this policy context, the "Global Green New Deal" proposal of the United Nations offers an opportunity for a win-win outcome for both the economy and the environment. The task at hand is to identify the most appropriate public investments ("green public investments") that would meet both objectives of maximizing the multiplier effect of government spending, and attaining long-term sustainability objectives.

4. Institutional and Implementation Hurdles

For many years, it has been a widely-cited observation in the Philippines that there is no lack of sound plans, programs, policies and laws, but it is in enforcement and implementation where the failure lies. In the Philippines, failures in enforcement and implementation can be attributed to at least three weaknesses: (1) law enforcement failures, (2) legal failures, and (3) coordination failures.

4.1. Law Enforcement Failures

The most conspicuous case in point manifesting the breakdown of environmental law enforcement has been in the enforcement of the logging ban. The government banned the export of unprocessed hardwood logs in 1986, both to arrest the rapid depletion of the nation's

[12] In the active policy debates during the time, it was argued by some even then that this prescription was misplaced and outright erroneous.

forests, and to stimulate domestic processing of raw lumber into finished products. In 1991 the Government imposed a selective logging ban. In spite of these, illegal logging has persisted – often attributed to powerful national and local politicians – and massive cutting of trees in the Sierra Madre and Cordillera forests in Luzon, and in forested areas in Mindanao continues to this day.[13] An estimated 40% of the country's industrial round wood comes from undocumented sources, thwarting earnest management and conservation efforts.

A similar failure in law enforcement is seen in the continued incursion of commercial fishing vessels within the 15-kilometer zone reserved by the Fisheries Code to small artisanal municipal fishers. Still in fisheries, a perennial problem has also been the persistence of illegal fishpens in both inland and coastal fisheries. Again, the problem in many cases is in powerful political or military interests being either behind or directly responsible for the incursions. Thus, the problem in enforcement of laws protective of the environment commonly boils down to rampant corruption in government.

Apart from corruption, lack of capacity or political will has been another reason for violations of the law on the part of local governments. The Ecological Solid Waste Management Act mentioned above had mandated that all municipalities have a sanitary landfill by February 2004. This provision of the law has been widely and flagrantly been ignored, as only a minority of local governments have so far complied with this requirement.

Still another example of unimplemented legislation is the provision in the Local Government Code of 1991 (R.A. 7160) that provides for the establishment and functioning of multi-stakeholder local development councils at the provincial, municipal and barangay (village) levels of local government. Most local government units (LGUs) have not been faithful in organizing these valuable forums for participatory governance, with most LGUs not even having established such councils, or where they have been established, they are not convened in any regular or meaningful way.

4.2. Legal Failures

Some of the difficulties of past years stemmed from inconsistencies and ambiguities in the laws

[13] Annual confiscations have amounted to 12 to 15 thousand cubic meters yearly. However, the level of confiscations is not a reliable indicator of the real extent of illegal logging.

themselves. Among the most controversial legislations pertaining to the environment has been the Philippine Mining Act of 1995 (R.A. 7942), whose constitutionality had been questioned at, and later affirmed by the Supreme Court. The other major problem has been the inconsistency of certain provisions of the Mining Act with the Indigenous Peoples Rights Act (IPRA) of 1997 (R.A. 8371), which recognizes and promotes the rights of indigenous peoples to ancestral domains and lands; their right to self-governance, economic and social rights; and their cultural integrity, including indigenous culture, traditions and institutions. However, the Mining Act is being invoked by investors and certain government offices (including the Office of the President) in allowing mining exploration and development activities in areas that would otherwise be barred from such by the IPRA.

Still another problem with legislation concerns the Clean Air Act of 1999 (R.A. 8749), which among other things provided a total ban on incineration, thereby creating difficulties for the disposal of certain types of hazardous wastes.

These instances have led to situations where non-enforcement and non-implementation of environment-related laws have been facilitated by flaws or impractical provisions in the laws themselves.

4.3. Coordination Failures

Most of the environmental challenges confronting the country require inter-agency, multi-sectoral and multi-disciplinary approaches and solutions. While the Philippines has been at the forefront of establishing multi-stakeholder coordinative and consultative mechanisms to deal with sustainable development and other governance concerns, difficulties of coordination remain, especially because government has always been organized along distinct sectoral lines. Notwithstanding this, overlapping and duplicating functions across government departments and offices is common.

A fundamental obstacle to sustainable land and natural resource use in the Philippines is its inefficient and ineffective land-use administration system. As observed by the European Commission Delegation in the Philippines, “there is a complex situation of overlapping of agencies and laws. There are also multiple standards for land valuation, which offer ample opportunities for corruption.”[14] The country's land administration and management system is in

[14] ECP (2005).

dire need of an overhaul, which would involve consolidation of functions currently lying within several land registration and administration agencies.

The Philippine Council for Sustainable Development (PCSD), the first national council for sustainable development established in the world after the Rio Earth Summit in 1992, was established to provide the venue for inter-agency, inter-sectoral and multi-stakeholder coordination, consultation and consensus-building. Chaired by the Secretary of Socio-economic Planning, who exercises an oversight role in government in the implementation of the country's development plans, the PCSD's effectiveness has varied through its 16 years of existence, primarily conditioned by the degree of commitment to sustainable development and PCSD by the top leadership, including the President and the Secretary of Socio-economic Planning. While such commitment was strong under the presidency of Fidel V. Ramos in the 1990s, the same degree of support was not provided by his successors and their respective planning secretaries, thereby rendering PCSD to lose its former prominence. This has led many to question the usefulness and efficacy of PCSD as a forum for pursuing sustainable development goals of the country at this time.

From the above discussions, the picture that emerges is one where the appropriate elements of a strategy and action agenda for reconciling economic and environmental objectives of Philippine development are already in place. The main barrier, however, to achieving desired outcomes and impacts is inadequacies in institutions and mechanisms – and in the people comprising them – for translating strategies, policies and programs into concrete action.

5. Summary and Conclusions

Being a country that is among the most naturally-endowed in the world, the Philippines has fallen victim to the commonly-observed "natural resource curse," with its abundant natural wealth seemingly having become a liability rather than an instrument for achieving prosperity. Its mixed record of economic growth through past decades has been marked by rapid degradation of the environment and depletion of its natural resource base. From an economy dominated by primary resource-based production activities up until the 1980s, it has transformed into one primarily propelled by services, although the primary industries in the rural sector continue to provide a disproportionate share of employment for the working population.

The abundant wealth in the country's forests was rapidly exploited and depleted in the past century, most especially in recent decades until the 1990s, when policies finally began to take cognizance of the need to arrest the decline. Population pressures and short-sighted human economic activities have severely stressed the country's marine and freshwater resources, posing serious threat on the country's food security and public health. Industrialization, urbanization, and intensive agriculture over the past decades have dramatically impaired the quality of the country's air, water, and soil, in most cases resulting in clear and present danger to public health. Economic activities have also contributed to the global phenomenon of climate change which is of particular importance to the country, whose vulnerability to this global threat draws from its archipelagic geography and more than 36,000 kilometers of coastlines.

The strategy and corresponding action agenda for reconciling the country's economic, social and environmental development goals is already well laid out in Philippine Agenda 21, which has been described as the most widely-consulted planning document the country has had so far. Concrete programs, initiatives and mechanisms are in place for addressing the various green, blue and brown environment issues confronting the country. For maximum efficiency and effectiveness, there is need to focus on approaches that promise greatest success. Community-based approaches have already demonstrated positive track records, particularly in the sustainable management of forest and coastal resources. Mechanisms based on multi-stakeholder partnerships have likewise proven effective when allowed to function fully and freely. The way forward, then, is to scale up and scale out such tested mechanisms that work well, and to strengthen them with the necessary policy and resource support.

Within government, the imperative is for close teamwork and coordination, given the multi-dimensional, inter-disciplinary and multi-sectoral nature of sustainable development challenges. Thus, bodies like the Inter-Agency Committee on Climate Change, Local Solid Waste Management Boards, and Local Development Councils need to be made to function actively and spearhead concrete initiatives to operationalize sustainable development at the national, local and community levels.

Good governance is the critical underlay that provides the vital foundation for all efforts to achieve sustainable development for the country. Until the current persistent governance weaknesses in the Philippines are overcome, and law enforcement failures, legal failures and coordination failures are transformed from current realities into things of the past, achievement of win-win outcomes for the economy and the environment will remain a distant dream.

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