

IUCN Nepal

# LINKING ECONOMIC DEVELOPMENT AND ENVIRONMENTAL POLICY IN NEPAL

An Overview of Government Fiscal Policies and Environmental Implications, and Measures for Environmental Policy Integration in Nepal



IUCN–The World Conservation Union

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**IUCN–The World Conservation Union  
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# FOREWORD

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Tacit government policies on agriculture, forestry, water, energy and industry have encouraged Nepali people to use the country's natural resources with open access. The consequent overutilization of natural resources has created negative impacts on productivity by raising production and maintenance costs. This has aggravated the problem of biodiversity conservation. The high degree of conversion of existing natural resources such as forests into land has necessitated a proper investigation of the trade-off between the benefits and costs of such conversions. The present study "Linking Economic Development and Environment Policy in Nepal" attempts to address selected government policies and their implications for environment and to suggest measures for integrating economic and environmental policy in Nepal.

In the past economists had not well understood the environmental impacts of production and consumption activities because the scopes of analysis between ecology and economics were treated as separate. However, more recently an approach that stresses the internalization of environmental costs is being increasingly accepted by economists. This paradigm shift may help redirect economic development policies to promote a sustainable development.

This study is a brief and general situation analysis of the status of environmental economics in Nepal. IUCN Nepal has undertaken this study for identifying thematic priorities and methods to help conserve biological diversity. This study was conducted during March to May 1998. Policy analysis and economic incentive measures analyzed and recommended in the study may also provide direction for sustainable economic use of biodiversity. We believe the issues raised in this report will provide directions and basis for future work in the economics of biodiversity in particular and environmental economics in general.

On behalf of IUCN Nepal I would like to gratefully acknowledge the support and assistance to our Environmental Economics Programme from Ms. Aban Kabraji, Dr. Joy Hecht, Dr. Jeff McNeely, Dr. Frank Vorhies, and Dr. Scott Perkin. I would like to thank Dr. Dirgha N. Tiwari, environmental economist the principal consultant and Dr. Bishwambher Pyakuryal, manager of IUCN Nepal's environmental economics programme for their help in preparing this study for IUCN Nepal. Anand Aditya provided editorial comments on the earlier draft. We will be pleased to receive suggestions on this paper.

Dr. Ambika P. Adhikari  
Country Representative  
IUCN Nepal  
October 1998

# PREFACE

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IUCN Nepal is pleased to bring out this monograph on “Linking Economic Development and Environmental Policy in Nepal” as one of the regular publications of its Environment Economics Programme. The study is expected to provide a general overview, and enhance the understanding of environmental economics for integrating economic thinking into the conservation and sustainable use of natural resources.

The continued supply of ecological goods and services depends on the capacity of an ecosystem to withstand the pressures caused by economic growth. It is important to investigate the reasons for over-exploitation of environmental resources and the scope for changing the behaviour of consumers and producers so as to protect the ability of ecosystems to provide ecological services. It is generally accepted that the major threat to biodiversity loss is from habitat alteration and destruction resulting from the expansion of human populations and activities such as land use changes, urbanization, infrastructure development and industrialization. Recent literature indicates that the use of appropriate economic incentives together with appropriate regulatory regimes can enable government and the private sector to support national conservation objectives more efficiently than the traditional regulatory approaches alone. The present study includes assessment of incentive measures on forestry, agriculture, urban air pollution, industry and water resources.

Economic valuation of natural resources is important for the successful conservation and sustainable utilization of biodiversity. It also indirectly helps to understand the economic forces which cause biodiversity losses by highlighting the reasons for market, policy and institutional failures. Economists have realized that market prices of species are poor indicators of their wider value to humanity. Biodiversity valuation can be treated as a method of determining the relative importance of the environmental consequences of economic activities. It helps to decide on the trade-offs between development activities and protection of biological resources. This study discusses economic valuation of natural resources and environmental services with the help of physical linkage approach and behavioral approach. The former is based on the measurements of physical effects of the changes in environmental quality and the latter directly measures people's preferences and is based on the assumption that individual preferences provide a valid basis for making judgments concerning changes in their economic welfare.

Although the production of goods and services is recorded in national income accounts, the costs created by pollution and depletion of natural resources are not properly accounted into the national accounting systems. This study analyzes the

policy integration efforts of the government by addressing the continued depreciation of natural resources and environmental degradation and also attempts has to provide a partial framework for green accounting.

We trust that this monograph will provide a useful overview of environmental economics initiatives being taken in Nepal.

Professor Bishwambher Pyakuryal

Manager

EE Programme, IUCN Nepal

October 1998

## ACRONYMS

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ADB	Asian Development Bank
AIC	Agriculture Input Corporation
APROSC	Agriculture Projects Services Centre
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Flora Fauna
DHM	Department of Hydrology and Meteorology
EPA	Environmental Protection Act (1997) HMGN
FAO	Food and Agriculture Organization (of the United Nations)
FDI	Foreign Direct Investment
FOB	Freight on Board
GATT	General Agreements on Trade and Tariff
GEF	Global Environment Facility
LRMP	Land Resources Mapping Project (of HMGN)
MEAs	Multilateral Environmental Agreements
MOPE	Ministry of Population and Environment (of HMGN)
NOC	Nepal Oil Corporation
PPMs	Parts Per Millions
SAARC	South Asian Association for Regional Cooperation
SAPTA	SAARC Preferential Trading Agreement
SEEA	Systems of Environmental and Economic Accounting
SNA	Systems of National Accounts
TSP	Total Suspended Particulates
UNCED	United Nations Conference on Environment and Development
WTO	World Trade Organization
WTP	Willingness to Pay
WUA	Water User Association

## **EXECUTIVE SUMMARY**

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A subject of wide discussion today is how to integrate environmental concerns with the economic policies in developing countries. Many developing countries have formulated environmental control rules and regulations, and national environmental action plans. However, the effectiveness of these measures in solving environmental problems has been limited due to weak institutional structures and high costs involved in implementing the regulations and programs formulated. In this context, potentially cost-effective solutions such as market-based measures, and policy mix of regulations and incentives, are now widely being recommended as major tools for environmental policy integration.

The existence of policy distortions such as in price and property right policies often hampers the process of environmental policy integration. This study is aimed at analyzing the existing distortions and their environmental impacts in different sectors of the economy in Nepal. Measures are suggested for environmental and economic policy integration at both the sectoral and economy-wide levels and research themes are identified that will contribute to achieving those objectives in Nepal.

This study also aims at giving an overview and analysis of the present status of environmental economics initiatives in Nepal. It was executed mainly by doing a literature study and using existing materials available in Nepal and in particular in the IUCN Nepal Environmental Economics Programme.

### **Economic Development and the Environment**

The first part of the study emphasizes that the developments of the economy and protection of the environment are moving in opposite directions. However, sustainable economic growth requires alternative measures so that the environment will not be negatively, and will preferably be positively, affected by development process.

### **Pricing Policy**

Analyses have shown that subsidies and taxes in every economic sector that may leave a positive initial effect on the economy (sometimes putting a big strain on the government budget) because an adverse impact on the environment. The degradation of soil, water, biodiversity, air and other natural resources often entails high future costs and thus leaves a negative impact on the economy in the long term. These pricing policies are not sustainable.

## **Economic Valuation**

It was realised that economic valuation of natural resources can contribute to further quantification of environmental impacts in each sector of the economy. Several methods of valuation can be categorized in the Physical Linkage and Behavioral Approaches.

The methods in the first category create cause-effect relations of events in the past and use the principle that the value of averting the environmental damages equals the costs that would be incurred to mitigate the potential damage. An example is establishing an environmental-economic link between environmental degradation and productivity. The methods in the second category measure people's preferences, assuming that these represent the value they attribute to different scarce goods (including environmental goods). The application of these methods is hampered by a lack of information, undeveloped and distorted markets and a low level of education and awareness. These methods are subject to wide debates.

## **Policy Prescriptions**

A constellation of policy prescriptions is also presented for environmental policy integration in each sector of the economy for Nepal. These include fiscal and economic measures for working towards a sustainable agriculture, greening of degraded forest lands, making urban transport more environment friendly, greening of industries, and managing water to meet the growing demands. It is suggested that in-depth studies in each sector are useful towards designing and implementing various measures outlined for policy integration.

## **Green Accounting**

Introduction of the Green Accounting concept can correct the current misleading calculation of GDP and make explicit the cost of environmental degradations and resource depletions that occur simultaneously with economic growth. This concept can be an important tool for policy integration.

The existing analytical frameworks for national accounting are comprehensive but complex and use is suggested of a partial approach for changing the System of National Accounts in Nepal. Data compilation, calculation, analysis and policy integration are provided for several important resources. The practical framework designed consists of basic steps for building environmental statistics, applying a Geographic Information System (GIS) for physical accounting and methods for arriving at environmentally corrected GDP.

Research on Environmental Economics has often been limited by financial constraints. Previous studies give only an overview of the problems. The priorities for in-depth research on environmental policy integration have so far been identified in the areas of: quantification of environmental impacts of perverse incentives, estimation of incremental costs of biodiversity conservation, implementation of the Environmental Protection Act (1997) and measurement of the impacts of international trade agreements on environment and of the environmental policy on trade competitiveness.

It is proposed that these studies be performed by IUCN Nepal, and governmental agencies in collaboration with national and international institutions to obtain sufficient insight into the cause and effect relationships between the economy and the environment.

Provided by donors, multinational and UN agencies. Identification of which environmental research areas are most vital to society is one of the basic steps for efficient utilization of available resources. In this section, several specific areas are outlined for in-depth research and analysis in order to design and implement cost-effective measures for reducing natural resource scarcity and improving environmental conditions. Box 6.1 provides six major research priorities suggested for environmental policy integration in Nepal.

# 1.0 INTRODUCTION

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## 1.1 Objectives and Scope of the Study

This study is a part of the on-going program on Environmental Economics of IUCN Nepal, and is aimed at presenting the current general status of the linkage between economic and environmental policies in Nepal. The specific objectives of the study are to:

- i) analyze existing policy distortions, especially those related to the pricing policies and subsidies in selected sectors of the economy.
- ii) identify the implications of various policy distortions on the environment using available information and indicators.
- iii) highlight valuation approaches for quantifying environmental impacts in monetary units.
- iv) provide a general framework for the correction of policy distortions and environmental policy integration at the sectoral level.
- v) develop a framework for Green Accounting at the economy-wide level in Nepal.
- vi) set research and programme priorities for further works for environmental and economic policy integration in Nepal.

This study attempts to provide only broad overview of the present status of environmental economics initiatives, and environmental policy integration in Nepal. It is therefore not an in-depth study of the cause-effect relationships it non does undertake designing policy measures in each sector of the economy. The materials presented are drawn from several sources, including the existing work in Nepal, studies by the principal consultant and the work done in IUCN Nepal.

## 1.2 Co-Evolution of Economic Development and Environmental Change in Nepal

During the past four decades, Nepal has undergone a series of changes in its economy and its state of the environment. According to some statistics, the Nepalese economy has grown at an average annual growth rate of about 2.3 percent from 1960 to 1970, and above 2 percent from 1971 to 1980, and above 4.7 percent from 1980-1990. In this period, the population has grown at a rate of 2 to 3 percent annually. Thus, economic growth has not kept pace with the growth in population. Since 1950, several changes have also taken place in the physical

environment of the country. Available information and indicators show a generally wide range of adverse impacts on the environment associated with the economic and demographic transition in the country. For example, the forest resource has considerably decreased. The per unit cost of output in agriculture and industrial sector is increasing, and energy use efficiency in both of the sectors is declining. The share of natural resource products in the total GDP has gone down with negative impacts on the balance of payments and fiscal balance. A tentative estimate of nationwide costs of forest resource depreciation and soil nutrient degradation in Nepal showed annual cost at 6 percent of GDP over the period 1974/75 to 1989/90 (Tiwari, 1995). The gap between the environmentally corrected GDP and final consumption is widening. The co-evolution of economic development and environmental change in Nepal in the past has thus taken place in opposite directions. As a result the process of economic development Nepal has pursued has been far from sustainable, both environmentally and economically.

### **1.3 Towards Sustainable Development**

Growing environmental problems, especially land degradation, natural resource depletion and environmental health problems, are appearing as the major threats to the Nepal's economic development. The development paradigm needs to be shifted towards sustainable economic growth with focus on the proper management of natural resources and improvement in environmental quality. The majority of the population in Nepal is still living below the poverty line, and the growing natural resource scarcity and environmental degradation will seriously affect their livelihoods. In this context, sustainable development in operational terms can be defined as development which will 'enable the country at least to fulfill peoples basic needs without further curtailing the level of overall consumption and further depletion and degradation of the natural resources and the environment'. Implementing concrete measures towards maintaining the natural capital intact, and re-investing for improving the quality of the life of people in Nepal, in general, requires integration of environmental and economic policy. In the past, Nepal has responded to these challenges by: i) preparing and adopting the National Conservation Strategy (NCS); ii) preparing a national document and signing on UNCED Agenda 21; iii) National Environmental Policy and Action Plan (NEPAP); iv) creation of a separate Ministry of Population and Environment (MOPE); v) formulation of Environment Protection Act (EPA) and Regulations; and vi) designing of programs aimed at improving natural resource conditions and environmental quality at the local

level. However, the NEPAP (1993) is not fully implemented with only selected sections being pursued by various agencies. The EPA (1997) also involves a difficult process of implementation. The success in implementing the various provisions made under the EPA (1997) will depend on a number of subsidiary measures such as in-depth assessment of environmental quality, setting environmental quality standards, enforcement of EIA guidelines, enforcement and monitoring procedures, decentralization of authority to local level as well as setting up of performance evaluation indicators. Such activities will add to the financial burden of the government and widen fiscal deficit.

Both the shift in development paradigm and recent policy debates, however, are focusing more on integrating environmental and economic policies. Nepal's EPA (1997) provides only a regulatory framework which is not sufficient for controlling pollution and reducing natural resource depletion in the country. The country also lacks financial and human resources and technology required for the implementation of EPA. Further, decreasing subsidies on polluting activities and introducing environmental tax reforms can help in lowering the budget deficit, improve environmental quality and sustain the pace of economic development at the same time. Such market-based measures may also help in attracting private investors in environmental clean-up activities which will ultimately reduce the government's financial burden.

Increased emphasis is recommended for the adoption of market-based policies because many countries have recognised their comparative advantage in terms of cost-effectiveness, provision of long-term incentives for pollution reduction, and potential for revenue generation for financing clean-up activities.

It is widely accepted that the environmental policy framework should be compatible with economic and social development goals, and that environmental considerations should be taken into account at all levels of planning.

The concept of policy integration implies that the environmental quality must be protected while the economy must develop simultaneously. Policies such as the introduction of environmental taxes on emission, or the presumptive-Pigovian taxes on polluting inputs where direct charge on per-unit-emission-basis is not possible, can be implemented with the existing fiscal policy.

At the international level, the globally agreed Rio Principle No 16 (UN, 1992) calls for coordinated action towards promoting the internalization of environmental costs. Rio declaration also promotes the use of economic instruments, taking into account the approach that the polluters should bear the cost of pollution without distorting international trade and investments. Likewise, several multilateral environmental agreements (MEAs) require adoption of market-based measures for the internalization of environmental costs.

## 1.4 Why Environmental Economics Initiatives in Nepal ?

The co-evolutionary change in the economic development and the degradation of the ecological system indicate the necessity of integrating environmental concerns into the economic development process. As Munasinghe (1993) has pointed out, ongoing policy debates and the need to pay attention to the economic-environmental interface have yielded new ideas on economic valuation and internalization of environmental impacts. Environmental economics provides a starting point for developing a broader conceptual framework that integrates the economic and environmental policy.

How should Nepal contain deforestation and soil erosion, reduce air and water pollution and promote clean industries? What should be the critical or tolerance limit for soil erosion rates in different types of soil, topographic conditions and agriculture lands? What level of air and water quality standards should be fixed for Nepal? Furthermore, the present EPA (1997) does not provide for an estimation of the costs and benefits of environmental protection. These issues can also not be fully addressed by simply copying similar standards from other countries. The level of acceptable pollution limit should be determined by analyzing various socio-economic, meteorological and topographical factors. As the majority of activities leading to the negative impacts on environment are tied up with economic activities, environmental economics offers suitable tools for addressing these issues and carrying out required analyses. Environmental economics can also play a role in raising public debate about the perception of society of the present environmental status. Subsequently, institutions can be developed to respond properly to these problems.

Some examples of potentially useful research topics are: i) analyzing causes and consequences of economic activities; ii) understanding the nature of property right enforcement; iii) understanding the basic economic reasons behind the co-evolution of economic policy and environmental change in opposite directions; and iv) designing suitable environmental policies and analyzing costs and benefits.

In summary, the reasons for undertaking Environmental Economics Initiatives are:

- First, understanding of the cause-effect relationships between the economic policy and the environment is fundamental to working towards minimizing environmental problems. Environmental economics offers valuable concepts and tools both in identifying the impacts, and analyzing the cause and effect relationships using economic valuation and modeling techniques.

- Second, it is necessary to know what alternative policies are possible, how to design them and what will be the costs and benefits of those options. Environmental economics can also assist in identifying alternatives by computing the costs and benefits and for designing the best alternatives for environmental management.
- Third, as emphasized in section 1.3, environmental policy cannot be enacted in isolation and has to be linked with the economic development aspects as well. The cause-effect linkages identified, help in policy integration with economic development processes. For example, pricing policies and subsidies need to be addressed for various economic sectors.
- Fourth, issues may arise with the potential costs of environmental policy. What is the range of possible costs of environmental policies? Do policy integration efforts affect the welfare level of the poorest of the poor class? If yes, how to design compensation mechanisms by recycling revenue that helps to generate employment and income while making them pay for environmental services? These underlying political/economical issues need to be addressed for an effective implementation of any policy measure.
- Finally, besides domestic concerns, there are growing international and global concerns. For example, addressing various provisions such as internalization of external costs as outlined in UNCED Agenda 21, estimation of the incremental costs of provisions made under the Convention on Biological Diversity (CBD), and addressing other transboundary issues, etc., and application of environmental economics can play an important role in Nepal. Provisions made under GATT, SAPTA, etc. all demand a more transparent and open economic policy. There is a growing awareness on environmental damage being done within and outside the national boundary which affects the consumers' health in the exporting and importing countries, and also at the global level.

With increased attention being paid to regulatory measures in Nepal, it is necessary to analyze the costs and benefits of these measures. In order to act immediately and effectively, there is a need to set priorities and weigh both the costs and the benefits of regulatory measures as well as those of the economic instruments. For example, whether the different options for the vehicle emission checking program and ban on the use of highly polluting vehicles on the road, or increased price of fuels, charges on vehicle miles traveled, parking fees, and peak hour fees are effective in controlling pollution, easy to monitor and economically efficient will have to be analyzed before making a policy choice.

## 1.5 Organization of the Study

aper aims at providing a general overview of government pricing and subsidy policies in different sectors of the economy, and their impacts on the environment. It also attempts to show how economic valuation can address these concerns of quantifying the impacts associated with these policies, how policy integration can take place at the national level and what some of the priorities are for promoting environmental economics initiatives in Nepal.

The organization of the remainder of this paper is as follows:

- The second section provides a general overview of the pricing and subsidy policies and their potential impacts on the environment using available information and indicators. The sectors covered are agriculture, water, forestry, energy and transport and industry. Important indicators are summarized and conclusions are drawn at the end of each sub-section.
- The third section provides an overview of the approaches to the economics of natural resources and environmental services, the applicability of those approaches and their previous applications in Nepal.
- The issue of introducing Green Accounting concepts in Nepal is addressed in the fourth and fifth sections. A general framework is suggested and past applications on policy integration are highlighted.
- Section six identifies national priorities for application of environmental economics concepts and research issues, related to the implementation of Environmental Protection Act (1997), CBD and Green Accounting.
- Finally, conclusions are drawn and future priorities and directions are suggested.

## **2.0 PRICING POLICIES AND SUBSIDIES IN SELECTED SECTORS, AND THEIR ENVIRONMENTAL IMPACTS**

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The past economic policies in Nepal have largely neglected environmental concerns. Despite the growing environmental awareness at the local, national and international levels much of the development planning activities has failed to interconnect economy and the environment. Not only economic policy reform has neglected the environmental concerns, but also many distortions that exist in the form of price distortions and subsidies leave negative impacts on the environment. This neglect of policy integration incurs high costs to the society as discussed in Section 1. In this section, we briefly review the pricing policies and subsidies in different sectors of the economy and their potential impact on the environment, using available information and indicators.

In developing countries, where markets are relatively underdeveloped, government intervention is considered necessary in order to protect the domestic producers and consumers. The government usually intervenes in the market by fixing a minimum support price of products and giving subsidies for maintaining a minimum level of profit for the domestic producers and for maintaining the supply of goods and services at reasonable prices for consumers. Some of these pricing policies unintentionally promote the supply and use of environmentally harmful inputs in the production process. These subsidies could be direct such as government support in the diesel prices, kerosene and fertilizers, or indirect such as lower taxes on polluting vehicles which ultimately causes negative impacts on the environment. The impact of these policies varies according to the ecological and urban-rural settings as the environmental problems largely vary, for example, in the Hills and Tarai. Various policies aimed at controlling prices and providing subsidies implemented in Nepal in the past have supported inefficient use of resources and have caused additional generation of waste and emissions.

### **2.1 Agriculture Pricing Policies, Subsidies and the Environment**

Pricing policies and subsidies in the agricultural sector include minimum price support policy, agriculture input subsidies, highly subsidized provision of irrigation water and low tariffs on the exports of agriculture commodities. The aim of agricultural policy in Nepal has been both the intensification as well as extensification of agriculture for achieving the goal of self-sufficiency in food supply. These goals and policies can have both positive and negative impacts on the

environment. To what extent these policies are responsible for environmental degradation, however, depends upon a number of factors, such as:

- Is the pricing policy in the agriculture sector supporting a shift towards erosive and energy intensive cropping patterns in the mountains and hills?
- To what extent are the subsidies provided helping to increase crop productivity?
- To what extent are the credit facilities encouraging extensification, or land management and resource conservation activities?

The government policy of fixing minimum support prices for major agriculture products aims at helping producers to retain a minimum level of profit and encourage extensification of agriculture. However, the government set price is usually lower than the market price, as opposed to practices found in the developed countries where support prices are artificially kept higher than the actual producer's prices. The lower agricultural commodity prices and lower level of profit margin discourage extensification of agriculture, proper land management activities such as re-investing in soil nutrition management as well as in terrace improvement activities in the hills. In the food deficit areas, the government has also a policy of delivering food at subsidized price through Nepal Food Corporation (NFC). While subsidized food availability in the mountains and hills would have helped to encourage farmers for diversification of agriculture practices towards tree-crops, or agroforestry practices, the subsistence nature of farming practices in many cases limit such efforts towards crop

## Indicators

**Extent of Subsidy.** The level of subsidy provided by the government on chemical fertilizers was found to be high during the 1990/91-1992/93 period. The average subsidy as a percentage of the retail price was estimated in the range of 34-45 percent in the case of Urea, and 24-46 percent in the case of Complex (computed from AIC).

**Pressure and Effect Indicators.** Available information shows high soil erosion rates from the agricultural fields in the mountains and hills. The loss in farmer's income due to nutrient depletion on an average is estimated to be about 0.53 percent of the total GDP and 1.16 percent of the agricultural GDP during the period 1985/86-1995/96 (Tiwarei, forthcoming).

The input/output ratio in the agriculture sector in Nepal over the 16 years period (1974/75-1989/90) shows an increasing trend, resulting in declining resource use efficiency (Tiwarei, 1995).

**Response indicators.** Economic incentives have been used to provide subsidies for terrace improvement, gully erosion control, and government watershed conservation programs. The scale of incentives is quite low; some response to reducing input subsidies was noticed, but the majority of the environmental problems still exist.

diversification. Consequently, the land degradation problem is more severe in the mountains and hills.

Likewise, farmers receive highly subsidized irrigation water and chemical fertilizers. Lower water fees have encouraged farmers to cultivate paddy even in the very steep terraces which can be considered as erosive cropping practices in the mountains and hills. Due to the nature of the topography and low level of fertilizer use, the negative impact of subsidies through non-point agriculture pollution is considered to be less in Nepal. High subsidies to chemical fertilizers, however, have discouraged farmers from practicing integrated plant nutrition management system (IPNS).

Measures taken recently by the government of Nepal show some response towards reduction in the subsidy and elimination of monopoly of the Agriculture Input Corporation (AIC). While the price subsidy on potash and phosphate has been removed, the price subsidy on urea continues and this relatively lower price has caused inefficient use of urea in the absence of proper knowledge on its application. However, the price elasticity of chemical fertilizer is considered low (Nelson, 1987, cited in Sharma, 1994), the slight increase in the price of fertilizers by removing subsidy in other kinds of fertilizers will have little impact on the use of chemical fertilizers.

Export/import tariffs are very low in Nepal, unlike in many other developing countries, such as the major rice exporting countries of Southeast Asia. The export tariff at present is just about 2 percent in the case of most of the agricultural commodities. There is some protection for domestic producers however, in the case of the imports of products such as milk powder, tea, coffee, dry fruits and edible oil, with import tariffs ranging from 15 to 10 percent. The protection of livestock and tree-crop products can have respectively negative and positive effects on the environment. The increased numbers of livestock have a detrimental effect on the environment as grazing lands are considered having the highest soil erosion rates in Nepal. However, government protection for tea and coffee brings positive impacts to soil conservation and thus helps the environment.

## Conclusions

- Although government pricing and subsidy policies may have helped farmers to maintain a minimum level of profit in the short-run, the continuing land degradation and loss of farmer's income as well as declining resource use efficiency raises questions on both the economic and environmental implications of these policies in the long-run.
- To what extent the loss in farmer's income is being compensated by the

government pricing and subsidy policy is a matter of further study. Government's subsidies mechanisms are providing disincentives to the farmers and increasing financial burden to the government.

- Reforming agriculture price policies and elimination of subsidies may contribute to the greening of the environment in the long run, but the overall policy implications will depend on how the revenue generated will be recycled towards the promotion of agricultural productivity.

## 2.2 Water Resources Sector

The Government of Nepal has declared a target of providing drinking water for all, while drinking water is still being considered as a 'free gift' of nature by the users. The water charge even in municipalities in Nepal is not based on the cost recovery pricing mechanism. For example, in the Kathmandu valley, the minimum charge on volumetric basis is only about 40 percent of the incremental cost the rest with subsidized (Tiware, 1998). Provision of water at low rates in urban areas and full subsidy (except for some labor contributions) in rural areas have resulted in:

- i) lack of maintenance of water supply facilities;
- ii) increased water pollution;
- iii) shortage of public funding for providing clean water; and
- iv) increased mortality and morbidity cases associated with the water-related diseases in Nepal.

Of major concern in the sustainable use of the water resources is: To which extent the user fee has resulted in negative, or positive impacts on the environment? There are positive benefits associated with the subsidized provision of drinking water, as majority of the rural poor cannot afford to pay the full price for these facilities. Provision of safe drinking water has also helped in improving environmental health conditions of the rural population. On the other hand, concentration of facilities in a few areas and the lack of mechanism for generating user charges for expanding the facilities in other areas have negative impacts on the environmental health conditions of more than 50 percent of the rural population who still lack convenient access to potable water. The tentative environmental health costs associated with the lack of safe drinking water in terms of increased mortality and morbidity cases associated with the water-related diseases is estimated to be about 2 percent of the GDP during the year 1995/96 (Tiware, 1998) which is considered very high. Likewise, there is no charging system for wastewater discharge coming from industrial, hospital or residential areas, and

several streams and river courses are being highly polluted in urban and industrial areas, due to unauthorised discharge of wastes.

The irrigation sub-sector, is also characterised (?)—low user fees, low collection rate and a lack of proper maintenance of created facilities. A nominal amount of irrigation service fee at Rs. 60/ha/year has been imposed to cover operation and maintenance costs, the collection rate of which was reported to be very low in the past. Some developments can be seen in charging user fees in farmer-managed irrigation systems with transfer of water rights to the farmers. The user fees in some already transferred systems such as the West Gandak project have been fixed in the range of Rs 225/ha/year by the WUAs themselves. The WUAs also charge a one-time share certificate fee at about Rs. 30/ha (CAD, 1998). These provisions still do not meet the financial sustainability criteria (e.g., cost recovery). However, they will help in reducing the amount of subsidy for operation and maintenance of the facilities and in increasing water use efficiency.

## Conclusions

- Consumers in urban areas like the Kathmandu valley as well as semi-urban areas have been highly subsidized for drinking water which has wider implications in the maintenance of water use systems and consequently on the water quality and consumers' health conditions.
- The majority of rural poor are deprived of basic necessity such as safe drinking water which has increased environmental health costs associated with the water-related diseases in Nepal.

## Indicators

### Extent of Subsidy

- In Nepal both the urban and rural consumers of water are highly subsidized for meeting the societal objectives. The level of subsidy ranges from 60 percent in urban areas to more than 70 percent in rural areas. All the government contributions to maintenance and construction in the rural areas can be considered being a subsidy.

### Pressure and Effect Indicators

- Still more than 50 percent of the rural population lack safe drinking water supply.
- Water availability per capita is declining in Nepal according to a report by Population International (1995).
- Water quality in many urban areas is reported to be below the normally accepted safe standard level.
- The health cost associated with water related diseases is estimated to be about 2 percent of GDP (Tiwari, 1998).

### Response Indicators

- No water price reform policy has been prepared yet. Transfer of water rights to the users has provided some incentives towards collection of irrigation service fees in some management transfer projects.

- The low level of charges and collection of irrigation water fees have resulted in poor maintenance and inefficient use of irrigation water. Expansion of irrigation system to meet the growing demand for irrigation water by constructing reservoirs can have severe environmental impacts the costs of which are not being incorporated into the irrigation water user fees.
- It is believed that economic cost pricing and expansion of drinking water facilities would prove environmentally more beneficial than provision of subsidy in the current few areas.

## 2.3 Forestry Sector

Until recently, the government forest policy was directed towards fixing of forest product prices by the District Forest Product Supply Board (DFPSB), and the Timber Corporation of Nepal (TCN). The latter was given a monopoly in purchasing wood products from the state-controlled forests and plantation areas in the Tarai areas, while the DFPSB continues to control the prices in the hill areas. The major issues related to the forest policy and deforestation in Nepal can be outlined as:

- To what extent are the controlled price mechanism and low capture of forest resource rent affecting the timber market?
- What percentage of resource rent is being captured by the government and how is this influencing the re-investment in forestry management activities to maintain forest capital intact?

As per the information provided by the TCN, the price of logs in different areas of Tarai is estimated to be about 30 to 70 percent lower than in the border areas with the India. While this price differentiation has undervalued forest resource rent in Nepal, it has also encouraged illegal logging activities in the Tarai. The illegal transaction does not appear in the accounting system due to the ban on timber exports, and some forests in the Tarai areas may be being lost without appearing in the national accounts and without capturing resource rents.

Biodiversity conservation efforts are mainly limited towards the creation of national parks and protection areas. Park entry fees are kept low and except in one or two major national parks, the management costs are being highly subsidized. Likewise, many perverse incentives exist in agriculture which have helped to encourage extensification of agriculture due to a lower opportunity cost of biodiversity conservation in Nepal. Many valuable species are said to have disappeared and many others are considered to be in the stage of extinction due to these past policies.

However, not all of the government subsidies have negative impacts on the

forest resources and biodiversity conservation. The government subsidy on the construction of Gobar Gas plants and distribution of improved stoves have positive impacts in terms of fuelwood saving and reduction of indoor air pollution. For Gobar Gas<sup>1</sup> plants, the government has the policy of providing interest-free loans with a repayment period of 7 years, and a direct subsidy of Rs. 12,000 (remote areas), 10,000 (accessible hilly areas), and 7,000 (Tarai) per plant through the Agriculture Development Bank (ADB) of Nepal. Even though the past evaluation of the program has shown that especially the richer farmers are benefiting from the subsidy, it has resulted in positive impacts in terms of fuelwood savings. The New Era study (1985) estimated annual fuelwood savings by 4.8 tons to 6.5 tons per household per year (differs with family size). Likewise, subsidies are provided for increasing the use of improved stoves which can save fuelwood consumption up to 50 percent.

In Nepal, fuelwood constitutes the bulk of the energy consumed (about 88 percent). Combined with poorly ventilated houses, the high use of fuelwood, especially for the cooking purposes, is contributing towards increased indoor air pollution. This problem in most of the rural areas is quite alarming. Some newspaper reports claim that in the majority of the households in Nepal, indoor air pollution is 5 to 19 times greater than the WHO standard in the developed countries. Chronic bronchitis and obstructive lung diseases such as asthma and emphysema are very common health problems associated with indoor air pollution in rural Nepal. It is estimated that benefits from fuelwood savings and health improvement can be significant from the provision of subsidy on biogas and improved stoves in rural Nepal.

## Indicators

### Extent of Subsidy

- There is high difference between the user cost, resource rent and government revenue in the forest sector in Nepal.
- The adjusted net revenue in the forestry sector was found negative for the period 1984/85 to 1995/96 which shows unsustainable use and management of forestry resources in Nepal.

### Pressure and Effect Indicators

- Forest area was being lost at the rate of 1 percent per annum, based on the forest resource inventory 1979/80 and 1990/91 carried out by the Department of Forestry.
- The cost of forest resource depreciation of wrong pricing policy is estimated to be a significant portion of GDP. (Source: Tiwari, forthcoming)

### Response Indicators

- Some reforms have recently been undertaken in forest resource pricing policy. Transfer of property rights to the local users provides some economic incentive, but this does not guarantee increase in capturing resource rents.
- Subsidy in the construction of biogas plants in rural areas has provided economic incentives for the use of biogas rather than fuelwood.

<sup>1</sup> Gobar Gas plants utilize methane and other combustible gases found in the excreta of domestic animals.

## 2.4 Energy and Transportation Sector

The government has recently introduced a policy of guaranteed purchase of electricity by the National Electricity Authority (NEA) for electricity produced up to a prescribed capacity by the private sector. To what extent these pricing and purchase policies affect the environment depends on the following issues:

- To what extent has the subsidized pricing of electricity helped substitution of the imported “dirty fuels” and domestic fuelwood consumption?
- Does the environmental benefit of fuel substitution exceed the environmental damage costs associated with agricultural and forest land inundation, human displacements and biodiversity loss associated with hydropower generation?
- Does the newly introduced VAT system differentiate between the “dirty” and “clean fuels” and how is it going to affect the demand of both the “dirty” and “clean fuels”, if different tax systems are applied?

While public complaints on relatively high electricity tariffs in Nepal (compared to the other countries of South Asia) are not unusual, past studies have shown that the electricity price in Nepal has still been kept below the average incremental cost (AIC). A comparison of 1991 tariffs for households and long-run marginal costs (LRMC) indicates that the monthly tariff is above the LRMC for the 5 to 10 kWh (kilowatt hour) use level, while it is 16-18 percent below the LRMC for high users at 16-20 kWh/month. If connection costs are excluded from the calculation, the LRMC tariff rate was found to be 99 - 399 percent higher than the actual tariffs for different level of users (deLucia and Associates, 1994). This pricing policy and provision may have both positive and negative impacts on the environment and the balance of payments. Lower electricity tariffs can discourage use of imported “dirty fuels” and promote the use of clean energy in household cooking and lighting, promoting cottage and rural industries and irrigation water use. However, questions also can be raised on whether the set price includes the environmental damage costs. To what extent the subsidized price and use of electricity has helped to complement the environmental damage costs associated with the inundation of agricultural and forest land, human displacements and loss in biodiversity, is not known. Furthermore, electricity can not replace the polluting fuels used in both the industrial and transportation sectors.

The market price of gasoline is usually based on the costs of supply and varying level of taxation, and has generally been kept at or above the economic costs and has not been subsidized by the government except during the years of

energy crisis (1989/90-1990/91). Both the import tariffs and local taxes on gasoline have been a major source of revenue. However, the price of diesel has always been kept well below the economic costs; for example, in the range of Rs. 1.0-2.0 per liter (1997 figure, NOC). Likewise, when compared to the Indian border prices, the retail price of gasoline per litre is higher by Rs. 0.9 to Rs 1.5 and that of diesel is lower by Rs. 1.83 to Rs. 2.80 in different towns located along the Indian boarder (1997 figure, NOC). The price of kerosene is also kept well below the economic costs through subsidies. Due to this, kerosene is often mixed with gasoline for vehicles creating adverse impacts on the air quality. This indicates distortions in the fuel prices, although the government has no additional burden in subsidizing diesel and kerosene as it is being met by the taxes in gasoline prices. Past studies point out that due to the difference in prices also some industrial users use kerosene instead of fuel oil (deLucia and Associates, 1994).

The import tax for gasoline is presently fixed at Rs. 9.0 per liter, and for diesel at Rs. 0.8 per liter of diesel (NOC, 1997). The municipality tax varied from Rs 0.09 to 0.17 per liter of gasoline (deLucia and Associates, 1994). After the introduction of VAT, the import tax has been fixed at 10 percent as in the case of other consumer goods. As the VAT system does not differentiate between clean and dirty fuels, it does not provide incentives to the consumer to use fuel in an environmental friendly way.

In the transport sector, the level of pollutants from mobile sources is considered to be a function of the vehicle conditions, fuel quality and road congestion. These activities are influenced by the level of charges or taxes on users. There can be a close relation between road taxes and air pollution, especially in the urban centers, such as in the Kathmandu valley. Road transport contributes to the urban air pollution levels. Various issues in this sub-sector in relation to their impacts on the environment include:

- What level of subsidy exists in the transportation sector, especially in the urban areas where road users generate environmental externalities through their activities? Do the taxes and fees paid by the users incorporate environmental externalities?
- Do user fees (road user fees, vehicle taxes, registration fees, etc.) cover the public expenditures on road maintenance?
- Are the taxes paid by the diesel vehicles higher or lower than those paid by the gasoline vehicle users and is the price of leaded gasoline higher than unleaded gasoline?

If the user taxes are close to the actual or potential environmental costs, they will help to provide economic incentives for minimizing the total annual mileage and save fuel use. The vehicle taxes are limited to the import duty, registration fee

and annual vehicle tax. The government custom regulation does not differentiate between various kinds of import duties on the basis of type of fuel and type of machinery while importing the vehicles. The custom duty and sales tax on new vehicles was about 41 percent of the FOB price for dry cargo trucks, and 36 percent for tankers. There is a provision for 25 percent additional charge on the import of old vehicles (deLucia and Associates, 1994). But the basis of charge for these old vehicles is not clearly identified. Companies registered outside the Kathmandu valley are allowed to import vehicles at 50 percent discount but the movement of such vehicles in the valley has not been well regulated.

The total vehicle tax in Nepal increased from Rs. 0.5 million in 1971/72 to Rs. 106.76 million in 1996/97. The contribution of motor vehicle taxes in the total tax revenue has been about 0.41 percent in 1972/73, 1.12 percent in 1985/86 and 1.94 in 1996/97 (DOT, 1996). Although there has been substantial increase in the vehicle tax revenue as the percentage of total revenue compared to the base year, it does not seem to have increased in pace with the cumulative increase in the number of vehicles as well as road network. This has not only affected tax revenue, but has also resulted in increased driving, congestion, and road damages. The rapid increase in the number of vehicles without expansion in road network and commensurate improvement in traffic management has

## Indicators

### Extent of Subsidy and Price Distortions

- Gasoline has not been subsidized in Nepal while the kerosene price is kept well below the economic prices.
- About 64 percent of road maintenance cost is subsidized by the government.
- The tax exemption policy has helped subsidize the vehicle purchasing of the richest section of the population.

### Pressure and State Indicators

- Available information shows that the number of new vehicles registered increased by 77 percent over the 10 years period from 1980/81 to 1989/90, while it increased by 62 percent in the next single year of 1990/91, continuing with a similar growth rate after 1990/91.
- The increase in the number of vehicles has severely worsened air quality, especially in the Kathmandu valley. Available information on TSP concentration from DHM indicated that the TSP concentration exceeded WHO standards by four times.
- The environmental health cost of air pollution in Kathmandu valley is estimated at about Rs. 200 million as reported in the past studies (URBAIR, 1996).
- The energy intensity per unit of GDP should an increasing trend, as also a growing inefficiency in the use of energy resources in Nepal (Tiwari, 1995).
- Subsidy in the construction of biogas plants in rural areas has provided economic incentives for the use of biogas somewhat curtailing indoor pollution levels.

### Response indicators

- Only regulatory approaches such as vehicle emission checking program has been followed, while no pricing policy adjustments have been made to abate vehicular air pollution.

drastically increased the level of air pollution in the urban areas.

The total annual cost of road maintenance costs (for asphalt and gravel roads) is estimated to be Rs 787 million. Compared to this, the total amount of road user revenue raised from fuel tax is estimated to be Rs 160 million which is roughly only 20 percent of the maintenance costs. If the vehicle tax revenue is also included, it covers about 34 percent of the road maintenance costs. This means that the provision and use of the road network in Nepal are highly subsidized which may be having negative implications on road maintenance, fuel use efficiency and air quality. The pollution abatement cost in the transport sector is estimated at Rs. 600/vehicle, Rs. 0.5/liter of gasoline and Rs. 0.3 per liter of diesel in terms of inspection/management cost (deLucia and Associates, 1994). Thus, neither the road user cost, nor the pollution abatement cost is covered by the present road user charges in Nepal.

## Conclusions

- Although the present subsidized electricity pricing policy may have some positive impacts, the net environmental benefit of hydropower development is still unknown.
- At present, as the government subsidy on diesel is low, and gasoline is not subsidized at all, it is not likely that fuel use efficiency will increase when government subsidy is eliminated. But since the kerosene subsidies are high, elimination of all such government subsidies is essential for the effective introduction of market-based measures.
- The price differentiation between diesel, kerosene and gasoline is high because of import and local/municipality duties. The price differentiation between diesel and kerosene as well as petroleum and kerosene has led to adulterations, fuel substitutions in vehicles and industries with adverse impacts on the environment.
- For the above reason, there is a need for establishing true economic prices for diesel and gasoline. But a provision of complementary measures is also recommended, to compensate the low income kerosene users who may otherwise increase the use of fuelwood for cooking purposes.
- The government policy of providing a discount on vehicle purchases to companies and high ranking officials has helped towards the increase in vehicle numbers, especially in the Kathmandu valley in recent years. This has increased government's fiscal deficit as well as the traffic congestion and air pollution.
- Low road user fees or taxes may have negatively affected the road conditions, fuel use efficiency and therefore the pollutant emissions from

mobile sources.

- Since the price elasticity of fuel demand is usually low in the developing countries (-0.3 to -0.45), it is less likely that pricing policy alone can help reduce the air pollution. This means that air pollution control measures should concentrate more on fuel quality, vehicle types, road user fees, vehicle conditions and emissions, travel mileage, etc.

It can be concluded that the government's pricing and tax regulations have not supported increase in the energy use efficiency in the transportation sector.

## 2.5 Industrial Sector

In the industrial sector, the discriminatory incentive structures and quantitative restrictions with substantial distortions have existed since a long period. Such distortions varied from 6.7 percent in the export-oriented industries to 34.3 percent in electronic industries to 34.3 percent with an average of 17.4 percent (ADB, cited in IIDS, 1996). The nominal rates of protection to India and third countries varied from 10.97 percent to 39.5 percent and the effective rate of protection varied from 44.9 percent to 761.2 percent for alcohol (IIDS, 1996). These policies may have varying degrees of environmental implications arising from inefficient use of energy, spatial concentration of polluting industries and low level of revenue generation for re-investing in clean industry sectors. As in other sectors of the economy, impacts on the environment associated with the pricing and subsidy policies in the industrial sector depend on the following information:

- Are the discriminatory incentive structures and other provisions made in the industrial sector based on the categorization of industrial products and processes on the level of energy use and waste generation?
- To what extent have these provisions encouraged producers to diversify the products and to adapt clean technologies?
- To what extent have these provisions helped in attracting investments in the clean production sector?
- Do these provisions encourage locational movements of dirty industries from the densely populated urban centers to relatively thinly populated areas?

The Foreign Investment and Technology Transfer Act (1992) provides some measures for attracting Foreign Direct Investment (FDI). As FDI is allowed in most of the industries except a few restricted ones, many “dirty industries” also come under this provision. The fiscal policy measures such as tax exemptions and concessions include a long list of such provisions in different industrial products. Some of these include: income tax exemption for receipts from export earnings, exemption of income tax given to a foreign investor on the interest income earned from foreign loan. Although there is some variation in the tax credit in the different industrial products, tax exemption in the case of cigarette, alcohol and sawmill industries will only help pollute the environment at a higher societal cost. On the other hand, tax exemptions in some cases, such as 50 percent rebate on their income tax for a period of 10 years in the operation of trolley bus, is bringing positive effects on the environmental quality. There are some spatial concessions on the major polluting industries with larger income tax credits in the remote areas which may help industrial establishments in thinly populated areas.

## Conclusions

- High rate of protection and lack of land use regulations have increased the concentration of industries in town areas and

## Indicators

### Extent of Subsidy and Price Distortions

- The discriminatory incentive structures and quantitative restrictions with substantial distortions have existed over a long period. Such distortions varied from 6.7 percent in the export oriented industries to 34.3 percent in the electronic industries to 34.3 percent with an average of 17.4 percent (ADB, cited in IIDS, 1996).
- The nominal rates of protection to India and third countries varied from 10.9 percent to 39.5 percent and the effective rate of protection varied from 44.9 percent to 761.2 percent for alcohol (IIDS, 1996).
- Provisions of tax exemptions and concessions such as free income tax for receipts from export earnings, exemption of income tax to a foreign investor on the interest income earned from foreign loan etc. made for attracting FDI do not differentiate much between the clean and the dirty industries. Both the loss of revenue and societal costs of such provisions in such a context could be high.

### Pressure and State Indicators

- The output/input ratio in the industrial sector for the years (1974/75 to 1989/90) showed a declining trend and therefore a decreasing efficiency of resource use in the industrial sector.
- The absence of competitive markets and land use regulations has led to the concentration of major polluting industries such as cement, brick, leather and carpet in the Kathmandu valley which have major adverse impacts both on the environment and human health.
- The industrial sector has been the major source of TSP and SO<sub>2</sub> emissions in Kathmandu Valley which was estimated at 668 tons and 673 tons for 1992/93 (Shrestha and Malla, 1993).
- Among the industries located in the Kathmandu valley, local bricks and cement factories emit the highest level of TSP, SO<sub>2</sub> and CO.

some of the polluting industries have high rates of emissions such as in the Kathmandu valley.

- The new industrial policy is supposed to promote competitiveness and attract FDI which can increase efficiency in resource use and create job opportunities. Both the increase in resource use efficiency and provisions of EIA of industries can help promote environmental quality.
- Although income tax credit in the case of road operation, such as electric vehicles are bringing positive impacts on the environment, the introduced tax credit system does not have positive impacts in every sector of production. As the differential tax credit system has been designed mainly for encouraging the industrial development and government revenue generation, such tax credits may not be helpful as they are not based on the amount of pollution they are likely to generate during the production process. Likewise, concessions in the use of raw materials for different products may result in over-use and over-exploitation of both the renewable and non-renewable resources as well. For this reason, such concessions are to be designed based on the product life cycle analysis as possible.
- As the EPA (1997) and Environmental Regulations (1997) regarding non-compliance fees do not fully articulate the pollution abatement costs, compliance with EIA provisions and regulations may be low. Such provisions alone will not help encourage industries to comply with the regulations in fear of the perceived high costs involved.
- Categorization of environmentally harmful products and introduction of a tax credit system in accordance with the level of wastes likely to be generated will help attract more FDI, generate employment in clean production sector and revenue at a lower societal cost.

- The measured level of these pollutants greatly exceeds the WHO standards and can have significant adverse health impacts on both the workers and the people living around these locations.

#### **Response Indicators**

- Concessions made on the electric vehicles and road transport systems may bring positive impacts on the environment.
- No specific policy response for promoting clean technology and production system has been established in Nepal.
- Subsidy in the construction of biogas plants in rural areas has provided economic incentives for the use of biogas reducing indoor air pollution levels.

## **3.0 ECONOMIC VALUATION OF NATURAL RESOURCES AND ENVIRONMENTAL SERVICES**

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### **3.1 An Overview**

The economic valuation of natural resource scarcity such as forest and soil resources and accounting of environmental damages is important for various reasons in Nepal. Valuation of natural resources includes:

- i) the valuation of biodiversity in protected and outside areas;
- ii) accounting the value of these resources and environmental damages into the system of national accounts by estimating and bringing the attention to the depreciation of natural assets;
- iii) using the values as indicators during environmental assessment; and
- iv) estimating the appropriate level of user fees, park entry fees, and pollution charges and other fees and charges for environmental amenities and services.

Economic valuation methods can broadly be categorized into Physical Linkages and Behavioral Approaches, both referring to the valuation techniques based on the identification of cause-effect links and people's/user's preferences.

### **3.2 Physical Linkage Methods**

The Physical Linkages approach to economic valuation is based on the measurements of physical effects of the changes in environmental quality. In this approach, it is assumed that a rational individual is willing to pay up to as much as the amount of the costs which damage would impose, to prevent the damage from occurring in the first place. This method therefore does not directly measure people's preferences (Scura, 1991). As the estimated values are based on the past cause and effect relationships, these estimates provide ex-post values which are further analyzed for measuring the gross benefits of environmental policy measures. Thus, it is implicitly assumed that the net value of averting damages from pollution at least equals the cost which would be incurred if the environmental damage had taken place otherwise.

Physical Linkages method also refers to the conventional environmental assessment approaches for quantifying the environmental impacts for use in economic valuation. Identification of physical linkages or cause-effect relationships includes establishing links between:

- i) environmental degradation and productivity;
- ii) deforestation and soil erosion;
- iii) soil nutrition levels and productivity;
- iv) water and air pollution and health effects; and
- v) recycling and energy use, etc.

Environmental risk characterization is the first basic step in establishing or developing dose-response relationships. Risk characterization is essentially a process of establishing priorities in terms of resource use and conservation. For example, by classifying ecosystem areas into resource rich and resource poor areas, one can analyze the resource use patterns possible within the ecological limits (Tiwari, 1991). By ranking high, medium and low risk species, areas and impacts, different physical linkages relationships can be established in each case and the economic value can be computed in each case which can help in designing alternative measures for areas with and without high risk.

### **3.3 Behavioral Approach**

The behavioral approach directly measures people's preferences and is based on the assumptions that individual's preferences provide a valid basis for making judgments concerning changes in their economic welfare. People's preferences, on the other hand, are based on the subjective judgments and usually vary with their level of education, necessity of specific commodity at a particular time, age, sex and cultural background.

The economic valuation of unpriced resources as defined by Pearce (UNEP, 1994) involves a process of measuring people's preferences for changes in risk of human life and other environmental changes rather than providing a direct value of the environment, or human life. Cropper and Freeman III (1994) mention a standard economic theory that has been extended and applied during the past fifteen years to estimate benefits of improvements in environmental quality and health. According to them, this theory is based on the assumption that individual's preferences are characterized by substitutability between income and health, and the trade-offs people make among various combinations of health and other consumption goods reveal the values they place on health.

Some of the economic valuation approaches are briefly outlined in Box 3.1.

VALUATION METHOD	PHYSICAL ACCOUNTING & ECONOMIC VALUATION	ADVANTAGES	DISADVANTAGES	APPLICABILITY IN NEPAL
Production Function Approach	Physical accounting involves establishment of functional relationships between environmental change and production activities	Easy to apply where time series or cross sectional information is available, for example, in the case of production and soil erosion loss; also widely applied in water pricing etc.	Establishment of functional relationship requires more information which is often difficult to find in the case of developing countries. Likewise, difficult when multiple production function relationships are involved.	Can be applied in the case of irrigation water pricing. No time series data exist for estimation of the impacts of deforestation, soil erosion by establishing soil nutrient loss-productivity relationships as established by Lal (1989) in Africa and used by Bishop et al. (1989) in Ghana
Valuation based on the market prices	Available market price of the natural resource products is used for monetary accounting with the assumption that it reflects the willingness of the people to pay	Relatively easy to obtain and can be used for accounting land use value, timber, fuelwood, water pricing, etc.	Where market is distorted the market price does not represent true value of the resources and economic value based on such distorted prices will not help in the true accounting of natural resources	Has very little scope for direct use of market prices in Nepal as market is heavily distorted due to control of price and subsidies, however, in the absence of other information, they can be used, as for estimating net returns from agriculture lands, forestry, etc. while calculating net income loss as a result of resource depletion and degradation; however, shadow prices and not the market prices should be used, if possible.
Shadow prices	Shadow price refers to the use of market prices with some corrections for distortions	Useful for estimation of non-marketed goods such as fuelwood using labor wage rate with adjustments in the seasonal employments	Not so easy and direct where information on labor wage does not exist or again is distorted	Can be used for estimating user cost in the case of forest resource depletion in Nepal
Contingent Valuation Method	Is based on the hypothetical market creation to elicit respondents willingness to pay, directly provide economic value of the services.	It can be used to measure option and existence value of biodiversity and natural resources and environmental services; useful where prior information on market prices do not exist.	Needs substantial time and effort in field survey, may present bias results if experiment is not controlled effectively.	Can be applied for economic valuation of water, irrigation water, air quality improvements, biodiversity etc., but caution should be taken during the design and field survey to avoid potential bias.
Replacement Cost Approach	Uses the cost of substitutes for environmental goods and services.	Help to estimate indirect use benefits when no information is available on production function relationships such as in the case of soil nutrient loss.	Usually overestimates the actual depreciation of natural capital	Can be applied in the case of soil nutrient depletion from soil erosion in the hills and mountains where no direct erosion-yield curve can be established.
Travel Cost Method	This approach derives WTP for natural resources and environmental services at specific locations based on the amount of money and travel time that people spend to visit the location.	Useful for economic valuation of national parks and other recreational areas widely used in developing countries in the past.	Requires considerable time and effort for carrying out survey in the field.	Can be used for measuring the value of biodiversity conservation and determining park user fees.
Hedonic Pricing Method	Uses property or labor market value for the computation of value of environmental services	Useful for computation of economic value of agriculture land prices in rural areas and air quality improvements in urban areas	Applicable where market is distorted and labor wage or property value does not reflect the true market prices	Can be used for determining economic value of air quality and water quality improvements in urban and semi-urban areas
Opportunity Cost Method	Refers to the value of best alternative use, or the benefit forgone due to use of resources for other purposes.	Very much useful for the estimation of the costs and benefits of biodiversity conservation, and drinking water supply, etc.	It is a more comprehensive approach and requires estimation of several direct and indirect use values attached to a particular resource.	Can be applied for estimating the opportunity costs and benefits of biodiversity conservation in protected areas/national parks and community forestry areas.

### 3.4 Issues in the Use of Economic Valuation Methods

Economic valuation approaches—either Physical Linkages method or Behavioral approach—are subject to wide debate. Some arguments on economic valuation approaches are raised due to the fact that pollution, for example, actually reduces the value of the environment, while economics in its conventional form seems unable to recognize this fact (Redclift, 1994). The estimated cost of abatement (such as of water pollution) cannot provide a value of or damage costs on the health of an ecosystem or human being, as the damages in many cases are irreversible. Redclift (1994) argues that economists cannot determine what the environment is worth; merely its value in monetary terms and the value put on pollution reflects people's priorities and not the value of environmental quality itself. Usually, the economic measures of value based on either the willingness to pay, or compensation demand are considered identical. But assigning such a value is always problematic, because of the transaction costs involved in assigning or altering the property rights such as prior use rights, subsistence use and equitable use in the case of common property resources (Skotoe, 1991).

These issues narrow down the scope of the practical application of economic valuation methods. However, given that we put a value on the effects or consequences rather than estimating environmental values, both the behavioral and physical models can be applied as an indication of the economic value of unpriced natural resources and environmental services. Some controversy also exists about the use of physical models as they are more mechanistic in nature because these models do not directly incorporate consumer's behavior.

Application of these economic valuation methods in Nepal is not without controversy. Lack of information, undeveloped markets and distorted market prices, lack of resources, low level of education and people's awareness, high spatial variation, all present problems in the application and use of these methods. For example, in the case of soil nutrient productivity loss using the productivity approach, and time series - cross sectional information do not exist for establishing such relationships. Likewise, in the case of impacts on air pollution, the establishment of a dose-response function for estimating additional mortality and morbidity cases is not possible. Information on industrial pollution is not readily available and the estimation of pollution abatement costs remains just an academic exercise. Due to this, indirect approaches have some limitations for application in Nepal.

Nevertheless, both of these types of methods—Physical Linkages and Behavioral approaches— can be applied. The Benefit-Transfer methods can be

used in the case of Physical Linkage models. Application of direct valuation methods is more suitable for measuring the natural resource scarcity prices and environmental damage costs and benefits. For example, (Larsson et al., 1996) provides tentative estimates of health damage costs of air pollution in Kathmandu valley using the Benefit-transfer methods (Box 3.2). Likewise, Tiwari (1998) used the contingent valuation approach for measuring the economic value of health and travel benefits of improved water supply systems and the economic value of water incorporating these benefits.

Some other applications of economic valuation methods in Nepal have been made in estimating user cost and natural resource depreciation (Tiwari, forthcoming); and benefits of national parks (Wells, 1993). As very few exercises have been carried out in the past, there exists a large potential for application of economic valuation methods for estimation of human health damages and property damages by air pollution in urban areas using contingent valuation and hedonic pricing methods. In addition, valuation methods include opportunity cost of biodiversity using travel cost and resource rent and user cost approaches, water pricing using both productivity and contingent valuation approach and economic value of cultural heritage and river quality using contingent valuation methods. Further evaluation of national economic and environmental policies can subsequently assist in the implementation of market-based measures as well as policy integration at the economy-wide level.

### Box 3.2 Application of Human Capital Approach

**Focus.** Economic Valuation of Health Effects of Air Pollution in Kathmandu Valley.

**Methodology.** Estimation of excess number of health impact cases using Benefit-Transfer method and economic valuation with estimation of the statistical value of life.

**Results.** The total number of excess mortality and chronic bronchitis cases were estimated at 84 and 506. The restricted activity days were estimated at 475, 298 days. Other cases estimated and included in the analysis were emergency room visits, bronchitis in children, asthma cases, etc. The value of statistical life was estimated at NRS 146,000 at 1990 price and the total health cost was estimated to be 209.051 million Rs at 1990 price.

**Implications.** The study indicated high costs associated with the economic activities generating air pollution in the Kathmandu valley and the costs are likely to increase if no effective air pollution control measures are undertaken.

Source: Larsson et al., 1996

### **Box 3.3 Application of Contingent Valuation Method (CVM)**

**Focus.** Economic value of drinking water supply in rural and semi-urban areas of Nepal.

**Methodology.** Contingent valuation methods were used to estimate willingness of the users to pay for: i) operation and maintenance services; ii) averting health costs due to the lack of safe drinking water; iii) savings in travel time; and iv) improvement in water supply and sanitation facilities.

**Results.** The result indicated users' willingness to pay for existing water supply facilities in the range of 30-50 Rs./month on an average and Rs.1000 - 4,000 for new water supply facilities. Likewise, users expressed willingness to pay in the range of 2000 - 5000 for private tap connections.

**Implications.** The result of the study also indicated that users' willingness to pay covers full operation and maintenance costs and partial cost recovery within 20-25 percent is possible in the rural areas of Nepal. This would help in the expansion of facilities to new areas.

Source: Tiwari, 1998

## 4.0 ENVIRONMENTAL POLICY INTEGRATION THROUGH ECONOMIC INSTRUMENTS IN NEPAL

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### 4.1 Environmental Economic Policy Integration

The environmental problems associated with various economic sectors discussed earlier are different in nature and require different types of policy instruments for policy integration. Also the effectiveness of any particular policy instrument may vary from one sector to another. For example market-based instruments such as environmental taxes on pollution could be more effective, easy to implement and monitor in the industrial sector than in the transport sector. Other implementation problems might include the high costs involved in, for example, the provision of economic incentives and monitoring of farming practices in the mountains and hills and lifting ban on timber export and monitoring the process of illegal exports through the open boarder with India. In some cases, regulatory approaches may be equally preferred due to the uncertainty associated with the market-based measures rooted in weak market, information and institutional capability. there are various issues involved in policy integration, such as:

- How can environmentally unfriendly subsidies be reduced and environmentally friendly subsidies be promoted in different sectors of the economy?
- Which tax incentives might be appropriate for promoting environmentally friendly behavior in different sectors of the economy?
- Which fiscal incentive measures should be designed and implemented for promoting environmental investments?
- How can available economic instruments be integrated with adjustment in the fiscal policy measures for addressing environmental problems and reduce negative feedback effects on the economy?

Policy integration measures addressing such a wide range of issues in the context of Nepal require further research in each sector of the economy. This section highlights some market-based measures, and provides general prescriptions that can be considered as effective tools for environmental-economic policy integration in Nepal.

## 4.2 Market-Based Measures

Market-based measures for addressing natural resource depletion and environmental pollution problems can broadly be categorized into:

- i) removal of market barriers;
- ii) removal of existing environmentally unfriendly subsidies;
- iii) tax instruments such as environmental charges and tax incentives;
- iv) market permits; and
- v) assignment of property rights.

**Removal of market barriers** — It refers to the improvement in pricing mechanisms of the natural resources and products which are usually distorted by the government price support policies. We stated in Section 2 that natural resource prices and user charges in many sectors of the economy are not based on proper pricing mechanisms. Instead, they are controlled and distorted. It is generally believed that removal of market distortions helps to represent the true market price of resources and to increase efficiency in resource use. The structural reform program carried out with support from the World Bank during mid-1980s, and the recent economic liberalization efforts should have helped to remove market barriers to some extent by improving the pricing systems. However, as they were not introduced to include the external costs involved, their effectiveness to reduce the environmental degradation problems has been minimum. Removal of minimum price support policy, restructuring of user charges and capture of more resource rents will help to correct market failures. This will improve both

### Box 4.1 Reasons for the Consideration of Market-based Instruments by Economists:

- to make them more cost-effective,
- to encourage polluters to control pollution and to invest in clean technologies,
- to make them less cumbersome to governments and businessmen to administer, and
- to assist in entering an industry and the growth within an industry without generating additional pollution.

Compared to the regulatory measures, economic instruments may:

- help in reducing administrative costs,
- provide a scope for efficiency gains, and
- help in integrating fiscal and environmental policies.

However, there are also some limitations associated with the use of economic instruments such as

- uncertainty in revenue generation,
- difficulty in implementing in the case of non-uniform emissions of pollutants, in terms of distributional impacts, and
- difficulty in implementation when polluters have a monopoly in the output market.

Smith, 1995

government revenues and environmental conditions.

**Removal of environmentally unfriendly subsidies** — In different sectors of the economy, it can again help reflect the true prices of the products and improve resource use efficiency. However, there is need for further study in each case on how the removal of subsidies, such as on agricultural inputs and fuels, will affect the producer's profit and consumer's welfare. In general, the removal of subsidies and corrections of present pricing policies in the agriculture, forestry and energy sectors in Nepal may be considered helpful because they promote efficient use of agriculture input, promote organic farming practices, and support efficient use of imported fuel. Because the provision of subsidies often distorts the market price, application of the 'Polluter Pays' principle without removal of these distortions may not help in achieving the desired results. On the other hand, environmental subsidies are becoming more popular and have been practiced in many developing countries for relocating the polluting industries and installation of waste-treatment facilities. Phase-wise reduction in the agriculture input subsidies, diesel and kerosene and improvement in pricing policy of irrigation and drinking water, parking fees and forestry product pricing may contribute in reducing the fiscal deficit as well as the size of environmental damages in Nepal.

**Emission charges or taxes** — These are charges levied on the specific pollutants discharged. Such charges are usually determined at the level where marginal damage costs and marginal pollution abatement costs become equal. The charges at this level are believed to encourage polluters to find the alternative means for reducing pollution which might be more cost-effective options. Examples are emission charges on industrial pollution and effluents and are being practiced in some of the developing countries of South-East Asia. But in practice, it is often difficult to design emission charges, and second-best policies such as charges on polluting inputs (also called presumptive Pigovian charges) and outputs as well as final consumption of such products are applied. Examples are taxes on diesel and gasoline. These practices can be found used in Thailand, Mexico and Korea for controlling air pollution. In the case of Nepal, estimation of presumptive Pigouvian taxes on fuel such as for curtailing air pollution and for polluting raw materials in the industries, can be used by adjusting the present pricing mechanisms or by imposing excise taxes.

**Market permits** — Market permits combine a quantitative limit on the pollution with a price signal. In this approach, a maximum or allowable total emission level within a geographical area is fixed and polluters are free to buy or sell emission discharge quota according to their own choices within that limit. As long as the

total emission set out is not exceeded, individual firms or industries can pay for their own level of emissions. This instrument is considered more feasible where the pollutants to be controlled are uniformly mixed in the atmosphere and equally contribute to the environmental damage. For example, it is more suitable to apply in some industrial estates located in the different parts of the country. Each polluter and regulator should know the level of his emissions. This system therefore requires an effective monitoring system for baseline information and to check the maximum allowable level of total emissions.

**Allocation or transfer of property rights** — If refers to the handing over of users' rights and management responsibilities to the users themselves. Examples are: transfer of water rights in the irrigation and water supply schemes and community forestry management practices. These provisions are considered effective, as they encourage the users to manage the resources efficiently. The success of community managed forestry in the hills, better management of irrigation water in the farmer-managed irrigation systems, improved irrigation service fees and collection in many irrigation management transfer projects are some of the examples of the effectiveness of these mechanisms. From an economic viewpoint, transfer of users' rights such as in the case of community forestry may not help to capture more resource rent, but this is not required as the User Cost (to be defined in Section 5.3) is lower in this case, compared to government forestry. But there should be some monitoring mechanism where there is the possibility of monopoly and illegal trade, for example, in community forests in the eastern Terai areas.

There can be a constellation of economic measures for promoting sustainable agriculture practices, greening of degraded forest lands and promoting sustainable utilization of existing forests, making the urban transportation system more environmentally friendly and greening of industries. A general policy prescription for application in each sector of the economy is provided in the following boxes. These suggested measures should be considered as only general measures, and they should be studied in detail before considering them for applications in each sector of the economy.

## **4.3 Suggested Fiscal Measures/Economic Incentives**

### **Working Towards Sustainable Agriculture**

A mixture of economic measures can be used for promoting sustainable agriculture development and practices. These need immediate attention and their application includes the removal of existing level of input subsidies, adjustment in the land tax

systems and reform in the land tenure system. Box 4.2 provides some measures in more detail.

### **Greening of Degraded Forest Lands and Promoting Sustainable Utilization of Existing Forests**

At present, the Timber Corporation of Nepal controls both the logging activities and forest products prices in government managed forests. As mentioned in Section 2, both the forest fees and taxes are extremely low compared to the user costs and do not internalize the external costs generated by increasing deforestation activities in the country. Furthermore, regulatory measures practiced in the past have not been effective, especially in the government controlled forest areas where deforestation continues. For this reason, former forest fees and taxes were not only low, they have also contributed to damaging the remaining forests. Economic incentives, such as cancellation of the present concession system and introduction of bidding process, would substantially improve the forest resource management practices in Nepal. However, effectiveness of such incentive measures depends on how the rent generated from the forest fees and taxes is used. Utilization of the revenue generated for providing economic incentives for greening of degraded and deforested lands would help in the greening of more areas under forests, and decrease the level of profit from conversion to the agriculture (by increasing the opportunity costs of agriculture).

#### **Box 4.2 Examples of Recommended Fiscal Incentives/Measures in the Agriculture Sector**

- Reduction in chemical fertilizer subsidy by at least 50 percent and the establishment of a provision of subsidy for organic farming, integrated plant nutrient management and integrated pest management practices.
- Revision of the regressive land tax system in the mountains and hills. Land tax can be increased in the case of cultivation in the very steep slopes. However, as it affects the poor more than the middle and higher income groups, subsidy should be provided for practicing non-erosive crops such as tree crops and agro-forestry practices. The government can also introduce a “set-aside” program for non-erosive cropping practices on a long-term basis and subsidy for terrace improvements and gully erosion controls.
- Cash subsidies and grants on per ropani basis for provisions such as buffer strips of grass along the water courses with and without trees or shrubs.
- Provision of subsidy for livestock farming in the case of landowners practicing tree crops.
- Reform in the land tax on natural undeveloped land so as to reduce the incentives for conversion to the agriculture lands.
- Agrarian reforms should be developed for assigning property rights to the tillers so as to provide incentives for practicing tree crops which usually involves a longer time horizon and planning. Without reforms in the land tenure system, such incentives might not work.

## Making Urban Transportation System More Environmentally Friendly

Economic measures controlling air pollution emissions in urban areas include improvement in energy use efficiency and making the users responsible for negative externalities they generate by the use of polluting inputs and vehicles. In this context, the introduction of market-based measures such as input taxes, price differentiation and user charges, increasing taxes on vehicle purchase and registration are supposed to bring behavioral changes and positive impacts both on the environment and fiscal balance. If such measures are effectively introduced in combination with the present on-going vehicle emission checking programs and road maintenance efforts, the urban air quality is likely to improve. In addition to tax incentives on inputs, tax credits on the vehicles using catalytic converters and maintaining emission levels within the standards specified might also be useful for making changes in users' behavior.

## Greening of Industries

Industrial pollution prevention is a necessity not only for improving environmental quality but also for providing a more competitive and productive environment to make the domestic producers compete in the growing market of clean goods. Some of the developing countries in South-East Asia have already started towards

### Box 4.3 Example of Recommended Fiscal Measures/Incentives in the Forestry Sector

- Lift export ban and regulate the border for illegal exports of timber to India. This will help accounting of exported forest resources and generate additional public revenue. At present, some forests in the Tarai are disappearing due to illegal activities without appearing in the National Accounts.
- Other measures could be: deregulation of timber market and price, and increase in the royalty from the present rate of 10 percent to 40 percent as to reflect the scarcity rent and help at least for balancing User Costs involved and forest revenue generated, and re-investing in maintaining the forest resources intact.
- Low interest rate credit can be introduced for reforestation programs by individuals/groups in the mountains and hills for encouraging and greening social forestry. The level of subsidy may be based on a certain percentage of the User Cost involved.
- Removal of perverse incentives in the agriculture sector as suggested above for decreasing the opportunity cost of forests.
- Providing subsidies in community forestry areas will encourage the protection of biodiversity. The present systems of national parks and protected areas are not enough for the protection of biodiversity and favour unequal allocation of government budget favoring conservation in these few areas. Each community should be encouraged to be financially sustainable for managing these resources in the long run by increasing park entry fees and improving the facilities inside the parks in the case of protected areas, conserving valuable species and charging forest products at least equal to the User Cost in the case of community forestry areas.

diversification of exportable product industries to meet the growing demand of clean products. Austria and Germany have been the leading countries in the developed world to diversify the external trade towards clean products. The resistance towards introduction of environmental regulation in developing countries, such as in Nepal, stems from the fear of increase in producers cost and loosing trade competitiveness. However, this fear is mainly attached to the regulatory instruments which do not provide flexibility to the producers in adopting more efficient measures. Simply making EIA mandatory and enforcing pollution control regulations encourages this conventional thinking. That has to be revisited by carrying out studies on the incremental costs of pollution abatement, on production efficiency benefits and on markets for clean products. Some fiscal measures/ incentives that can be considered for study and applications in the industrial sector are outlined in the Box 4.5.

### **Managing Water to Meet the Growing Needs on Sustainable Basis**

Fiscal incentive measures that can be employed for the sustainable management of water resources could include improvement in the existing user charges or the development of pricing mechanisms by asking users to pay the full costs of development and management plus additional taxes aimed at discouraging the pollution of water

#### **Box 4.4 Examples of Recommended Fiscal Measures/Incentives for Urban Air Pollution Control**

- Differentiate VAT on public transport. For example, on cars and gasoline, VAT it could be increased up to 30 percent, and it could be reduced to 5 percent in the case of public transport buses.
- Introduction of tax differentials in manufacturing of electric/ gas powered vehicles. At present, although a subsidy is provided, the electric/gas powered three-wheelers charge more to the users than highly polluting three wheelers. The charge in public/ private mass transport systems should be lower in the case of non-polluting vehicles by charging more the polluting vehicles and diverting this extra revenue to the non-polluting sector. This should be arranged by the national government or municipality.
- Reduction of subsidy on the diesel and provision of subsidy on unleaded petrol. There should be some price differentiation at least equal to the per unit external cost generated by the use of leaded petrol.
- Increase in the price of gasoline to ensure revenue for funding of environmental programs, such as provision of subsidy for the purchase of catalytic converters. This can also be done by designing a differential pricing system for the use of leaded and unleaded gasoline that encourages users to use catalytic converters into their vehicle and use unleaded petrol at the same time.
- Eliminate all types of subsidies and discounts provided on the import of vehicles. This will help generate revenue and discourage import of more vehicles.
- Encourage timely maintenance and repair of old vehicles by i) charging more with the number of years of the vehicle use; ii) total mileage traveled per year; and iii) monitoring the rate of emission during annual vehicle emission checking.
- Strongly enforce car parking fees, and establish busy hour road charges.

sources. This might involve high transaction costs, but the use of such mechanisms in combination with the transfer of property rights provides the best feasible solution in the case of user charges as shown by the ongoing transfer of many water use systems to the local communities in the country. In the case of wastewater, both taxes and subsidies might be applied.

#### 4.4 Fiscal Measures/ Incentives in the Water Resources Sector

- Charging water users in urban centers equal to the average incremental costs, and in semi-urban areas to cover the full cost recovery including operation and maintenance costs. This will contribute to the tax and subsidy ratio and help in expansion of the provision of safe drinking water in the urban areas.
- Introduction of wastewater charges at least equal to or above the per unit treatment cost to provide incentives to generate less waste and establish treatment facilities by hospitals, hotels and polluting industries.
- Partial subsidy on the establishment of waste treatment plants in some cases using the tax revenue generated from the wastewater charges.
- User fees and taxes for excessive use of groundwater. As it is rather difficult to monitor, such charges should be based on the water supply

- All vehicles should be inspected twice a year with strong enforcement of measures of charging penalties for non-compliance. The corruption involved in vehicle emission checking programs, as complained about by the vehicle owners/drivers, should be checked.

#### Box 4.5 Example of Recommended Fiscal Measures/ Incentives in the Industrial Sector

- Revision of present tax exemption provisions made for attracting FDI. As Nepal is a resource-poor country, it cannot afford cleaning up later, once the FDI is drawn, as in some South-East Asian countries. The brown pollution problem in the Eastern European countries provides an example of difficulties in cleaning up the stock of pollution generated over years.
- Capital tax exemption for environmental investment, such as in the case of recycling, electric vehicles, water and air pollution control investment and income tax exemption for some years on the income generated from these industries and investments.
- Direct taxes on hazardous ozone depleting substances.
- Tax credits for increasing investments in the development of renewable energy resources, such as solar and wind power. Reduction of the income tax liabilities of the individual and corporate tax payer in such industries.

systems providing water from ground water extraction (i.e., differential pricing system on volumetric basis for groundwater despite of extraction costs involved).

## **5.0 SNA AND GREEN ACCOUNTING: METHODOLOGICAL ISSUES AND ACCOUNTING FRAMEWORK FOR NEPAL**

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### **5.1 Introduction**

Natural assets - land, forests and water - are still considered the principal sources of livelihood for the majority of the population in Nepal. Increased deforestation and modification of land ecosystems have exacerbated the process of land and water erosion in the mountains and hills. Physical productivity of some of the major crops in these regions has declined and flood frequency as well as property damage downstream have increased. The majority of the rural population also face the problem of scarcity of safe drinking water. This deteriorating situation in the mountains and hills has encouraged natural people to move to in the urban centers. Unplanned settlement patterns, and concentration of polluting industries and motor vehicles have resulted in increased air and water pollution in many urban centers with significant death tolls and morbidity rates. However, these various costs are not properly valued and included into the National Accounting system. This lack of policy integration efforts at the national level is seriously contributing towards continued depreciation of natural resources and environmental quality degradation. The share of contribution of natural resources in the GDP growth has already declined not because of increased growth in industrial and services sector, but due to the decline of natural resource stocks and flows.

Green accounting is the practice of incorporating natural resource depreciation and environmental costs in the computation of the GNP, or GDP with the basic objective of developing policies aimed at reducing over-extraction as well as overuse of natural and environmental resources. Heavy dependence on the extraction of natural resources, especially in developing countries, raises questions about the adequacy of the present system of National Accounting to capture the true state of the economy. Another problem is that their macroeconomic problems are only addressed with short-term macroeconomic adjustments, such as fiscal policies and balance of payments (El Serafy, 1993). In recent years, increased public awareness, several provisions made in the multilateral agreements and some institutional changes at the national level have increased national demands for environmental information and towards integration of environmental and economic policies. However, many basic issues remain in making attempts towards integration of environmental and economic

policies in Nepal as outlined in Box 5.1.

Full integration of environmental and economic accounts as well as policy modeling in Nepal will require a more comprehensive approach which may still take considerable time and efforts for building data bases, accounting and carrying out modeling exercises. In this section, an attempt has been made to provide a partial framework for Green Accounting and to give some insights into how the results from Green Accounting can be used for environmental economic policy integration in Nepal.

### **Box 5.1 Basic Issues in Environmental-Economic Policy Integration in Nepal**

- To what extent does the present accounting system or the GDP reflect the true gross domestic product that exists when natural resources and environmental effects are taken into account?
- Is the present rate of resource exploitation excessive?
- Is the present level of final consumption sustainable, with 60 percent of population still living below basic needs level sustainable?
- To what extent are the generated revenue and savings dependent on natural resources and how is depreciation and degradation of natural capital going to affect macroeconomic stability?

## **5.2 Gross National Product: Concepts and Measurement Issues in Nepal**

The present System of National Accounts (SNA) in Nepal covers only the actual economic transactions. The SNA started in Nepal from 1974/75 although some accounting information was made available from 1964/65. The current SNA includes: production and income originating from the agricultural sector and manufacturing sectors (modern and cottage); construction, water supply, electricity and gas; hotels and restaurants; public sector enterprises (corporate trades); foreign and domestic trade; transport; storage and communications; community, social and personal services; and private sector services. The production values from each sector are obtained by multiplying the production volume by market prices. In the case of non-market production, they are computed on the basis of the market values of the resources used in the process.

The accounts are presented in four forms:

- i) Gross Domestic Product (GDP) and expenditures;
- ii) National Disposable Income and its applications;
- iii) accumulation accounts; and
- iv) external transaction costs.

The GDP measured in this way is considered to be a measure of public welfare (CBS, 1987). Some of the deficiencies in the present SNA in regard to the

natural resource depletion and environmental degradation are outlined in Box 5.2.

### 5.3 Green Accounting: Theoretical Concepts and Practical Issues

Green Accounting is considered a catalyst for framing environmental policy in developing countries (Theys, 1989). The use of Green or Environmental Accounting can basically serve two purposes of: i) generation of measures of economic performance, and ii) data organization on economic activities (Peskin, 1989). The concept of green GDP has been put forward in many ways. In simple terms, green GDP and NDP as defined by Pearce (1996) can be expressed as:

- $gGDP = GDP + ES + / - ED - IR$ , (1)
- $gNDP = NDP + RDIS - DEP - ED$  (2)

where:

- $gGDP$  = “Green” Gross Domestic Product
- $ES$  = The value of environmental services
- $ED$  = Environmental damages
- $IR$  = Invested resource rents
- $gNDP$  = “Green” net domestic product
- $RDIS$  = The value of resource discoveries
- $RDEP$  = The value of resource depreciation

There is considerable disagreement among economists on how green accounting should be carried out and therefore how the national accounts should be corrected for incorporating these concerns. Various analytical frameworks and

#### Box 5.2 Salient Deficiencies in the Present National Accounting System

As Nepal follows the UN Systems of National Accounting, it suffers from the same kinds of deficiencies as other countries regarding the accounting of resource depletion and environmental degradation costs. Specifically, in the context of Nepal, the major deficiencies can be listed as:

- failure to take into account its vast natural resources depletion, such as the depreciation of forests resources and depletion of soils nutrients resulting from anthropogenic actions and other forms of land degradation;
- failure to take into account the off-site socio-economic impacts of environmental degradation, such as the impact of soil erosion, landslides and floods;
- partial analysis of the quality of life of the people with no consideration for made those who have been the victims of environmental degradation;
- defensive expenditures on health, education, watershed management, drinking water, etc. considered as increments in the national welfare;
- the misleading physical accounts of utilization of certain resources are. For example, the export volume of timber is not shown from the year 1986 after which a ban on timber export was imposed. But the illegal export activities through the same route were continued as usual and though it was not recorded as production in the national accounts, significant areas of forest land were lost every year.

methods have been developed, suggested and applied in the past, both in the context of developed and developing countries. These various methods can basically be described under three approaches: i) net price or depreciation method; ii) user cost method; and iii) systems of integrated environmental and economic accounting (SEEA).

## Net Price or Depreciation Method

The “net price” or “depreciation method” emphasizes the accounting of actual depreciation of natural resources (Sadoff, 1995). The basic premise of this approach is that the present depreciation of natural assets affects productivity of natural capital in the future and thus should be reflected in the national income. The Resource rent or Hotelling rent estimated as the difference in price and marginal cost should be reinvested in order to maintain the economic productivity. The total resource depreciation is estimated by multiplying the resource rent or net price by the quantity depreciated, and the true income is estimated by deducting the resource depreciation from the conventional NDP. The net national product (NNP) in this case is estimated as:

$$\text{NNP} = C + I - \text{DPR} + /- \text{DPNR} \quad (3)$$

where:

- C = aggregate consumption
- I = net investment
- DPR = depreciation of non-renewable resources
- DPNR = depreciation of renewable resources

The depreciation of both the renewable and non-renewable resources is estimated by multiplying the net price with the difference between mean annual increment (or resource discovery in the case of non-renewable resources) and annual loss of resource stocks as explained above. The net price method initially developed by Hartwick and applied by Repetto et al. (1989) in Indonesia, by Soloranzo et al. (1991) in Costa Rica and by Cruz et al. (1992) in the Philippines has been extended for application in many other countries.

## User Cost Approach

The User Cost represents forgone future income, or the difference between total revenues and Hicksian income (El Serafy, 1989). To arrive at the true national income, the User Cost is deducted from the conventional GDP. This approach

involves the identification of: i) income portion that can be spent on consumption from the annual earnings from the sales, and ii) the capital element which should be set aside year after year and invested to create a perpetual stream of income that would provide same level of true income, both during the life of the resources as well as after the resource has been exhausted. The ratio of true income to total receipt is given by:

$$\frac{X}{R} = 1 - \frac{1}{(1+r)^{n+1}}$$

Where X refers to the true income, R to the total receipts (net of extraction costs), r to the discount rate and n refers to the number of years during which the resource is to be liquidated. X-R represents the user cost (El Serafy, 1989). The User Cost method has been widely applied for accounting of depletable resources such as minerals and oil resources in developing countries.

### **The Satellite Environmental-Economic Accounting Approach (SEEA)**

The SEEA approach developed by the United Nations provides a comprehensive framework for an integrated National Accounting system and seeks to develop a system of environmental accounts that allows changes in natural and environmental resources into the Systems of National Accounts (SNA). The SEEA focuses upon the relationship between the economy and environment with emphasis on the physical data of the flows of natural resources from the natural environment to the economy. It aims at:

- i) segregation and elaboration of all environment-related flows and stocks of traditional accounts;
- ii) linking physical resource accounts with monetary environmental accounts and preparation of balance sheets;
- iii) assessment of environmental costs and benefits;
- iv) accounting for the maintenance of tangible wealth; and
- v) elaboration and measurement of indicators of environmentally-adjusted products and income (Bartelmus, 1996).

The environmentally corrected Net Domestic product (EDP) is estimated by subtracting from the conventional GDP the depreciation of conventional fixed capital, the value of depleted assets, and the value of environmental protection activities. The SEEA consists of consideration of the supply and use asset balances by types of produced and non-produced economic assets and helps to trace the inter-industry effects of environmental change (Scherp, 1993). The case studies carried out in Mexico (van Tonbergen et al., 1991) and Papua New Guinea

(Bartelmus et al., 1992) demonstrate the practical application of the SEEA in the context of developing countries.

## **5.4 Methodological Issues and Practical Problems for Application in Nepal**

In the context of Nepal, full integration of environmental and economic accounting is constrained by many factors. Due to a weak institutional structure, and poor data bases and market structure, and poor data are not available for such accounting at present. However, there are several reasons why it is desirable to immediately begin the processes of building environmental accounting.

Some of these reasons can be listed:

- i) there is a high expectation for economic growth from the democratic government and the government has itself set a target of 5.1% annual growth in GDP;
- ii) Nepal's dependency on natural resources, especially on the renewable resources is very high;
- iii) there is increasing resource depletion and environmental threat which needs immediate attention;
- iv) the level of poverty is increasing and the environmental degradation has exacerbated the plight of the poor;
- v) there is a constraint on budget for research/ information collection;
- vi) the traditional management of resources has been more cost-effective and successful in the past;
- vii) there is need for an approach to enhance local participation for sustainable use and management of resources; and
- viii) rural environmental problems are increasing and they need immediate action (as opposed to the still developing urban sector). There is thus an urgent need for integrating environmental and economic accounting but it has to be carried out on a step by step basis.

### **Case of Strong Sustainability**

Conceptually, SEEA invokes a strong sustainability case which by some definitions implies maintaining the natural capital intact. The environmental costs are computed as the costs that would be required to maintain these assets intact. Both the adequacy and applicability of the strong sustainability concept in the developing world has been widely debated.

## Computation of Environmental Costs

Computation of the costs of replacement, or the maintenance costs rather than the cost of environmental damage may not reflect true costs of environmental degradation. In many cases, prices needed to compute the environmental costs do not readily appear in the market. Likewise, the maintenance cost also varies with the stage of economic development. While replacement costs trend to decrease with technological advancement, the environmental damage valued in monetary terms may still be high due to high mortality and morbidity costs.

## Comprehensiveness

The final and most important issue in the application of the Green Accounting concept in developing countries is: How comprehensive should the accounting of natural resource depreciation and environmental damages be? Although SEEA provides a more comprehensive framework with an aim to integrate information comprising the economic, environmental, social and demographic dimensions, it poses real problems in data compilation and computation of environmentally corrected GDP.

Although there are several weaknesses associated with each of the Green Accounting methods, the ongoing efforts on empirical studies have served the basic purpose of Green Accounting by refining methodologies. The “greening” of national accounts is continuously evolving as a theory of institutional change from the new institutional economics perspective (Meyer, 1997). In the case of developing countries, the problem in collection of more reliable information is not only associated with Green Accounting but also with the existing systems of national accounts. In Nepal, where the major natural resources are renewable, such as forests, where the extraction as well as exploration of mineral resources are marginal and where there is a lack of information, partial frameworks may be more useful to introduce the Green Accounting concepts. Such partial frameworks have been widely applied in the past in some of the developing countries. Repetto et al. (1989), Soloranzo et al. (1991) and Cruz et al. (1992) attempted to provide partial accounting of natural resource depreciation in Indonesia, Costa Rica and the Philippines. Winter-Nelson (1995) applied User Cost approach for accounting natural resource depletion in the mining sector in six African countries. Young and Motta (1995), and Crowards (1996) extended both the User Cost and Net Price methods for natural resource accounting in Brazil and Zimbabwe respectively. These studies conclude that while estimates obtained with the User Cost approach were of the same magnitude as the conventionally measured income, a very different result was obtained in the case of Net Price method. In the later case, it

showed large oscillation compared to the conventionally measured values. Attempts also have been made for partial accounting of natural and environmental resources in China (Li, 1993, cf. WWF, 1995) and India (Parikh, 1994). The objective of these various studies has been to estimate the impact of economic activities on natural resources. The next section presents a framework for partial accounting for application in Nepal based on these approaches.

## 5.5 Green Accounting: An Analytical Framework for Application in Nepal

In view of the various issues and complexities involved in the integrated accounting system, it is preferred to initially attempt a partial adjustment of the economic accounts based on the changes of some important resources (El Serafy, 1993) gradually a longer preparation period and subsequent adoption a comprehensive framework like SEEA can be developed. This step-wise strategy involves:

- Development of Environmental Statistics
- Development of Natural Resource and Environmental Accounts
- Monetary Accounting
- Analysis and Policy Integration

### Development of Environmental Statistics

**Present Efforts in Compiling Environmental Data.** Several studies have been undertaken to compile data on natural resources and to analyze the nature of linkages of the resource base and resource use conditions. These studies include:

- i) Land Resources and Mapping Project Study (1985);
- ii) Master Plan for the Forestry Sector (1988);
- iii) Natural Resources Management Study (ERL, 1990);
- iv) National Report to UNCED-92;
- v) Annual Economic Survey published by HMG of Nepal;
- vi) Water and Energy Commission (WECS) Synopsis Reports, etc. Recently the Central Bureau of Statistics (CBS) has initiated the compilation of available environmental statistics in Nepal.

### **Institutions Involved in the Research and Collection of Environmental Data.**

Some national agencies such as Agricultural Marketing Center, Forestry Department, National Planning Commission, Nepal Mining Department, Nepal Rastra Bank, and certain research centers and private limited organizations such as, APROSC, Agricultural Development Bank, Trade Promotion Center, Nepal Electricity Authority, are presently involved in compiling environmental statistics.

Besides, many international agencies working in Nepal are also involved in taking air photos, obtaining satellite images and carrying out field surveys which could be used to assess environmental changes. However, these national and international agencies involved in this task often do not co-ordinate data collection, compilation and dissemination. This is why the data collected at various moments in time and various places are not comparable. The National Remote Sensing Center can play a significant role in helping the compilation of environmental statistics.

## Development of Natural Resource and Environmental Accounts

**Land Use Accounts.** The main purpose of Land Use Accounting is to provide data on the changes in availability of land for various types of land use and land quality classes suitable for different purposes. Past surveys on land resources are limited to the identification of land use change and classification of the land use categories. They neither provide year to year land use variations nor show the subtraction or addition in the changes in land use pattern from one mode to another. The Land Use Accounts should consist of the land capability classes, resource use in each classes and change from one class to another in each changing period.

Periodic land use assessment of critical areas can also be done by acquiring and interpreting satellite imagery. However, the use of satellite imagery with high resolution, for example Landsat, MSS or SPOT, is limited in image recognition in mountain and hilly areas. Hence, periodic aerial survey and data feeding from local sources might prove to be the best alternatives for land use accounting.

### Box 5.3 Framework Proposed for Environmental Statistics

#### 1 Social and economic activities and natural events statistics

Natural resource use statistics  
Emissions, waste dumping and applications of biochemicals  
Natural events and calamities

#### 2 Environmental impacts of activities and events statistics

Resource growth and depletion  
Environmental quality  
Human health and environmental disasters

#### 3 Responses to environmental impacts

Resource management and rehabilitation  
Pollution monitoring and control

#### 4 Stocks and inventories

Inventories of biological resources (agriculture, forestry, fauna and flora)  
Cyclical and non-renewable resources (hydrology, climate and mineral resources),  
Energy stocks (stocks and consumption of renewable and non-renewable energy sources)  
Ecosystem inventory on watershed basis of major mountain watersheds

Modified from UN (1984, 1988)

**Forest Accounts.** The past data on forest cover are not comparable due to different kinds of methodology used in area and density assessment. The data published on timber and fuelwood extraction do not provide the total volume of timber and fuelwood consumed in a year. The use of remote sensing and GIS can provide a basis for data base management for forest resource accounting (Box 5.6).

**Biodiversity Accounts.** Accounting of biological diversity is extremely important in Nepal to maintain ecological productivity and integrity. It has drawn attention at the international level and the accounts for addition and loss of species should be maintained.

**Soil Accounts.** Soil accounting mainly consists of the amount of soil depletion per year as a result of both geological and anthropogenic activities. The former is estimated on the basis of landslide scars (Ramsey, 1985; Tiwari, 1990) and the latter by estimating soil loss from different land use categories and rainfall data. At present, very few rainfall run-off plots are established and sufficient data on soil erosion rates are not available. The use of Geographic Information Systems provides a basis for estimating the approximate soil erosion rate which can be compared with the measured values in some localities (Box 5.6).

**Energy Accounts.** Except for fuelwood, hydropower, and some coal, other forms of energy in Nepal are imported and these statistics are available. In addition to fuelwood accounts, the estimation of per unit extraction cost and market price should be compiled, using the same energy unit for the various categories of energy sources.

**Production Loss Accounts.** Production loss accounts can be generated through;

- i) soil nutrient loss accounting;
- ii) decrease in actual yield; and
- iii) loss due to floods and other natural calamities. The soil nutrient loss can be defined as the total nutrient added (e.g., fertilizers) to maintain the level of productivity at the base year level.

At present it is difficult to calculate all these variables to arrive at total loss.

**Water Supply and Water Quality Accounts.** Though Nepal has abundant water resources in terms of total available quantity per capita, the supply of potable water to both urban and rural areas is scarce. In rural areas, it is difficult to value both the available quantity and the quality of the water as the measurement devices are not installed in most of the streams and water use systems. The estimation for yearly accounts should be based on the design capacity of the water use systems. In the case of river water, river discharge and water quality are measured in some major rivers which can provide some figures for rough estimation. But for complete accounts, a computer-based hydrological simulation modeling system is needed that can be used for estimation of surface runoff, soil erosion rates and sedimentation load in the rivers. This can be carried out on the basis of major rivers and should include both the mountain watersheds and Tarai belts.

## Monetary Accounting

Linking physical accounting to the conventional GDP or GNP is important as the purpose of environmental accounting is to reorient the reallocation procedure of resources and make use of Systems of National Accounts (SNA) to measure the true income or the welfare of a country. As mentioned above, there are different kinds of expenditures and costs to be calculated

### Box 5.4 GIS-Assisted Natural Resource Accounting Framework for Nepal

The estimation of physical soil loss and conversion of this loss into monetary value is not an easy task for Nepal. In this case, application of Geographic Information System (GIS) techniques provides a basis for database management on a spatial basis. The methodology applied in the case of a small watershed in Nepal resulted in an estimation of the soil erosion rate ranging from 8t/ha in forest lands to 173t/ha in grazing fields in silt clay with slopes as high as 75% (Tiwari, 1990). Likewise, studies exist to provide some basic data for soil erosion estimates in Nepal. But estimating soil erosion rates on the national basis might not be practical due to high variations of the topography and agricultural practices. For this reason, spatial database management is quite important for physical accounting of resources such as forests and soil.

#### Forests Accounts — Procedural Steps

- Yearly, a balance sheet should be prepared for the calculation of the exact volume of forest degradation.
- Divide the country into homogenous equal units. The present ecological belts classification requires revision. The vegetation cover map used for soil erosion rate estimation can also be used for forest accounts. Every year the total surface of forest land in each polygon unit can be entered in the GIS files.
- For each classified ecological unit, the type of forests/ shrubs, their growth potential, total area, volume of timber and fuelwood both on a sustainable yield basis and actual extraction in that year should be estimated and entered.
- By GIS overlay for two different years, the change in forest/shrub (gain or loss) and transfer of

for correcting the conventional GDP. These include: depreciation of natural capital, environmental degradation costs and defensive expenditures. These costs can be estimated using the economic valuation approaches dealt with briefly in Section 3.

## Considerations of Defensive Expenditures

The debate on the defensive expenditures is based on the fact that the expenditures made both by the government and households are meant to maintain the status quo of the quality of environment. This does not add more welfare to society and hence these kinds of expenditures should be deducted to arrive at the sustainable income. A simple example in the case of Nepal is the expenditure on managing the degraded mountain watersheds. This has been merely to maintain the status quo condition of the watersheds damaged by anthropogenic actions in the past. Investments have not been made in natural watersheds where there was no human intervention before. The second example is investment in the malaria eradication program in the newly introduced irrigated areas which have problems after the introduction of irrigation facilities. Likewise, the expenditures made by the urban households and government in waste disposal will not add more welfare to the society than before. It merely helps to maintain the environmental quality level before the current pattern of consumption was adopted by the households which generated additional waste. These kinds of expenditures should be treated as intermediary products and be deducted from the NNP.

utilization can be identified. An example of the procedure for the identification of changes can be found in Tiwari (1990).

- The forest area in national parks which is protected should not be taken into account for timber supply but only for firewood calculation.
- Collect the available information required to provide information on composition, growth, volume and species diversity of forests in Nepal.

### Soil Accounts — Procedural Steps

- The map showing soil erosion rates in each predefined polygon can be modified at different levels with estimates depending upon the level of accuracy required.
- Collection of data on crop yield, crop management practices, crop types and crop coverage percentages.
- Digitization of maps, entry of other field data and preparation of database files.
- Calculation of each factor of the Universal Soil Loss Equation (USLE) =  $R * K * LS * C * P$ ; where, R: rainfall and runoff factor, K: soil erosivity factor, L: slope length factor, S: slope grade factor, C: vegetation/ crop cover factor, and P: conservation practice factor.
- After the determination of each factor, the values should be entered into each map, and they should be multiplied by overlaying the factor value maps to obtain soil erosion rates.
- Preparation of land use, vegetation cover, soil, geological, topographical and rainfall distribution maps on a watershed basis.

However, this logical reasoning concerning defensive expenditures has been criticized on many grounds. Maler (1991) strongly argued that when the value of environmental services are included, the current defensive expenditures should not be deducted from net national income in order to avoid double counting. The wages earned by labor from the expenditures made on maintaining the quality of the environment add to the welfare of those people. Likewise, the purchase of goods and services to protect oneself or others from a degrading environment are made to improve the well-being at least for those who made the purchases. There is nothing that makes the defensive expenditures different from other expenditures in this respect. However, the value of input goods used to enhance the stock of natural assets should be deducted from conventional net national product (Maler, 1990). The controversy thus lies in which component to include and which not to include rather than the issue of deducting defensive expenditures as a whole to obtain the environmentally corrected national income.

### **Box 5.5 Examples of Expenditures that may be Considered as Defensive Expenditures under Different Ministries**

#### Ministry of Housing and Physical Planning

- Expenditures on preservation of historically important monuments
- Expenditures on collection, treatment and recycling of solid waste
- Expenditures on treatment of water and provision of water to rural areas
- Expenditures on providing and maintaining sewerage systems

#### Ministry of Water Resources

- Expenditures on flood control/rehabilitation works
- Expenditures on protecting environmental damage during dam constructions

#### Ministry of Forestry

- Expenditures on watershed management activities
- Expenditures on afforestation in degraded areas
- Expenditures on national park management

## **Analysis and Policy Integration**

The ultimate aim of Green Accounting is to integrate environmental and economic policies. To what extent Green Accounting can facilitate the desired change does not only depend on the exercises for estimating green GDP, but also on how the results of green GDP can be used for policy integration. El Serafy (1993, 1997) outlined several policy implications of Green Accounting especially in the case of a country that is consuming or selling its natural assets on an appreciable scale while considering this as value added in the national accounts. These include policy issues related to:

- i) savings and investment;
- ii) price stability and the exchange rate;
- iii) the balance of payments on current account; and
- iv) fiscal balance. El Serafy (1993) demonstrated the implications of green GDP for investment and the balance of payments in the case of Indonesia using the information provided by Repetto et al. (1989). The results indicated a deficit in the current account by 10 percent when the User Cost present in the forestry export and oil sub-sector were taken into account.

Hamilton and Lutz (1996) emphasized the potential use of green accounting for measuring genuine savings as one of the policy implications of green GDP. Genuine savings by definition are the net savings less the value of resource depreciation and the value of environmental degradation. If the genuine saving is negative, then it leads to declining welfare. Hamilton and Lutz (1996) also provided an example of the calculation of genuine savings in the case of Pakistan, concluding that the genuine savings were much lower than the net savings as recorded in the conventional National Accounts.

All of these policy implications of green GDP may not be possible to highlight in the case of Nepal. The share of natural resources, such as forests and major agriculture products

### **Box 5.6 Environmentally Corrected GDP and Implications for Macroeconomic Policy Adjustments in Nepal**

A tentative estimation of forest resource depreciation, cost of soil nutrient loss and defensive expenditures was carried out for the period 1974/75 - 1989/90, using the available information on forest inventory (LRMP, 1979/80) and productivity loss as well as soil nutrient additions in the hills and mountains. Some defensive expenditures were deducted to calculate the environmentally corrected national income (ENI). As an implication of the estimates of ENI, the results were compared with the level of final consumption. The concept behind this is that if the final consumption is larger than ENI, it shows unsustainable patterns of national consumption and other macroeconomic variables have to be adjusted to decrease the gap. The comparison between the final consumption and ENI for these years indicated widening gaps. In the case of Nepal, as the overall level of consumption is already low, it leaves little room for adjusting consumption and increase in investment. This clearly shows that the issue of sustainability is a case of borrowing or importing sustainability in Nepal at least for that period during which the investment made towards increasing productivity capacity will exceed the sustainable livelihood level of the people living below the poverty line. However, viewed otherwise, the issue of borrowing or importing sustainability will have negative impacts on the balance of payments. Adjustment in the domestic and international credit expansion and foreign exchange policy will have to be carried out based on these realities.

Source: Tiwari, 1995, p. 206

in the export earnings, has declined over time. At the same time, the size of the population that is largely dependent on the primary natural assets has increased from 42 percent in 1976/1977 to 49 percent in 1993/94. The economic and resource productivity indicator in the agriculture and manufacturing sectors in Nepal as well as the share of natural resource contribution to GDP over the period 1974/75-1989/90 showed a declining trend. The domestic resource gap scenario indicated that although the percentage of domestic savings to GNP is increasing, the percentage of budget deficit to GNP is also increasing over the same period (Tiwari, 1995). This situation indicates both the need for estimation of genuine savings and integration of the concepts into the macroeconomic policies in Nepal. Box 5.6 provides an example of the use of environmentally corrected GDP estimated by the author for the period 1974/75 - 1989/90.

## 6.0 SETTING RESEARCH PRIORITIES FOR ENVIRONMENTAL AND ECONOMIC POLICY INTEGRATION IN NEPAL

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The foregoing analyses, discussions and developed frameworks demand further research and initiatives towards environmental policy integration in Nepal. Basic research on various aspects will be needed for improving public understanding, implementing of regulatory measures as outlined in the EPA (1997), design as well as implementation of market-based measures as outlined in Chapter 4, and policy integration at the national level. Nepal is presently struggling with both its continuing poverty and widening environmental degradation. Conflict often seems to arise while trying to address both of these simultaneously. For the mainstream economists, the solution to a poverty-ridden economy could be more investment on agriculture, development of basic physical infrastructures like roads and irrigation facilities and education. Analysis of fiscal policy and environment in Section 2 indicates that these activities aimed at addressing poverty and economic growth also incur a wide range of negative impacts on the environment, and cumulative effects on the economy as well. This means that in order to reduce the poverty in the country, environmental degradation must be addressed simultaneously. Although some conflicts may arise in the resource allocation at the initial stage, ultimately the poor segment of the population will enjoy the benefits of environmental improvement. Better understanding of the cause-effect relationships of resource use and environmental degradation, and cost-benefit analysis of regulatory measures and economic incentives will help implement measures with the least negative effect on the economy and provide analytical tools available to the decision makers.

In-depth research in these topics has received a low priority in Nepal in the past. While the in-country capacity is severely limited due to financial constraints, attempts made by bilateral, multilateral and international agencies have so far been limited to literature studies and general overviews of the issues. There also seems a lack of interest and expertise with various external agencies working in Nepal towards understanding the cause-effect

### **Box 6.1 Major Research Needs for Environmental Policy Integration in Nepal**

The major areas for further research in Nepal with an aim of environmental policy integration at project, sectoral and economy-wide level can be grouped into the following six areas.

1. Quantifying environmental impacts of perverse incentives: Focus on quantification of the level of impacts, the necessary proportion of removal of these disincentives for greening of the budgets,

relationships, and design appropriate policy measures/strategies before implementing the resource management programs aimed at reducing environmental problems. Allocation of resources for research and analysis is not perceived as a part of the solution to the growing environmental problems. Technical assistance coming from various external agencies with the development projects usually ends up with several short-term task missions without a detailed cost-benefit analysis of environmental implications of the fiscal policies. Despite some efforts from the external and internal agencies, environmental degradation in Nepal continues to be a major threat to the ecological, human and economic health. In an era of diminishing resources, there is also a need for efficient utilization of technical assistance being provided by donors, multinational and UN agencies. Identification of which environmental research areas are most vital to society is one of the basic steps for efficient utilization of available resources. In this section, several specific areas are outlined for in-depth research and analysis in order to design and implement cost-effective measures for reducing natural resource scarcity and improving environmental conditions. Box 6.1 provides six major research priorities suggested for environmental policy integration in Nepal.

- and maximizing societal welfare function (including natural wealth and poverty aspects).
2. Measurement of incremental costs of biodiversity conservation: Focus on the estimation of opportunity costs of biodiversity conservation, and design of policy measures towards how local people, especially the poor segment of the population, can benefit from resource conservation and sustainable utilization and how to promote their participation for sustainable management of these resources.
  3. Quantifying Costs and Benefits of Environmental Policy Act : Measurement of present costs of environmental degradation in different sectors and analysis of costs and benefits of environmental regulation measures for helping revise/implement provisions made in the EPA (1997).
  4. Green Accounting and Integration with SNA: Measurement of green GDP and genuine savings and Integration of environmental policy at the economy-wide level following the framework developed in Section 4.
  5. Measurement of the impacts of international agreements on the environment: Research focused on to what extent GATT measures will affect the environment if Nepal is made a full member of the WTO, and how regional trade integration such as SAPTA will affect the environment.
  6. Analyzing effects of environmental policy on producers' profit and trade competitiveness: Quantification of environmental policy effects on trade competitiveness will help avoid the fallacy of environmental policy burden on the external trade flows of polluting commodities.

## **6.1 Quantification of Environmental Impacts of Perverse Incentives or Pricing Policies and Subsidies in Different Sectors of the Economy**

Understanding the cause-effect relationships between the economy and the environment is the basic step towards promoting environmental economics initiatives in Nepal. Section 3 provided a general overview of such effects using available information and indicators and providing a “general prescription” towards solving these problems. However, there is need for further quantification of the cause and effect relationships of price policies (taxes and subsidies) and environmental change. The underlying research issues can be outlined as:

- How are the present pricing and subsidized production/consumption activities affecting the producers’ as well as consumers’ welfare, particularly in the poor segment of the population in different ecological belts?
- What is the impact of agricultural policies and subsidies on land degradation in the hills and mountains, on conservation and sustainable utilization of forest resources and particularly on biologically rich resources in Nepal?
- What is the relation between forest pricing and export ban policies on the one hand and deforestation and lower scarcity rent on the other?
- To what extent is energy pricing policy responsible for the increased air pollution in Kathmandu valley and other urban centers?
- What would be environmentally optimum pricing and subsidy policy in each sectors of the economy?

Policy research in these areas should focus on understanding the contribution of the present pricing policy on the poverty reduction and environmental degradation, and how the change in these fiscal dimensions aimed at improving environmental conditions may affect the poor. With a clear understanding of these cause and effect relationships, environmental policies can be designed and integrated for improving the environmental conditions as well as improving the quality of the life of the poor people.

## **6.2 Estimation of the Incremental Costs of Biodiversity Conservation**

Conservation and sustainable utilization of biodiversity play a fundamental role in making the transition towards sustainable development. Despite expansion of areas under protection and formulation of guidelines and policies, the existing system of national parks and reserves does not provide an adequate level of protection for

biodiversity and government and donor agencies' efforts are limited to managing only short-term threats. A sound analysis is needed showing why and how big areas should be protected and whether a least developed country with almost 60 percent of the population living below poverty line can afford the costs associated with the biodiversity conservation. Even though Nepal has been a signatory to the CITES and Convention on Biological Diversity (CBD), mechanisms to implement its obligations are not well developed to fulfill the provisions made in these international agreements. Estimation of incremental costs of biodiversity conservation and the design and implementation of strategies that benefit the local people are the basic steps towards conservation and sustainable utilization of the resources in Nepal. The present conservation approach is embedded in several programs and action plan which might have a high opportunity cost. A more in - depth research on the opportunity costs of biodiversity conservation in Nepal will assist in gradual removal of perverse incentives, in strengthening the application of market-based opportunities and estimate the incremental costs of implementation of CBD measures. In this context, environmental policy research may focus on:

- Which value do people attach to the conservation of biodiversity, especially to the protection of endangered species?
- How much land area is required for conservation and sustainable utilization of biodiversity in Nepal?
- What are the opportunity costs and benefits of biodiversity in protected areas and community forestry areas?
- How can economically and environmentally sound economic incentive measures be developed to foster conservation and sustainable utilization of these resources?
- How can benefit sharing mechanisms be developed, involving the local people living in the surroundings, especially in the buffer-zones?
- How can biodiversity conservation concerns be integrated into the national and project level decision-making process?
- What are the incremental costs for Nepal of the provisions made under CBD?

The quantification of opportunity costs of biodiversity conservation in different ecological belts with varying rates of species diversity, tourist visitation rates and ecological functions is also important for help in the on-going debates of water resources development for hydro-power generation in Nepal as it involves inundation of large forest areas. Computation of the existing value of water with and without biodiversity conservation will help internalize these costs into the computation of per unit price of electricity generation which is a major determining factor in the on-going debates of large vs. small scale hydropower

development in Nepal. Other implications might be for attracting funding from Global Environmental Facility (GEF) and other funding agencies for protecting endangered species in Nepal.

### **6.3 Assisting Implementation of the Environmental Protection Act (1997)**

Formulation of Environmental Protection Act (1997) and Environmental Regulations (1997) can be considered as milestones in the evolution of environmental policy in Nepal. However, the majority of provisions made both in the Act and regulations are not clear yet, their cost benefits are uncertain and they are not being effectively implemented. While the present capacity of the Ministry of Population and Environment (MOPE) to implement the Act is limited, other concerned line ministries, and groups also appear to be confused due to the lack of clarity of the provisions made in the Act. There are concerns from the industrialists expressed on the Environmental Impact Assessment (EIA) provisions made in the Act. There is a lack of basic understanding of the relationships between the regulatory provisions made and how such provisions can contribute towards greening of the industries. Implementing economic incentive-based measures requires analysis of the costs and benefits of the existing mechanisms and how a “policy mix” can be designed and implemented. With respect to the cost-benefit analysis of the different provisions made in the Act, in-depth research may be focused upon:

- Can the regulatory provisions made in the different sectors promote peoples’ participation?
- What value do people attach to the improvements in air, water and land quality? What is the desired level of environmental quality and how willing are the people to pay for the desired level of environmental quality?
- What will the costs be for firms for carrying out EIA and complying with other regulations?
- What kinds of economic instruments or “policy mix” are best suited for the greening of industries to enhance local producers participation in improving environmental quality?
- What will be the costs of vehicle emission checking programs and for private users complying with the air quality regulations?
- What is the present cost of managing landfill sites? How do people perceive the environmental health impacts around the landfill sites? To what extent are the polluters or the producers of solid waste being asked to bear both the management and external costs of solid waste disposal?

Also, in relation to the introduction of several regulatory provisions and “policy-mix”, the political economics of implementation are important, such as incidence of costs and benefits and distributional impacts at the household level. These have to be analyzed in their national, regional and local political-economic context for effective implementation of environmental policy measures. Likewise, monitoring mechanisms such as measuring the level of pollution/land degradation and indicators for measuring the effectiveness of policy measures are required in each sector of the economy, or per type of pollutants and nature of industries. A monitoring programme may include the establishment of a system design process that involves regular monitoring of the ambient pollution concentration. The programme should also include reporting on health hazards, dissemination of information, and occasional survey of the consumers’ and producers’ perceptions as well as their WTP for improving existing environmental quality.

## **6.4 Policy Integration at the Economy-wide Level**

Working towards policy integration at the economy-wide level and application of the framework suggested in Section 4 requires a more comprehensive approach than integrating policies at the project or sectoral level. As outlined in Section 4, the major research issues towards policy integration at the economy-wide level include:

- To what extent does the present accounting system, or the GDP reflect the true gross domestic product that is calculated when natural resources and environmental effects are taken into account?
- Is the present rate of resource exploitation excessive?
- Is the present level of final consumption sustainable, with 60 percent of population still living below the basic needs level? and,
- To what extent are the generated revenues and savings dependent on natural resources and how are depreciation and degradation of natural capital going to affect macroeconomic stability?

SNA needs to be reformulated in order to establish wealth accounting rather than only income accounting, to develop inter-industry accounts and a perpetual inventory of wealth including both the reproducible and non-reproducible assets.

Both the natural resources and environmental accounting are important for

- i) reducing uncertainty about sustainable economic growth;
- ii) appropriate pricing of natural resources;
- iii) shaping the size of financial outlays for re-investing in natural capital;
- iv) assessing the level of technology required for moving towards cleaner

- production and consumption processes; and
- v) measuring economic success and quality of life. Research efforts towards policy integration should be carried out on a step-by-step basis as suggested in Section 4.

## **6.5 Estimating Impacts of the Implementation of International Agreements on the Environment**

Environmental effects of trade liberalization have received wide attention both in the developed and developing countries. In order to promote sustainable trade and tourism industries, priority to research should be given to studying the environmental impact of Nepal's external trade flow patterns, the open boarder with India and Nepal's possible entry to the WTO in the near future. Basic research issues in this case in the context of Nepal can be:

- To what extent will trade liberalization change the volume of external trade flows of polluting commodities and natural resource products?
- To what extent will liberalization of agricultural trade lead to the extensification and intensification of agriculture?
- In the absence of strong enforcement of environmental quality standards, will trade liberalization result in Nepal being a "heaven" for polluting industries?
- To what extent will the open trade policy and FDI—as envisaged by SAPTA—lead to increase or decrease in the external trade flows of primary product such as forest resources, endangered species, and investments in hydropower development which can have negative impacts on the environment?

Analysis of GATT provisions, especially of agricultural trade liberalization on the product prices and volume of trade, shows some likely changes in product prices, which are marginal changes in the enormous world trade volume. The effect of agricultural trade liberalization on the environment, however, is dependent on internal policy measures and the extent of existing policy distortions. Analysis of the likely effects of agriculture trade liberalization both in the developed and developing countries based on the FAO study (1995) indicates a very low level of likely impacts due to shifts in agricultural inputs use and agricultural extensification (Tiwari, 1996). Studies relating to the likely shifts in volume and extensification of agriculture may be of some importance for Nepal along with the effects on the environment of the shifts in other industrial products like textiles, leather, cement and carpets.

## 6.6 Analyzing Effects of Environmental Policy on Trade Competitiveness

The fear of losing competitiveness coming from the businessmen and industrialists regarding potential increase in the production costs has been a major concern in the implementation of environmental rules and regulations in the developing countries. The prevailing perception that environmental policy integration results in increase in producer's costs and affects the trade competitiveness—if similar measures were not taken by other trading partners—has often engendered opposition to the implementation of developed policy measures. The major research issues in the context of Nepal can thus be:

- What do the experiences from the past teach about the costs and benefits of environmental policies? What is the probability of the producer's prices being affected, if the EPA (1997) provisions are effectively implemented?
- How can the policy makers, decision makers, politicians, businessmen and industrialists be taught about the linkages between environmental policy and employment generation, resource use efficiency and trade competitiveness by analyzing the cause-effect relationships?
- What will the impacts of multilateral environmental agreements (MEAs) be, if Nepal will be under the GATT provisions?

Policy research focusing on areas like identification of the potential incremental costs of processing and product standards (PPMs) are eco-labelling measures which could be initiated in specific areas to avoid the fear of losing trade competitiveness and help in taking pre-cautionary measures for promoting external trade flows. In this context, at the industry level, application of simple indicators approach will help in showing how large these costs and impacts will be on external trade flows. For example, whether the excise taxes on energy resources would lead to a decrease in the external trade flows of polluting commodities in a single country can be analyzed using the indicators approach (Tiwari, 1996).

## **7.0 CONCLUSIONS AND FUTURE DIRECTIONS**

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### **7.1 Conclusions**

#### **Pricing Policies, Subsidies and the Environment**

First, our analysis provided the general indication that the costs of government policy failures in terms of natural resource and environmental degradation are likely to be high in Nepal. In many sectors of the economy, the government still controls prices, imposes lower charges or taxes sometimes even resulting in the failure of the revenue to cover the expenses of operation and maintenance services. This results in poor operation and maintenance of the services in various sectors and consequently in negative environmental impacts. Subsidies are mostly provided without a preceding analysis of who the beneficiaries are and what the impacts on the environment are. However, one notable exception is the subsidies on the construction of biogas plants.

Second, response indicators in each sector of the economy showed very little efforts in correcting government policy failures and subsidies. This has merely added to the burden of the government and, in the presence of such distortions, it is likely that market-based incentives will have only a little positive impacts on the environment.

Finally, while EPA (1997) and environmental regulations have not been yet implemented their costs and potential effectiveness in solving the country's environmental problems is still uncertain. The lack of robust enforcing and monitoring agencies impedes effective implementation of these provisions. Self-enforcing mechanisms such as market-based instruments may be more suitable for addressing selected environmental problems at certain levels.

#### **Economic Valuation, Market-Based Instruments and Policy Integration**

Economic valuation of the natural resource scarcity and environmental impacts is the basic step towards environmental policy integration using market-based measures. Various economic valuation approaches could be used in the context of Nepal depending upon the availability of information, budget and the need for in-depth analysis. Contingent valuation methods could be more appropriate in measuring the economic value of improved air and water quality, and biodiversity

resources.

Market-based measures—although increasingly popular—need to be continuously reviewed for application in the context of Nepal, as the first-best measures may not be feasible in many cases due to the lack of information and effective institutional structures. A series of policy prescriptions made in Section 4 should be considered as a general prescription and as a guidance for the development of more concrete measures.

Although the measures outlined in Section 4 may provide a general basis for policy integration at the sectoral level, it may not be possible to achieve the objective of greening of the budget without making corrections in the present system of National Accounts at the economy-wide level. As highlighted in Section 2, past studies have already shown wide gaps between the conventionally measured GDP and environmentally corrected GDP. The framework presented in Section 5 provides a practical guidance for green accounting with an objective of integrating environmental and economic policy in Nepal.

## 7.2 Future Directions

In-depth research efforts, design and implementation of market-based measures and effective monitoring mechanisms might influence the future direction of environmental policy integration in Nepal.

- First, the concerned agencies should help in carrying out a review of existing policies, conduct in-depth research and the design of cost-effective policies in each sector of the economy. This could be done in collaboration with various government and donor agencies. While revising the existing policies and programs, the major areas of concern might be: how the centralized decision making process can be discouraged and how local institutions can be made more responsible towards managing the environment. In this context, the research priorities, outlined in Section 6, provide a framework for in-depth research for environmental policy integration.
- Second, efforts should be directed towards strengthening of the institutional capability, not only by providing technical assistance which usually ends up without establishing any concrete pillar and is likely to dismantle as the external assistance stops, but also by enhancing capabilities providing direct assistance in collaboration with different external agencies. The market-based measures will not be successful without a re-orientation of the present institutional mechanisms in Nepal.
- Third, suitable resource management regimes should be pursued and continued where market-based measures alone are not likely to achieve the

results desired. A policy mix, rather than MBIs alone would be more suitable for harnessing the local peoples' participation in improving the quality of the natural resources and environment, especially in the rural areas. Studies on property right transfers and capability of local organizations in managing local environmental resources using "policy mix" options should be pursued, analyzed, designed and implemented.

- Finally, continued research and dissemination of environmental matters of global concerns such as global warming and its impact on the natural and human health in Nepal could be helpful in raising public awareness. These could be done in collaboration with the national and international institutions like IUCN - The World Conservation Union, Royal Nepal Science and Technology, Kathmandu University, Tribhuvan University, various governmental agencies such as, Department of Hydrology and Meteorology and Department of Agriculture.

It is hard to say exactly how far these initiatives will help in drawing public attention and how long it will take to clean up the environmental disorder created by the failures of government policy and lack of public awareness. However, when the benefits and costs of the measures aimed at environmental improvements are known to the general public, the decision makers and politicians, efforts towards solving these problems should naturally arise. Future efforts in integrating environmental policy should thus be directed towards in-depth research in many different sectors as well as on the economy-wide level and towards communication of the results to the public, taking their perception into account, in order to achieve strong public support for appropriate policies.

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## GLOSSARY OF THE TERMS USED

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**Average Incremental Cost** — is the per unit cost estimated dividing the incremental cost of services provided such as water supply facilities by the additional quantity of water supplied and discounted over the project life period. It refers to the price charged for each incremental cubic meter of water to recover the operating and investment costs including the opportunity cost of capital.

**Contingent Valuation Method** — is a direct economic valuation technique for pricing unpriced natural resources, or environmental quality. As the respondent's answer to a valuation question, such as the one for improved water quality in this case, is contingent upon the particular hypothetical market rather than the actual improvements in the water quality, this technique is known as contingent valuation method. This approach is now becoming more popular as it also helps in incorporating public participation in the decision-making process.

**Economic Valuation** — refers to the different kinds of direct and indirect approaches used to determine the value of a commodity or services. For example, the value of clean water or clean air which is usually not reflected by the market prices. Such a valuation approach is not free from controversy, but while making economic valuation it should be kept in mind that the attempt is made to put some economic value of the resource or services in question, rather than the true functional value such as the value of the environment or human life. For example, we can tie some rupees value to a tiger, using different kinds of valuation methods for use in the economic decision process, but it reflects only peoples' preferences rather than the true value of the tiger.

**Environmental-Economic Policy Integration** — refers to the measures for incorporating environmental concerns into the economic decision-making process and implementation of such measures for improving both the environmental quality and process of economic development. The concept is based on the assumption that environmental and economic concerns are complementary and pursuit of the goal of environmental quality improvements also helps in achieving economic growth. If the environmental concerns are neglected, it may also have cumulative effects on the economy in the long run.

**Green Accounting** — is an approach for correcting lossess in natural resources and environmental degradation which are usually not accounted in the standard systems of national accounts. In simple terms, in the present methods of

estimation of NDP, only the depreciation of man-made capital is accounted, whereas, depletion of the natural resources such as forests is not deducted from the national accounts. This means that when the forest resource depreciation is occurring at a fast rate, the GDP or NDP increases even when we are losing our valuable natural wealth. For estimating the green GDP or green NDP, usually the costs of natural resource depreciation and environmental degradation are deducted from the conventional GDP or NDP.

**Hedonic Pricing Method** — of economic valuation measures the economic value based on the difference of the property values between localities. For example, it is assumed that the improved environmental quality in a particular locality is reflected in the increased price of housings in cleaner localities. This method has been applied to measure the value of air and water quality improvements in the past.

**Market-Based Instruments (MBIs)** — are incentive-based systems which work through the relative changes in the prices of polluting inputs and commodities. The example of market-based policy instruments are prices, taxes and charges which are often considered more cost-effective for improving environmental quality and have been widely used in both the developed and some developing countries. These policy instruments can be implemented by re-adjusting fiscal policies and by introducing charges or taxes on pollution such as effluent charges based on the volumetric pricing mechanism.

**Opportunity Cost** — refers to the value of resources in their next best available use. For example, the opportunity cost of biodiversity conservation indicates the earnings forgone by the local people from the conversion of the same area of land for agriculture or other use. Alternatively, the opportunity cost of the conversion of forest lands into agriculture refers to the income lost from the use of same area for the conservation and sustainable utilization of biodiversity.

**Travel Cost Method** — is generally used to determine the value of recreational sites. The concept is based on the assumption that the number of trips to a particular site by people decreases with the distance and their willingness to pay for entry into the recreational sites depends upon their income, price of commodity and other socio-economic characteristics. This method may be useful for the economic valuation of national parks and protected areas.

**Willingness to Pay** — indicates how much value to people attach for the environmental services such as drinking water supply under the existing and

improved water supply conditions. It is assumed that peoples' WTP for improved environmental services depends on a number of factors—income, education, quality, reliability of the services, etc.

Founded in 1948, The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organisations in a unique world partnership: over 900 members in all, spread across some 138 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. A central secretariat coordinates the IUCN Programme and serves the Union membership, representing their views on the world stage and providing their goals. Through its six Commissions, IUCN draws together over 9,000 experts, volunteers in project teams and action groups, focusing in particular on species and biodiversity conservation and the management of habitat and natural resources. The Union has helped many countries to prepare National Conservation Strategies, and demonstrates the application of its knowledge forward by an expanding network of regional and country offices, located principally in developing countries.

The World Conservation Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

IUCN—The World Conservation Union officially launched the Nepal Country Office on 23 February 1995 with His Majesty's Government, Ministry of Finance as the government partner. IUCN Nepal has been developing partnerships with various government line agencies as well as non-governmental organisations to carry forward its activities to conserve Nepal's natural resources and ecological processes.

