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**SUSTAINABLE DEVELOPMENT AND
ENVIRONMENTAL ECONOMICS**

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Traditional development, which emphasizes growth in per capita income, has promoted an increase of global economic activity in the past few decades. However, those economic activities also have increased the scope and depth of environmental degradation. Countries are not able to cope with these problems as they have transcended geographical and generational borders (Tietenberg, 1994). Many developing countries are in a situation where they are depleting their natural stock at a much faster rate than the replenishment rate, and the income produced from those activities are not being converted to other types of capital. In addition, traditional development has not been able to address problems of intergenerational inequity, unequitable distribution of wealth, land and resources, population growth, and indeed may well have contributed to those problems. The difference in income between the upper 20% and the lower 20% of the global population is now at a ratio of 150:1, having doubled in 30 years (Pronk and Haq, 1992).

Human population is increasing at a rate faster than ever in history. An additional 90 million people will be born every year until the 21st Century. The number of malnourished people in Africa continues to increase, Asia supports the largest absolute undemourished population in the world and in the next fifty-five years the demand for food is expected to increase three-fold. Forest areas continue to be removed and degraded in all but a few tropical countries, and it is estimated that between 1980 and 1990 tropical forest areas have been reduced by an average of 15.4 million hectares per year (World Resources Institute, 1994). Desertification and degradation have claimed approximately 10% of the total fertile land available while soil erosion and siltation claim 8.5 million hectares a year. Over a billion people must fulfil their daily requirements for water with polluted water and twice as many are without sanitation facilities (Pronk and Haq, 1992).

On the other hand, only one-fifth of the global population live in developed countries, yet it consumes 70% of the world's energy, 75% of its metals, 85% of its wood and 60% of its food. If the population in developing countries were to live in the same manner, the use of fossil fuels would increase ten-fold and the mineral requirements would increase two hundred-fold (Pronk and Haq, 1992)! As population grew, the requirements would also grow. It is evident that it would be impossible to provide the same material consumption levels that exist in the developed world for the developing world. It is also evident that there is a direct link between resource use, environmental quality, and economic development.

Since the 1980's individuals and organizations began to hint at the need to make economic growth and environmental management compatible activities. The failure of traditional economic development to address issues of intergenerational inequity, income distribution and poverty, gave rise to the need for a new model of economic development which would provide long term growth potential and take into account environmental and social factors. A report prepared in 1987 by the World Commission on Environment and Development supported a model of "global sustainable development" which would ensure that economic growth and environmental management were compatible.

Sustainable development has been defined in many ways. One common definition is that sustainable development is the development path which maximizes the net long-term benefits to mankind (Ascher and Healy, 1990). The World Commission on Environment and Development (1987) defines sustainable development as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." In any case, sustainable development means development that is economically, socially and

Economic instruments include the application of the polluter pays principle and charging for the use of environmental goods and services, particularly those currently considered as free goods. They also include taxes, subsidies, user fees, charges, tradable permits, deposit-refund systems, performance bonds, rebates, packaging taxes, severance taxes on minerals, production

In the field of economic instruments for example, much has been developed in the last decade. After years of experience with command and control regulations and legislation, implementing institutions find they are necessary but not sufficient tools to bring about better environmental management and sustainable development. Often excessive reliance on them can be wasteful and inefficient in achieving the set environmental objectives. Economic instruments can supplement regulations.

The field of environmental economics studies matters concerning renewable and non-renewable resources, pollution and growth. Property rights, scarcity, prices, market failures, policy failures, population growth, environmental costs, extraction costs, substitute availability, tax policy, disposal costs, etc., are all factors that influence the proper management of environmental assets and are of concern to environmental economics. In the last twenty years ideas from environmental economics and the use of economic incentives have become more popular. Thanks to years of research and work in the field, there are more economic tools for environmental management available, and more and more institutions are beginning to test, implement and enforce these tools.

Environmental economics is addressing many of the issues that sustainable development is concerned about. The goal of environmental economics is to strike a balance between the preservation and use of environmental assets, through the efficient allocation of resources. By using economics as an analytical framework, one can study the relationships between the environmental and political and economic systems. The identification of situations that promote environmental problems (such as market failures), the identification of the underlying causes of those problems and the identification of the possible solutions to those problems is facilitated by economic analysis.

The international development community today is concerned about issues such as poverty, environmental degradation, fair distribution of the world's resources, consumption and production patterns, and basic political, economic, cultural and social rights, in addition to economic improvement in developing countries. Sustainable development does not mean condemning developing countries to poverty forever. No one can argue legitimately that to be able to support social progress and long term environmental protection, sustained increases in per capita income are not necessary. Growth is a necessary part of sustainable development, but it is one which is achieved with equity, participation of all sectors of society, wise use of natural resources and environmental preservation, because better resource and environmental management can promote income growth (Ascher and Healy, 1990). It is no longer adequate to solely focus on per capita income growth in developing countries; the development community should now place much more attention on type of growth rather than how much growth.

ecologically sustainable. It is now generally believed that a country must meet its population's social and environmental needs such as education, employment, low population growth and a sustained natural resource endowment as well as its economic needs. It is no longer feasible for current generations to satisfy their own needs without being concerned about the needs of future generations. Economic, fiscal, trade, energy, agricultural, industrial and other policies must take into account the needs and welfare of future generations, as they cannot speak for themselves.

taxes on toxic substances, effluent or emission taxes on toxic substances, taxes on fossil fuels, emissions trading, etc. They serve in part as incentives to private enterprises and households to take the right action for environmental management. Those who advocate the use of economic instruments encourage taxes on environmental impacting activities as opposed to taxes on labor and capital. Economic instruments can be used also as a means to raise funds for government coffers which can be spent on environmental management programmes.

Fiscal policies, prices, and the functioning of market mechanisms have an important role in influencing attitudes towards the environment. Within an appropriate legislative context, economic and market-based approaches can be used to provide cost-effective solutions, encourage the introduction of environmentally sound technologies, and apply integrated pollution prevention control measures. Economic instruments can be used as tools to integrate the social and environmental costs into economic activities thus reflecting the true value of natural resources and the cost of development programmes.

Another aim of economic instruments is the internalization of externalities. An externality occurs when a firm or household does not bear the full cost of their activities. Product prices must adequately reflect the full environmental cost (i.e., pollution generation) of their production. It is quite clear that most consumers do not have knowledge of the full costs involved in the production of the products they use; and therefore are unable to make informed decisions about their purchases. Once full cost pricing is implemented, or in other words costs are fully internalized, market forces will make heavily polluting and wasteful industries obsolete and encourage environmentally sound ones. The task for industries to implement full cost pricing is to take into consideration the cost of pollution in their accounting procedures and by adopting pollution prevention practices.

Governments also play a role by implementing new economic instruments such as taxes and charges and changing regulatory policies to promote a less adversarial relationship with industry. In the case of full cost pricing as well, economic instruments are used to encourage industries to internalize the environmental costs of their activities. Emission and energy taxes, and taxes on raw materials and toxic substances are enforced in order to encourage industry to reduce regular and toxic emissions, lower production inputs and discourage wasteful practices and energy inefficiency. Distortionary subsidies such as tax incentives for extractive activities and low water and energy charges are to be removed. Those types of subsidies and low charges cause increased resource extraction and use which are in direct conflict with environmental objectives (Panayotou, 1994).

Another concern for environmental economics is the field of national income accounting. As a result of increasing environmental awareness over the last few decades, the need to account for the contributions of activities made by all sectors of the economy and their impact on resource depletion and degradation has become increasingly apparent. The current national accounts system provides misleading information on national economic growth. The system does not differentiate between economic growth due to increases in income and economic growth due to the use and degradation of the natural stock or natural capital of a country. The natural stock includes air, water, biodiversity, soil, forests, all of which are national assets. The commonly used depreciation adjustment for man-made assets is not applied to natural assets in the national income accounts, in fact, their depreciation is estimated as income as it is the result of economic activity (Tietenberg, 1994). Since sustainable development includes social, economic and environmental dimensions, it is essential that national income accounting reflect the degradation and depletion of natural resources. As the current system of national accounts (SNA) does not

take these considerations into account, various approaches to environmental and resource accounting (ERA) have been proposed.

The UN Statistical Office developed a system of integrated environmental and economic accounting (SIEEA) which was elaborated in a handbook. The SIEEA attempts to amalgamate and integrate the different approaches in natural resource and environmental accounting in a module presentation. Clearly, techniques for the application of ERA will continue to undergo further development and refinement. However, this should not be used as an argument for inaction. ERA provides a useful instrument for assisting countries to achieve sustainable development. Moreover, the application of ERA is regarded as an evolutionary process in the development of effective accounting of the relationship between the economy and the environment. It is necessary to estimate the depreciation associated with deforestation, soil depletion and pollution, and include it in the national accounts; such depreciation represents a reduction in the national natural resource assets.

Economic instruments, environmental impact assessments, natural resource accounting, and other policy instruments are tools which are used to achieve environmental objectives. For such instruments to be efficient and effective, they need to take into account the full social, economic, and environmental costs of drawing on natural resources and environmental goods and services, including those which are considered free (i.e., air, water, soil, the ozone layer).

Estimating the full social and economic costs of environmental degradation, the value or benefit of environmental enhancement, and the true costs and benefits of utilizing natural resources has been a major challenge. This includes the value of clean air, clean water, fertile soil, watersheds, and forests. Environmental economics provides a framework for the estimation of these values in the application of environmental and natural resource valuation. Environmental and natural resource valuation is an economic tool which is composed of several techniques created to assign a price for resources for which no explicit price exists. For example, valuation is useful in estimating the value of the various environmental services provided by forests, the value of timber that forests can supply, their role as reservoirs of biological diversity, their value as a habitat for indigenous people, plants and animals, the role forests play in water retention and as environmental sinks for CO₂ and other greenhouse gas emissions, and their cultural, aesthetic and scenic values. Valuation of environmental resources, amenities and services is critical to guiding the allocation of investment resources to meet the environmental management needs for sustainable development, to provide pricing of utilities and services to improve economic efficiency and environmental management and for the integration of environmental and natural resource accounting in national income accounting.

It is clear that there is an intricate relationship between economics and the environment. It is also evident that there is a need for their integration in order to achieve environmentally sound and sustainable development. The incorporation of social, environmental and equity issues into economic development is a necessary step; not only to ensure that future generations will not be worse off than current generations, but also to ensure that the present world's population will be able to enjoy a higher standard of living and improved quality of life without irreversible damage to the environment.

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