SUSTAINABLE DEVELOPMENT, ENVIRONMENTAL REGULATION, AND INTERNATIONAL TRADE

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Summary

Economic activity typically takes place as part of a system known as the natural environment. Therefore, any economic activity is likely to affect the environment. Further, the interdependency between economic activity and the environment can be complex. This article provides an overview of the important issues related to the environment and development. We begin with a brief discussion of sustainable development. We then discuss the relationship between the environment and development emphasizing the effect of population growth and international trade on environmental quality and the non-monotonic relationship between the environment and development. We conclude with a discussion of the relationship between institutions and the environment with a special focus on the mechanisms of environmental regulation.

1. Introduction

Environmental problems are typically associated with resources that under normal circumstances regenerate themselves (termed renewable natural resources) but that are in danger of exhaustion from excessive use. Possibly the best example of such a resource is the earth's atmosphere. Normally the earth's atmosphere regenerates itself, but the speed of regeneration depends on the current state of the atmosphere, the rate of

pollution emission, and so on.

Economic activity takes place as part of a system that is known as the natural environment. Clearly, therefore, any economic activity will significantly affect the environment. All economic activities can be classified under one of two categories: production and consumption. Both of these types of activities can significantly affect the environment. Further, the interdependency between economic activity and the environment is often pervasive and can be complex. The act of production and consumption affects the environment in a number of different ways. Often, environmental resources are used as inputs in the production process. Both consumption and production give rise to waste that is released into the environment. Consumption also directly uses a flow of services from the environment to individuals without the intermediation of production activities. On the other hand, environmental quality can significantly affect both forms of economic activity. For example, declining environmental quality can have adverse health effects on individuals. Resources then might have to be diverted from (potentially) more productive activities to measures aimed at improving the health of the population.

The world's resource base is limited and contains a complex and interrelated set of ecosystems that are now exhibiting signs of fragility. It is therefore relevant to ask whether the global economic system can continue to grow (as is required to satisfy the material demands of the ever growing world population) without severely undermining its very basis—the natural environment.

This article provides an overview of the important issues relating to sustainability and development. Section 2 examines the relationship between the environment and development, beginning with a brief discussion of sustainable development. Ensuring sustainable development is particularly important in developing economies, where population pressure and widespread poverty have increased pressures on the stock of natural resources. Sections 2.2 and 2.3 discuss the relationship between the environment and development in developing countries and the role of population in this relationship. The relationship between international trade and the environment is then discussed. International trade is often viewed as a panacea for developing countries (the hypothesis of trade as an engine of growth). But increasing international trade in goods and services can also be associated with increasing transmission of pollution across international borders. This is known as the problem of transboundary pollution. The fact that environmental regulations are not uniform across nations can add to the problem of transboundary pollution because of the migration of dirty industries from countries with more strict environmental regulations (typically the more developed countries) to countries where environmental regulations are lax (typically the developing countries). This section concludes with a brief discussion of the past relationship between economic growth and the environment as summarized by the environmental Kuznets curve hypothesis.

Section 3 discusses the relationship between institutions and the environment. It is often argued that environmental problems are more severe in developing countries than in developed countries because of inadequately defined property rights. This issue, along with the different approaches to environmental regulation, is examined in this section.

2. The Environment and Development

2.1. Sustainable Development

The World Commission on Environment and Development defined sustainable development as that which "meets the needs for the present without compromising the ability of future generations to meet their own needs." Essentially this means that the process of improving present living standards should not be at the expense of the living standards of future generations. The issue in question is the trade-off of present against future welfare. Two important questions arise:

- Should a society be willing to accept a lower standard of welfare now so that future generations can enjoy a higher welfare level?
- What are the costs of improving present living standards at the cost of slightly lower welfare in the future?

These are not new questions. Growth theorists have long been concerned with the issue of the present versus the future trade-off. The standard neoclassical growth theory starts with the premise that current savings and current consumption are substitutes, and current savings are a crucial determinant of future growth (and hence higher living standards in the future). Higher income levels and consequently higher living standards in the future are therefore attainable at the cost of higher current savings, but then the proportion of current income that can be saved is constrained by the minimum consumption requirements of the present generation. Neoclassical growth theory therefore attempts to obtain an optimal level of savings to maximize the net benefit—a weighted lifetime benefit function that takes into account the requirements of both present and future generations.

The issue of "sustainable development" merely adds another dimension to this problem. Essentially, if living standards are not to decline over time then future generations must have access to as effective a resource base as current generations do. However, while the effectiveness of a particular resource base is known to the present generation, there is significant uncertainty about the future effectiveness of the same resource base. This is because the effectiveness of any resource base depends on the level of technological development and on how the different components of the resource base (human-made capital, exhaustible resources, and renewable resources) complement each other to satisfy the requirements of future generations. The level of technological development in the future and the relative importance of the three components of the resource base are "unknowns" to the present generation. Additionally there are problems with the design of an effective valuation methodology of future resource bases.

The notion of sustainable development is based on the argument that earlier generations should be free to pursue their own well-being as long as they do not reduce the welfare of future generations. This leads to three alternative definitions of sustainable allocations.

1. Weak sustainability: Resource use by the present generation should not exceed a level that would prevent future generations from achieving a level of well-being at least

as great as that attained by the present generation. One important implication of this definition is that the total value of capital stock (natural plus physical capital) must not decline. Individual components can decline, though this decline needs to be compensated by an increase in the value of the other components (through the act of investment) sufficient to leave the total value unchanged.

2. Strong sustainability: According to this definition of sustainable development, the value of the remaining stock of natural capital must not decline. This definition places particular emphasis on preserving natural and not just total capital because it is argued that natural and physical capital are not perfect substitutes and the loss of specific components of environmental capital cannot simply be compensated by an increase in the level of physical capital.

3. Environmental sustainability: Under this definition, the physical flows of individual resources need to be maintained, not merely the value of the aggregate. For example, in the case of a wetland, the focus should be on the preservation of its ecological functions.

It is possible to examine the theoretical conditions that characterize the different allocations (including market allocations and efficient allocations) and compare them to the conditions necessary for an allocation to be sustainable under the alternative definitions. In general, not all efficient allocations are sustainable and not all sustainable allocations are efficient. Market allocations can therefore be: (1) efficient but not sustainable; (2) sustainable but not efficient; (3) inefficient and unsustainable; and (4) efficient and sustainable. Only case (4) can be termed a win-win solution that allows a simultaneous increase in the welfare of both current and future generations.

This leads us to an extremely important question. How does one put into operation the notion of sustainable development? One simple working definition of sustainable development is that the total value of the stock of the capital must not decline over time. There are, however, problems with this definition.

- The problems associated with valuing the environment imply that environmental capital would not be given adequate importance in the make-up of the total capital stock.
- Several components of the environmental capital stock have a natural limited capacity that must not be exceeded. If this limit is exceeded, then there can be significant adverse effects on existing ecosystems. To impose constraints on the use of certain environmental capital one needs to add to the value of capital stock at any point of time a set of indicators of environmental resources showing the limits that must not be exceeded.

While there are difficulties in providing a working definition of sustainable development, one can develop certain working rules as necessary conditions of sustainable development. The three most important are equity, resilience, and efficiency.

Equity: It is argued (in most cases correctly) that a declining and degrading natural

resource base is more likely if the interests and needs of the poorest segments of the population are not taken into account (P. Dasgupta and K.-G. Mäler).

Resilience: Resilience is defined as the capacity of a system to maintain its structure and patterns of behavior in the face of external disturbance. This requires an ability to adapt in a way that is distinct from ecological stability. Ecological stability, it might be noted, refers to the capacity of a system to maintain its equilibrium in response to normal fluctuations in the environment. The concept of resilience is particularly relevant in agriculture, where it is important that an agricultural system maintain its productivity in the face of a stress or a shock. If such systems lose their resilience, then they are rendered more susceptible to other shocks.

Efficiency: Development implies rising living standards and the policies pursued to attain the highest living standards need to be consistent with whatever constraints the criterion of sustainable development imposes. Whatever the objective function policy makers seek to maximize, the pursuit of sustainable development requires an efficient use of existing natural resources (i.e. the greatest value must be obtained from any given input). To achieve this objective, policy makers have to use a set of allocative instruments including prices, taxes, and other fiscal controls (or a combination of all these instruments) and they also need to regulate resource use with a greater appreciation of the benefits and costs of the regulations.

To achieve these three working definitions of sustainable development, one needs to identify actions to be taken. Three possible actions are significant: valuation, regulation, and monitoring.

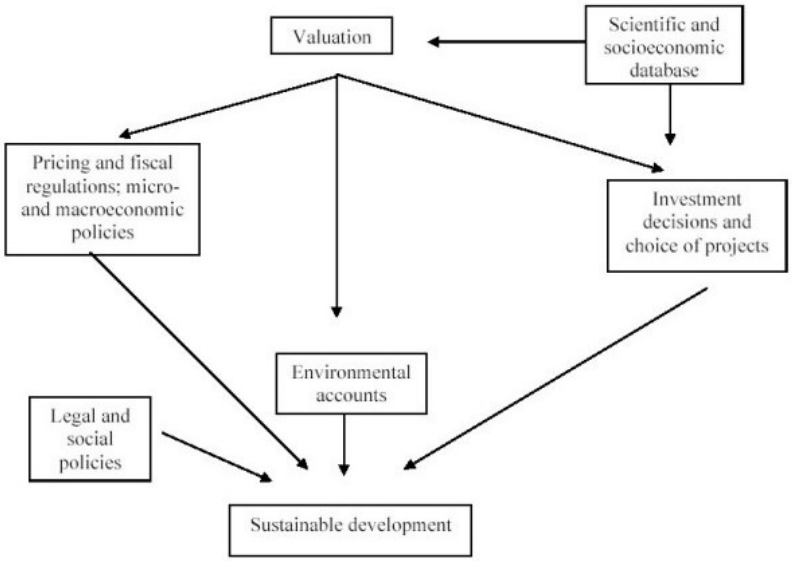

Figure 1. Broad policies for sustainable development: a schematic representation (*Source*: P.K. Rao, *Sustainable Development: Economics and Policy* (Malden, Mass.: Blackwell, 2000), Figure 3.3, p. 91)

Valuation: It is important that natural resources are valued correctly and such valuation should account for all services performed by the resource, including those that do not result in cash flows or market activities. Such activity ensures that key elements in the

natural resource and environmental make-up are given due weight in the definition of total benefit from the stock of capital. The valuation process in turn leads to two regulatory activities—pricing and investment analysis. On the pricing side, such valuation allows decisions on pricing, taxation, and other subsidies to be made in a rational manner. On the investment side, it feeds into project appraisal activities that determine how capital funds are allocated between development activities and between development activities and others that relate to environmental protection and conservation.

Regulation: While correct valuation of natural resources is necessary for sustainable development, it is not sufficient. Proper valuation must be backed up by proper regulatory activities, and this includes putting in place a legal and social framework. Economic, social, and legal policies need to act together to ensure more sustainable resource use.

Monitoring: Even the weak definition of environmental sustainability requires that the future not be left with a smaller resource base than the present. It follows that per capita consumption (the most widely accepted measure of living standards) must not decline over time. This leads to the question of how to account for environmental resources in this consumption measure since environmental and natural resources are not generally valued in the system of national accounts for most countries. While some progress has been made (the national accounts of some countries include stock of natural resources), much more needs to be done.

Figure 1 illustrates these three broad policy measures and how their relationships add to the pursuit of a policy of sustainable development.

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Biographical Sketch

Pushkar Maitra is a senior lecturer in the Department of Economics, Monash University, Australia. He completed his Ph.D. in economics from the University of Southern California, Los Angeles, in 1997 and since then has held faculty positions at the University of Sydney, Australia, and Monash University. His primary areas of research are development economics, economic growth, and population economics. He has presented papers at a number of well-known general and field conferences in the United States, Australia, India, and Europe and has been invited to present seminars in several universities in those countries. He has served as a referee for a number of respected international journals and was on the organizing committee of the 27th Conference of Economists held at the University of Sydney in September 1998 and is a member of the organizing committee for the Econometric Society Australasian Meetings to be held at Monash University in 2004.