Chapter II

THE SUSTAINABILITY OF DEVELOPMENT: BEYOND NATURAL CAPITAL

Whereas traditional growth theory sought to determine the optimum speed of capital formation, more modern approaches focus on the sustainability of development and seek to determine what kinds of capital need to be formed and for how long.

1. Introduction

At a time when the countries of the region are still striving to attain a reasonable level of growth and social equity, a new dimension of development has come to the fore: sustainability. Although the World Commission on Environment and Development has proposed a definition of the concept,[1] no consensus yet exists as to its meaning or implications, despite the fact that the terms "environmental sustainability" and "sustainable development" are employed in almost all the more recent writings on development strategy. This chapter will not attempt to lay to rest the controversy surrounding this subject, but it will explore its most relevant aspects.

A wide range of examples can be cited of areas in which the sustainability of development is a concern. A few such examples are the following:

The analysis of the long-term consequences of economic policies, investments and institutional reforms;

The evaluation of different development styles' impacts on the well-being of future generations;

The identification of non-traditional capital goods (fish, forests, soils) with a view to their incorporation into the evaluation of development or resource allocation schemes; and

The recognition of the pivotal role played by natural capital or heritage in providing important benefits to society.

The studies conducted in the region have approached the issue of sustainable development from two different angles. *The first focuses on the environmental dimensions of economic and social development.* In this case, the foundations of sustainable development are primarily expressed in certain conventions or "working rules" which constitute a specific approach to the analysis of the subject. The most orthodox of these working rules define sustainable economic and social development as an activity which does not violate certain laws of nature. If these laws are contravened as a result of the over-exploitation of some resource, then a process of environmental degradation will be set in motion which, in some cases, may be irreversible.

This line of thinking is not new. The literature of the sciences of biology, physics and chemistry has been making valuable contributions to its development for many years now. In fact, the concept of sustainability, in its most elemental form, comes from the biological sciences. Thus, the procedure used for assessing the conservation or abuse of a resource calls for the adaptation of these working rules to the natural patterns and characteristics of the resource in question. These

types of assessments give rise to specific recommendations concerning such aspects as a resource's optimal use, acceptable forms of exploitation, levels of investment, etc. In the case of renewable natural resources, these working rules include the recommendation that use rates should not exceed a given "critical zone" in the flow of the resource because higher use rates could lead to its eventual disappearance. This critical zone is referred to as the "maximum sustainable yield" or "maximum use capacity".[2] In other cases these rules entail a recommendation that a resource's productive capacity should be restored, which is, given the cost of the necessary technology, generally an extremely expensive undertaking.

The agreements reached among specialists as to a given resource's levels of sustainability vary depending upon the quality and quantity of the existing information, the extent of knowledge about the resource in question, and the way in which exogenous phenomena that affect it are evaluated.

"Exogenous" phenomena are all those which operate outside the framework of the above-mentioned working rules. Hence, for example, the human population is an exogenous phenomenon because it does not follow the natural pattern of the resource as such. Nonetheless, as is well known, it is precisely the human population itself which is the primary subject of development. Examples of specific activities to which these working rules have given rise include forest conservation programmes, the closure of grazing areas and the protection –sometimes regardless of the cost– of the productive potential of these resources. The institutional manifestation of such activities is often sizeable, as in the case of the creation of departments of forestry management which, in some instances, constitute veritable armies of forestry-resource defence forces. This also occurs with respect to other resources such as fisheries, and in both cases these types of activities usually place a heavy burden on the fiscal budgets of countries deciding to use such options.

As a greater awareness of the need for the public to participate in development emerges, these orthodox working rules become less relevant. It is no longer possible to continue to believe that economic potential invariably runs counter to conservation. This is far more than just a political issue. The survival of existing resources is at stake. This new focus on sustainability tends to become increasingly complex, however, as other working rules which influence resource management and use are introduced, such as those relating to the participation of the citizenry, policies and institutions. Under such circumstances, in order to achieve sustainable development we will have to succeed in reconciling the two types of working rules –those that focus solely on the resource itself, and those which combine that focus with considerations relating to the participation of those who use the resource.

The second approach addresses the question of sustainability by analysing development in terms of space and time. This focus is reflected in much of the work being done in the region, such as, for example, studies to ascertain why certain investment projects deteriorate or disappear before the end of the estimated life of the project as calculated during the design stage [3] (see box II-1).

This topic is not new to the region either, since the region has had ample experience with development initiatives that have failed for reasons that go beyond the natural and environmental capital involved. These failures have, *inter alia*, been due to an absence of suitable institutions, shortcomings on the part of the human capital involved, a policy of incentives that works against sustainability, or a lack of the necessary physical and financial resources to sustain the development effort.

A review of these two concepts of sustainable development reveals a number of noteworthy points, some of the most valuable of which are the following:

The phenomenon of sustainability cannot be understood solely at the microeconomic level because, as has become evident during the past two decades, sustainability largely depends on sectoral and macroeconomic factors. For example, the external debt burden tends to cause support to be withdrawn from long-term

Box II-1

SHORTENING OF THE USEFUL LIFE OF RESERVOIRS

Many reservoirs which have been constructed in Latin America and the Caribbean without steps having been taken beforehand to control erosion in the corresponding catchment basins are silting up much more quickly than expected. In countries which have few dam sites and relatively short rivers, as is the case in Central America and the Caribbean, this phenomenon is particularly serious when the land's protective cover is stripped away. In Guatemala, for example, annual soil runoff in areas which still have some plant cover ranges from 20 to 300 metric tons per hectare, but in areas where slash and burn agriculture has destroyed the vegetation, the rate of erosion climbs to between 700 and 1 110 metric tons per hectare.

A recent study of the reservoir for Guatemala's Pueblo Viejo-Quixal hydroelectric plant reveals the existence of a rapid process of sedimentation which could shorten the useful life of the system and destroy the plant's generating capacity. If this situation is not corrected, the cost of generating the plant's projected power output will rise to over US$100 million. Meanwhile, the carrying capacity of the Montagua River, which is also in Guatemala, was reduced by 50% between 1960 and 1980 as a result of silt deposits in the riverbed. In Costa Rica, lost revenue due to silting at just one hydroelectric plant has been estimated at between US$133 million and US$274 million annually.

Problems of this type do not respect national borders when a basin is located in more than one country. The Lempa River, for example, begins in Guatemala and Honduras but flows into El Salvador. Although it constitutes the drainage system for 49% of El Salvador's territory and provides 93% of its hydropower generating capacity, 8 000 km^2 of the upper reaches of the basin's total area of 18 000 km^2 are located outside Salvadorian territory. The case whose international implications are potentially the most far-reaching, however, is the siltation of the lake that supplies the water needed to operate the Panama Canal.

Source: H. Jeffrey Leonard, *Natural Resources and Economic Development in Central America. A Regional Environmental Profile*, Washington, D.C., International Institute for Environment and Development, 1987.

environmental programmes due to the shortage of fiscal resources which it engenders.

The ability to sustain a development activity depends on the level and performance of other activities within the economy. The achievement of a sustainable level of development therefore requires a recognition of the intersectoral, national and international linkages that are involved; the simple fact that ecosystems do not conform to man-made boundaries is enough to demonstrate the need to consider these relationships. This is also true of air pollution, marine pollution, the depletion of the ozone layer and the greenhouse effect.

This second general observation relates to various dimensions of the issue. One such dimension is brought out by the fact that an evaluation of levels of sustainability must go beyond the specific activity in question. What is being evaluated is not a natural resource or a specific environmental variable but rather a dimension that relates to an entire set of development activities (see box II-2). Hence, intra- and inter-sectoral relationships are more important than they were portrayed as being by traditional economic thinking. Forestry policies are one example: although such policies may have been designed and implemented for the purpose of achieving a sustainable form of development, experiences in the region have shown that if these policies are accompanied by policies aimed at expanding the agricultural frontier, it will be virtually impossible to protect forest resources. Similarly, a policy designed to control air pollution in a city by rationalizing automobile use and transport in general may be undermined by another policy which dispenses with environmental standards in an effort to promote industrial development.

The analysis and evaluation of the sustainability of development should figure as one of the main topics of discussion in the dialogue between lending nations, continents, and international institutions and the countries of the region. This dialogue is likely to revolve around the following aspects: i) the relationships between external investments and the various economic

Box II-2
FORCES GIVING RISE TO THE ENVIRONMENTAL DETERIORATION OF THE AMAZON BASIN

The main environmental impacts of the agricultural settlement of the Amazon basin are the result of the destruction of the forest in the areas of dry land within the basin and of subsequent attempts to introduce inappropriate agricultural crops, practices and methods in the areas that have been cleared.

In assessing the environmental impact of this process, it is necessary to distinguish between the activities of small-scale farmers (homesteaders participating in land settlement projects, squatters) and those of large-scale agricultural projects.

a) *The impact of small-scale farming*

Generally speaking, small-scale farmers use slash and burn agricultural methods to grow subsistence crops; the impact of this method of farming on the environment depends on the population density of the area in which it is used. The natural fertility of the soil decreases sharply two or three years after the land has been cleared, whereupon the farmers abandon their plots and go on to clear and settle other, more remote tracts of land. The forest grows back on the abandoned plots, but if the pressure of the population is intense, the amount of time they lie fallow will be shorter and they will be farmed more intensively, and the soil will therefore not have a chance to recover. This is what has happened in a large part of the area along the agricultural frontier.

b) *The impact of large-scale agriculture*

In the early 1980s the average area of approved projects (which ranged from 4 000 to 200 000 hectares) was 27 300 hectares. Most of the projects of the Development Agency for the Amazon Region (SUDAM) call for the clearing of extensive tracts of land which are then planted with grasses suitable for grazing. The way in which this programme has functioned has permitted the clearing of such land regardless of meat prices and the market conditions for these products. In addition, due to the limited supervisory powers of the authorities, most of the livestock-raising activities which have been introduced are not suited to the ecological conditions of the newly-cleared areas.

The difficulties encountered by many livestock-raising projects have chiefly stemmed from the fact that the methods and practices developed in the central and southern zones of the country are inappropriate in the Amazon basin. One of the main problems lies in the fragility of the soil in the basin, which, once exposed, is subject to rapid deterioration unless special precautions have been taken when clearing the land.

The increasing importance of land in the investment portfolios of large-scale enterprises, the provision of credit on attractive terms for investment in the Amazon basin, the low taxes levied on capital gains, and the minimal extent of oversight and control of land acquisition have together given rise to a speculative demand unparalleled in the history of Brazil.

Source: Mueller, Charles (1983), "El estado y la expansión de la frontera agrícola en la Amazonia", *Expansión de la frontera agropecuaria y medio ambiente en América Latina*, ECLAC/UNEP, Madrid, International Centre for Training in the Environmental Sciences (CIFCA), 1983.

activities; ii) the role played by what might be called "non-traditional forms of capital", which are not necessarily quantifiable but which are nonetheless essential, such as the institutional setting, the natural resource base or natural capital, and cultural assets; iii) the role of the "time" variable and how it affects medium- and long-term decisions; iv) the legitimacy of certain types of economic appraisals which are based on stocks of physical and financial capital and their rates of return; v) a systematic quantification of external and indirect impacts; and vi) a number of other aspects which are difficult to quantify in monetary terms.

Taking these assessments into consideration, on the basis of the work done by ECLAC and other international bodies, it can be asserted that *sustainable development requires a dynamic balance among all the forms of capital or assets involved in the countries' economic and social development effort* so that the resulting use rate for each form of capital will not exceed its own reproduction rate, taking into account the substitutive or complementary relationships existing among them. The most important forms of capital include human capital (where people also constitute the subject of development), natural capital, institutional capital (decision-

making systems), cultural capital, physical capital (infrastructure, machinery and equipment, etc.) and financial capital.

This view of sustainable development, which focuses on the need for a dynamic balance among all the forms of capital involved, highlights a series of elements which are necessary in order to succeed in changing production patterns with social equity. One of the chief such elements is the possibility of placing environmental issues within the setting of development so that development and environment become two dimensions of a single, indivisible reality (see box II-3).

2. Implications of the approach

An historical review of the allocation of different types of capital to the development effort reveals a number of major stages in the economic evolution of the region. Traditional theories of economic growth emphasized, in practice, just one dimension of development: the optimum amount and speed of capital formation.

Box II-3
TOWARDS SUSTAINED AGRICULTURAL DEVELOPMENT

Various studies have shown how the use of policy instruments often distorts the opportunity costs of natural resources and consequently encourages their neglect or over-exploitation.* Such instruments as subsidies, prices, taxes and credit systems affect the structure of incentives that economic agents most deal with, thus influencing their behaviour and indirectly affecting the rate of environmental degradation and, in particular, the problems of sustained agricultural development. The decisions of economic agents which result in the inappropriate use of resources and the inefficiency of many agricultural practices are due to the natural tendency to seek to further short-term interests in the light of the "wrong signals" given by the economic policies in question.

The paragraphs below describe how the use of policy instruments such as prices, subsidies, credit and taxes has a direct or indirect influence on the use of natural resources. An analysis is then made of some constraints on the correction of these distortions and the many policy recommendations which have emerged in past decades.

Experience of three sectoral policies

Prices and subsidies: The policies followed by many countries of the region with regard to prices and subsidies have led to inefficiency and resource allocation problems.** In some cases these policies have discriminated against the agricultural sector in favour of urban activities, with the result that big farmers have increased their production on more extensive lines, with a lower labour/land ratio, which seems to have led to an increase in rural poverty and environmental degradation. In other cases, subsidies for the production of basic grains have contributed indirectly to the deterioration of natural resources by encouraging the use of marginal areas where agricultural practices are not, generally speaking, sustainable. Moreover, although these subsidies were designed to relieve rural poverty, their main beneficiaries have been the big farmers, since it is they who have access to the land. In the case of Haiti, for example, import restrictions artificially kept up the prices of grains such as maize and beans, until 1985, thus encouraging their production to the detriment of coffee, which was subject to a high export duty. This policy indirectly accelerated soil erosion, since coffee bushes hold the soil in place better than the cultivation of such grains.

Land taxes: In a large number of countries of the region, land taxes had not given the right signals to encourage a form of land use in keeping with sustained agricultural development. The evidence indicates, for example, that these taxes have not served to promote agricultural activities other than extensive livestock-raising, which uses big areas of more fertile land and exerts pressure on the use of marginal land, thus accelerating ecological deterioration. Generally speaking, the region's experience with these taxes has not been very satisfactory, either from the point of view of tax revenue or as instruments to bring about the proper management of natural resources. On the one hand, the evidence indicates that the high rates of inflation suffered by many countries in recent years have significantly eroded the tax base, so that the proportion of government income coming from this source has gone down from 15-20% to 1-2%. On the other hand, the traditional difficulties in applying direct taxes, together with the rather unsuccessful attempts to increase tax rates in rural areas, have caused the very possibility of the effective reassignment of resources through such instruments to be called into question.

Credit policies: The distortions created by credit policies in the region have been analysed on numerous occasions. On the one hand, policies designed to provide subsidized credit for agricultural activities have helped to distort the opportunity cost of resources, thus resulting in the misuse of the latter. The evidence indicates, for example, that the granting of subsidized credits for the development of livestock-raising in countries

such as Brazil and Costa Rica has encouraged the expansion of a non-sustainable form of agriculture which has contributed to the deterioration of the tropical forests. At the same time, however, difficulties in gaining access to agricultural credit, whether subsidized or not, can also be an obstacle to sustained development. This has been indicated as one of the serious problems in Haiti, where it is estimated that only 10% to 15% of the rural population has access to institutional credit, thus limiting investments which could increase agricultural productivity.

* Robert Repetto, *Economic Policy Reform for Natural Resource Conservation*, Environment Department Working Paper No. 4, Washington, D.C., World Bank, 1988; G. Foy and H. Daly, *Allocation, Distribution and Scale as Determinants of Environmental Degradation: Case Studies of Haiti, El Salvador and Costa Rica*, Environment Department Working Paper No. 16, Washington, D.C., World Bank, 1989, and Hans P. Binswanger, *Brazilian Policies that Encourage Deforestation in the Amazon*, Environment Department Working Paper No. 19, Washington, D.C., World Bank, 1989.

** Based on "Sustainable Agricultural and Rural Development in Latin America and the Caribbean", Regional Document No. 3, FAO/Netherlands International Conference on Agriculture and the Environment, 8-12 October 1990.

This concern with rapid capital formation led to the expansion of the capacity for its formation, based on the hypothesis that there was a shortage of physical capital (infrastructure, bridges, roadways, hydroelectric plants, etc.) and of financial capital. Accordingly, until the 1970s development activities were aimed in this direction.

The other side of this hypothesis was that all other forms of capital were in abundant supply. Obviously, however, the sustainable development cannot be thought of solely as a function of the quantity and quality of natural capital. To do so would lead to a repetition of the same mistakes as those inevitably engendered by the approaches which sought to "optimize" physical and financial capital. An extreme example of the outcome of this type of thinking is provided by programmes designed to develop certain types of natural resources, such as those which have been implemented to protect native forests in countries that have very meagre supplies of human, institutional or financial capital. In such cases, the result is almost always the same: the development effort cannot be sustained.

An examination of experiences with a large number of projects designed to improve environmental conditions leads to the conclusion that the crucial elements in determining sustainability are always, in essence, human and institutional factors.[4] Consequently, environmental sustainability hinges on systems for assigning property rights and tenancy, economic and social incentives, economic and resource management and the roles of the different actors in the system, such as the State, businesses, communities of various types, and people.

With respect to the question of financing, it is important to remember that environmental programmes are usually long-term plans, and as such require financing over longer periods than those provided for within the context of administrative cycles. A lack of financing produces severe distortions in terms of the achievement of such programmes' proposed objectives, as will be discussed in depth in chapter VIII.

As noted earlier, a basic requirement of a strategy for achieving sustainable development is that all forms of capital should be represented, and it is therefore important to ascertain where imbalances exist, whether in natural or other forms of capital. No targets of any sort will be achieved if no natural capital is available, but the same thing will also occur if there is a partial or total lack of some other form of capital. These types of imbalances are illustrated in the boxes included in this chapter (see boxes II-1, II-2 and II-3).

As may be seen from these specific examples, the central question asked by traditional growth theory is not enough to lay the foundations for sustainable development. A different approach is needed, and different questions must therefore be

asked. One of these is the following: *What types of capital should be formed or increased and for how long?* Whereas the traditional approach emphasized the rate of capital formation, this question basically refers to the optimum composition of capital formation, and thus opens up the possibility of a more detailed analysis of the trade-offs among growth, social equity and sustainability.

This focus on the relationships among various forms of capital underscores aspects which are usually overlooked or underestimated. This is especially the case in appraisals of the economic efficiency of physical or financial capital, which generally disregard the fact that the economic efficiency of such capital depends on the quantity and quality of the other forms of capital (human and natural capital) and institutional and cultural resources. The ECLAC secretariat regards these relationships as one of the pivotal issues to be considered in the negotiations leading up to the United Nations Conference to be held in Brazil in 1992. It is essential that an understanding of these relationships be attained by that time, since they will constitute the basis for the formulation of plans of action which will be in keeping with the realities of the region.

The most important types of relationships among the various forms of capital are those of *complementarity and substitution*. Most of the differences of opinion as to how sustainable development is to be achieved are related to differing ideas about the degree of complementarity and substitutability existing among natural capital, institutional capital and the remaining forms of capital.

Although technological progress opens up the possibility of increasing the substitutability of various forms of capital and their rates of reproduction to some extent, as the evaluation of the region's experience progresses it is becoming apparent that the degree of substitutability is extremely low, especially when it is a question of conserving biological or cultural diversity. In the worst of cases, natural resources are irreplaceable; in the best of cases, they can only be rebuilt at a very high cost.

3. Micro and macroeconomic equilibria

The *microeconomic dimension* comes into play when a given activity falls within the immediate boundaries of the resource in question. In this case, economic agents have a direct relationship with the environmental or natural resource system. The link between economic agents and natural resources does not pose a problem in the region, since it is generally recognized. The problems arise when it is a question of understanding how natural ecosystems function and the nature of their relationship with economic systems. Unfortunately, the amount of information we have about these relationships and the extent to which they are monitored are negligible, and as a result certain circumstances go unrecognized when the time comes to take decisions.

It is at this point that the *macroeconomic dimension* becomes highly important, since the activities of the individual agents of development should all be directed towards the social and economic objectives of the nation concerned. Moreover, a balance between the micro and macro levels may increase the possibility of ensuring that the country's economic policy will take both present and future generations into consideration

The materialization of this macroeconomic dimension is brought about by means of changes in policies and investment strategies, and through institutional and social changes. Environmental macroeconomics is a new field which is beginning to take on great importance precisely because its aim is to achieve a rational articulation of sustainable development strategies.

Notes

[1] "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." See *Our Common Future*, Oxford, Oxford University Press, 1987, p. 43. See also, *Our Own Agenda*, *op. cit.*, pp 44–45.

[2] See such classic works on the subject as S.V. Ciriacy-Wantrup, *Resource Conservation: Economics and Policies*, Berkeley and Los Angeles, University of California Press, 1952, "The economics of environmental policy", *Land Economics*, vol. 47, No. 1, February 1971; Vernon L. Smith, "Economics and production from natural resources", *The American Economic Review*, vol. 58, No. 3, part 1, June 1968; and G. Hardin, "The tragedy of the commons", *Science*, vol. 162, No. 1243-8, 1968

[3] ECLAC, *Report of the Regional Seminar on Environmental Management and Large Water Resource Projects* (E/CEPAL/L.262), February 1982.

[4] Examples include integrated rural development projects concerned with highland farming which include a component on soil, water and forest conservation, such as those which have been conducted in almost all the Central American countries; agricultural-terrace rehabilitation projects in the Andes; and numerous environmental clean-up projects in large and medium-sized cities of South America and Mexico.