The Concept of Sustainable Economic Development

by

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INTRODUCTION

In recent years there has occurred a major revision in development thinking that is presenting a fundamental challenge to the conventional consensus on economic development. This new approach emphasizes meeting the basic needs of the poor, advocates cultural sensitivity, and encourages 'grassroots' participation in the development process. More crucially, it stresses that 'real' improvement cannot occur in Third World countries or anywhere else unless the strategies which are being formulated and implemented are environmentally sustainable. As a result, there is a growing 'recognition that the overall goals of environment and development are not in conflict but are indeed the same, namely the improvement of the human quality of life or welfare for present and future generations' (Bartelmus, 1986 pp. 13–4).

However, the concept of sustainable economic development is a difficult one to grasp analytically. Given that one is attempting to describe the environmental, economic, and social, features of an ongoing process, the difficulty lies in arriving at a universally acceptable definition that is also analytically precise. More often than not, precision is sacrificed for acceptability. For example, the *World Conservation Strategy* (IUCN, 1980) emphasizes 'the maintenance of essential ecological processes and life-support systems, the preservation of genetic diversity, and the sustainable utilization of species and ecosystems', with the overall aim of achieving 'sustainable development through the conservation of living resources'. While lauding the general underlying message, sympathetic economists have nonetheless been critical of the definition and objectives outlined in the *World Conservation Strategy* for being too imprecise to be operational, for failing to perceive crucial issues of trade-offs among economic and conservation goals, and for ignoring valuation problems (Tisdell, 1983; Pearce, 1985).

While it may be extremely difficult, if not impossible, to define sustainable development in any analytically rigorous way, there is still a need to describe its characteristics and to distinguish it from other concepts of development. To do this is the aim of the following paper, which attempts to refine and substantiate the concept of sustainable economic development. Stressing the unique environmental, economic, and social, features of sustainability, is the first step towards an interpretation that is sufficiently rigorous to provide the useful tools needed for practical analysis and policymaking. This paper limits itself to discussing the concept of sustainable economic development as applied to the Third World.

DEVELOPMENT AND ECONOMIC DEVELOPMENT

As, over the years, economic policy goals have changed, concepts of economic development have also been modified. The current consensus in non-Marxist thought defines economic development as the 'process whereby the real per capita income of a country increases over a long period of time—subject to the stipulations that the number below an "absolute poverty line" does not increase, and that the distribution of income does not become more unequal' (Meier, 1976 p. 6). This consensus ascribes the following characteristic features to economic development:

a) It is only one part of the total development of society, and can be distinguished and analysed separately;
b) Its quantitative dimension is associated with economic accumulation, or growth in real *per caput* output;
c) Its qualitative dimension is associated with technological and institutional change, or 'innovation' broadly defined; and
d) It should ideally be measurable, i.e. economic development is associated with direct and readily measurable economic gain.

The 'total development of society' involves not only changes in economic activity but also political, social, and cultural, transformations. In assessing the 'total development of society', economics tends to focus primarily on economic changes and thus isolates economic development from 'total' development. The general consensus remains that 'it is conventional to begin with an increase in per capita real income as the best available overall index of economic development' (Meier, 1976 p. 8).

However, although *per caput* growth is considered the crucial indicator of economic development, the conventional consensus also accepts that there are important qualitative dimensions to development that distinguish it from economic growth. That is, 'economic *development* implies not only more output but also different kinds of output than were previously produced, as well as changes in the technical and institutional arrangements by which output is produced and distributed' (Herrick & Kindleberger, 1983 p. 21). In addition to the invention and diffusion of new technology, these 'innovations' would include changes in organization, government policy, patterns of ownership, human skills and tasks, and consumer tastes and preferences.

In its efforts to establish empirical validity and conceptual concreteness, economics has been keen to translate any notion of 'economic improvement' into a variable to be measured and compared. Thus if increases in aggregate real

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per caput income are considered 'the best available overall index of economic development', any relatively poor nation exhibiting both absolute and relative increases in real income must by definition be developing successfully. Moreover, quantitative indicators of economic development can be disaggregated and aggregated to any level. For example, the same criteria of relatively and absolutely increasing real *per caput* income can be applied to a relatively poor region, community, or income group, within a country.

The above-cited four features represent only the basic consensus, as the concept of economic development and its relationship to overall development have been constantly redefined throughout the post-war (World War II) era. As this 'semantic history' has been carefully reviewed elsewhere (Arndt, 1981; Meier, 1984), it will not be discussed further here.

The Meaning of Sustainable Economic Development

The 1970s saw the emergence of a major revision in development thinking that presents a fundamental challenge to the conventional consensus on economic development. In common with the call for a 'basic needs strategy' (ILO, 1976; Streeten *et al.*, 1981; Stewart, 1985), this revision emphasizes improving the basic needs of the poor. However, the sustainable development approach additionally argues that 'real' improvement cannot occur in Third World countries unless the strategies which are being formulated and implemented are environmentally sustainable over the long-term, are consistent with social values and institutions, and encourage 'grassroots' participation in the development process. Thus it is argued that 'there will be no sustained development or meaningful growth without a clear commitment at the same time to preserve the environment and promote the rational use of resources' (Tolba, 1984). Similarly, to be socially and culturally sustainable, 'development must be gauged by the values [which] a society itself, or some member thereof, deems to be requisite for its health and welfare' (Goulet, 1971 p. 333).

The 1972 United Nations Conference on the Human Environment, held in Stockholm, is usually credited with popularizing the concept of sustainable development, although Caldwell (1984) suggests that the origins of the term probably lie in the Paris 'Biosphere Conference' and the Washington, DC, conference on the Ecological Aspects of International Development, which were both held in 1968. In general, the concern has been that 'few if any countries take adequate account of environmental considerations when making policy or planning development. Few allocate or regulate uses of their living resources so as to ensure that they are environmentally appropriate and sustainable. Many lack either the financial or technical resources, or the political will, or adequate legislative, institutional, or public, support for conservation (or any combination of these) to carry out fully the conservation measures required' (IUCN, 1980 para. 8.8).

The result of those lacunae is that, at the level of project planning and design, unwanted environmental impacts have arisen from inadequate attention having been paid to environmental consequences, and from the lack of knowledge and information necessary to predict them; other causes have included ignorance of cost-effective preventive or mitigating measures, and failure to consider alternative project designs or locations (Lee, 1985).

Perhaps the most important contribution of sustainable development approaches is the recognition of a fundamental process of 'cumulative causation' (Myrdal, 1968) in situations of poverty, environmental degradation, and underdevelopment:

> 'Poor people in their struggle to survive are driven to doing environmental damage with long-term losses. Their herds overgraze; their shortening fallows on steep slopes and fragile soils induce erosion; their need for off-season incomes drives them to cut and sell firewood and to make and sell charcoal; they are forced to cultivate and degrade marginal and unstable land. Putting people first, and enabling them to meet their needs, can be, then, to reduce these pressures, to reduce degradation, and to maintain potentials for sustainable agriculture and sustainable development at higher levels of productivity. And this in turn means that more people in future can have adequate, secure, and decent, levels of living' (Chambers, 1986*b* p. 7).

Although rapid population growth and uneven distribution in some areas undoubtedly complicates natural resource management, it is also true that 'population pressures on resources usually reflect an extremely skewed distribution of resources. When farmers encroach on tropical forests or cultivate erodible hillsides, population pressure is blamed, but the pressure typically stems from the concentration of land in large holdings' (Repetto, 1986*c* p. 45). Nor can the vagaries of climate be solely blamed for the environmental degradation occurring even in ecologically fragile regions. For example, a World Bank (1985) study concludes that drought by itself does not pose a threat to the long-term sustainability of rural production systems in the West African Sahelian and Sudanian zones, but accelerates the negative consequence of resource abuse enforced by poverty:

> 'The spread of rainfed, extensive agriculture into forest, bush and pasture areas reduces total forage available to transhumant livestock, particularly when, as now, mixed farmers increasingly collect and stock crop residues to carry their own animals through the dry season period. When drought strikes, transhumant pastoralists do what they can to save herds. Lacking alternative forms of forage, they try to increase their animals' intake of browse. They vigorously lop trees already weakened by lack of soil moisture. Many trees die as a result of this abuse. Pressure then intensifies on the remaining woodstock during the next drought. Clearing fields for animal traction or machine cultivation may disrupt existing soil fertilization cycles based on nutrients that in-field trees return to the soil surface in the form of humus. If these organic nutrients are not replaced by organic and/or chemical fertilizers, crop yields decline. Stripping trees from fields also reduces the windbreak effect that even an open canopy can provide, and increases wind erosion. When fields are fallowed, in those systems where man/land ratios still permit it, natural regeneration occurs much more slowly. In the meantime, soils may suffer both wind and water erosion' (World Bank, 1985 p. 7).

Thus the basic premise of sustainable economic development is that 'many environmental problems in develop-

ing countries originate from the lack of development, that is from the struggle to overcome extreme conditions of poverty' (Bartelmus, 1986 p. 18). Poor people often have no choice but to opt for immediate economic benefits at the expense of the long-run sustainability of their livelihoods. For example, one of the consequences of deforestation and the depletion of fuel-wood supplies is that it forces poor households to divert dung for use as fuel rather than for fertilizer. The 'present value' of the dung as fuel is higher than its value as a soil nutrient, but 'the context is one where there is no choice anyway since there are neither fuel nor fertilizer substitutes to which households can gain access' (Pearce, 1986 pp. 5–6). The result, however, is most certainly a decline in soil fertility, low levels of productivity, and loss of future economic welfare.

The primary concern of sustainable economic development, therefore, is ensuring that the poor have access to sustainable and secure livelihoods. At the national level, this calls for policies, regulations, and incentives, to induce economic behaviour that is 'environmentally rational' (Lee & Goodland, 1986). As will be discussed below, this 'macro' approach to sustainable development has been endorsed by the World Commission on Environment and Development and is currently being explored within the World Bank and the Asian Development Bank (Asian Development Bank, 1986; Conable, 1986; Warford, 1986). However, macroeconomic or 'top-down' approaches are not sufficient; ultimately, the focus must be on 'the needs and priorities of poor people as they perceive them' (Chambers, 1986*a*). As emphasized by a recent submission to the World Commission, 'satisfaction of basic human needs—food, clean water, fresh air, fuel, shelter, health-care education, and employment—is essential to sustainable development' (Global Tomorrow Coalition, 1985 p. 5).

In addition, for economic development to be truly 'sustainable' requires 'tailoring the design and implementation of projects to the needs and capabilities of people who are supposed to benefit from them' (Uphoff, 1985 p. 359). As a recent review of development projects has shown, not only does 'attention to issues of sociocultural compatibility ... pay off in economic terms—among others, in economic rates of return twice as high as those of the socially insensitive and inappropriate projects', but it also lays to rest 'the fallacy of overinnovation and of a socially insensitive development strategy that justifies change in terms of abstract goals rather than in terms of locally perceived needs' (Kottak, 1985).

Any attempt to reduce environmental degradation will be counter-productive if there is failure to respect the needs and encourage the participation of those social groups which are most affected by any change. For example, World Bank-financed social forestry programmes in India have failed in the past to have an impact on the landless, small, and marginal, farm households that are most responsible for deforestation. This was because of a limited commitment to serving community needs, the lack of involvement of poor women (who collect fuel-wood and fodder), and the distrust of social forestry programmes by the landless (Centre for Science and Environment, 1985 pp. 56–7).

To summarize, in contrast to the conventional consensus on economic development, the following revised criteria underline sustainable economic development:

i) It is indistinguishable from the total development of society and cannot effectively be analysed separately, as 'sustainability' depends on the interaction of economic changes with social, cultural, and ecological, transformations;
ii) Its quantitative dimension is associated with increases in the material means available to those living, or destined to live, in absolute poverty, so as to provide for adequate physical and social well-being and security against becoming poorer;
iii) Its qualitative dimension is multifaceted, and is associated with ensuring the long-term ecological, social, and cultural, potential for supporting economic activity and structural change; and
iv) It is not easily subject to measurement; the quantitative and qualitative dimensions are mutually reinforcing and inseparable, and thus cannot be fully captured by any concept of direct and measurable economic gain.

Sustainable economic development is therefore directly concerned with increasing the material standard of living of the poor at the 'grassroots' level, which can be quantitatively measured in terms of increased food, real income, educational services, health-care, sanitation and water supply, emergency stocks of food and cash, etc., and only indirectly concerned with economic growth at the aggregate, commonly national, level. In general terms, the primary objective is reducing the absolute poverty of the world's poor through providing lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption, and social instability.

Towards an Analytical Method

Because the criteria underlying sustainable economic development differ so markedly from the conventional economic consensus, there is really a need for a completely new analytical approach in that regard. Unfortunately, a rigorous exploration of such a new methodology has yet to be attempted. At best, this paper can only suggest some of the basic steps required in formulating such an approach.

There are many obstacles to overcome. For one, the conceptual complexity of sustainable economic development makes precise measurement of its 'success' through quantitative indicators extremely difficult. The quantitative dimensions of sustainability (e.g. increases in food, real income, life expectancy, etc.) can perhaps be captured by some 'basic needs' or 'physical quality of life' index. However, the more qualitative dimensions (e.g. cultural diversity, social cohesion and stability, improvements in environmental quality, greater self-esteem, etc.) are virtually impossible to quantify.

In addition, not all the quantitative and qualitative aspects of sustainable economic development can be maximized simultaneously in all situations. This suggests that any development effort must surmount a continuous and dynamic configuration of trade-offs, such as between increased productivity and environmental degradation, or improving the status of women and preserving traditional values, or introducing new techniques and relying on traditional skills. Assessing the appropriate choice in the face of these trade-offs will require knowledge of the benefits and costs involved in alternative decisions.

Given that many of the qualitative dimensions of various trade-offs cannot be quantitatively measured, precise analysis of all benefits and costs cannot be assured. Moreover, the dynamic nature of development, and the diverse social, economic, and ecological, conditions in which it must be pursued, mean that the various trade-offs involved are constantly changing over time. This makes continuous assessment of benefits and costs even more crucial. One basic analytical approach is to view this process as an interaction among three systems: the biological (and other resource) system (BS), the economic system (ES), and the social system (SS).

Each system has its own unique set of human-ascribed goals:

Biological system goals:
- genetic diversity
- resilience
- biological productivity

Economic system goals:
- satisfying basic needs (reducing poverty)
- equity-enhancing
- increasing useful goods and services

Social system goals:
- cultural diversity
- institutional sustainability
- social justice
- participation

The general objective of sustainable economic development, then, is to maximize the goals across all these systems through an adaptive process of trade-offs, as illustrated by the shaded area in Fig. 1. In contrast, the current conventional consensus on economic development attempts to maximize only economic system goals, and Marxist economics maximize only ES and SS goals.

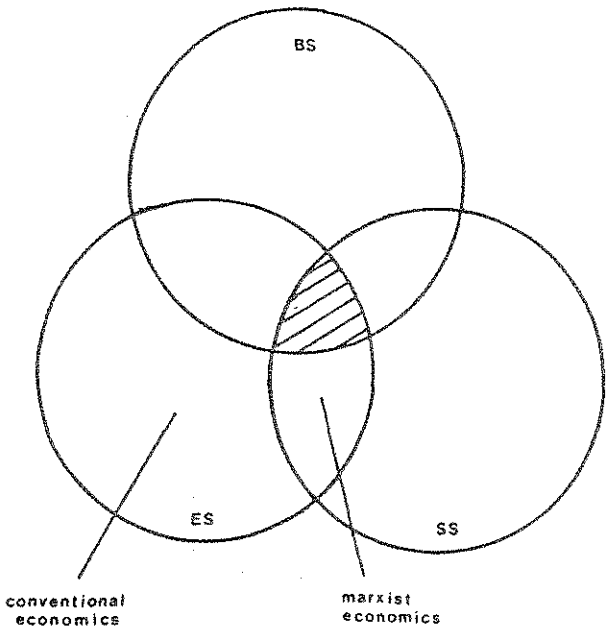

FIG. 1. *Sustainable economic development maximizes the goals across the biological and resource system (BS), the economic system (ES), and the social system (SS), as illustrated by the shaded area. In contrast, conventional development approaches maximize only ES goals, and Marxist economics maximizes only ES and SS goals.*

Sustainable development involves a *process of trade-offs* among the various goals of these three systems; as noted above, it is not possible to maximize all these objectives all the time. For example, as the economic process of production and consumption is dependent on resource use, increasing even useful goods and services may conflict with ensuring the maximum productivity and genetic diversity of the biological and resource system. There may also be conflict among intra-system goals. For instance, in some rural communities institutional sustainability could mean reinforcing societal norms that inhibit women's economic independence and limit their social participation. This may conflict with rural women organizing themselves to secure increased social justice, participation, and access to land, credit, skills, etc. (Muntemba, 1985). Given these potential trade-offs among goals, a choice must be made as to which objectives should receive priority, and thus greater weight, in the development strategy.

This process of trade-offs among goals must also be *adaptive*, for as individual preferences, social norms, ecological conditions, etc., change over time, so must the relative weights attached to the various goals. Thus, for example, after social norms have adjusted to allow women greater economic independence and increased social participation, perhaps there will be less conflict generated by pursuing institutional sustainability (e.g. in terms of the process of community decision-making, social organization of production activities, etc.).

As economic, social, and ecological, conditions also vary in different locations and situations, priorities among goals should also differ. For instance, in the West African Sahelian and Sudanian zones, biological and resource productivity and resilience are clearly a high priority (World Bank, 1985). For agro-ecosystems in the critical uplands of East Java, the trend of increasing absentee land-ownership raises the additional issue of equity in land tenure. This may indirectly affect sustainability through its impact on the incentives for soil conservation (KEPAS, 1985).

Finally, interactions among BS, ES, and SS, goals (cf. Fig. 1) change as the scale or hierarchy of the systems is extended from the local to the regional, and thence to the national and even global, level. As 'systems theory holds that the behaviour of higher systems in such a hierarchy is not readily discovered simply from a study of lower systems, and *vice versa*' (Conway, in press), the choice of sustainable development goals to be pursued at, say, the national level, may differ from those advocated at the local level.

Sustainable Economic Development Applied

The next stage in making the concept of sustainable economic development operational would be to develop the tools necessary to analyse the trade-offs among the systems, and to apply these tools to interacting systems at different levels of scale (hierarchy), over various timescales and locations, and under markedly different economic, social, and ecological, conditions. However, before this next stage can be adequately tackled, two additional issues concerning the applicability of the concept of sustainable economic development need to be clarified: first, is the concept only relevant to agriculture, including forestry and rangeland and wildlife management, or can it also be made applicable to all forms of economic and social

activity, including industry and human settlements? Second, does sustainability in agriculture require the returning of all organic matter to the soil and thus support a subsistence rather than a surplus-producing system? The latter question will be addressed first:

'In agricultural development, ecosystems are transformed into hybrid agro-ecosystems for the purpose of food or fibre production' (Conway, 1985 p. 34). While agricultural sustainability requires the organic material of the soil to be replenished, this criterion can be met in a number of ways by both subsistence and surplus agricultural systems. For example, there exist many 'naturally subsidized solar-powered ecosystems', such as tidal estuaries and river deltas, where biomass productivity is greatly enhanced by the flowing of water that assists the importation of organic matter and nutrients from other regions (Odum, 1975 pp. 17–8). Many important agro-ecosystems (e.g. delta-based agricultural systems) have traditionally tapped these regions to produce a surplus without much loss of sustainability—precisely because the natural flow of organic material into the system continues to maintain the latter's fertility. In fact, many agro-ecosystems are not 'closed' with respect to material cycling but are interdependent on one another and on other natural ecosystems for a continuous inflow of organic material and nutrients to maintain soil quality (e.g. natural soil and nutrient runoff from the highland, fertilizing lowland agricultural areas). In these instances '100% recycling of organic materials' is not necessary to avoid long-term soil degradation; instead, what is required are agricultural techniques and practices that do not degrade soil quality and ecological functions at a rate faster than the natural cycles and flows can 'repair' the damage.

Moreover, in many instances of sustainable rural or agricultural 'development', one is talking about transforming a system that was previously unsustainable into one that is at least relatively sustainable. A good example is a World Neighbors project in Honduras (Bunch, 1987). At a cost of $13 per person, the Guinope Integrated Development Program has transformed a previously unsustainable smallholder agro-ecosystem through appropriate agricultural technology, training, and erosion control—including intercropping of 'green manure' crops with the traditional corn or sorghum—into a surplus-producing system with yield increases of over 300% and a marketable surplus of vegetables. Even in drought-prone Africa, there are numerous successes in improving agricultural sustainability—ranging from the large-scale Kenyan Soil and Water Conservation Programme to the Yatenga Water Harvesting Project in Burkina Faso (Harrison, 1987).

Finally, if maintaining the nutrient levels and organic material of soil is a necessary condition for agricultural sustainability, there should be no fundamental problems in maintaining an agro-ecosystem by 'some increase of external inputs' provided those inputs are ecologically benign or even beneficial (e.g. organic fertilizers, appropriate biotechnology, integrated pest management, etc.). If the acquisition of those additional inputs actually improves soil quality sufficiently to raise productivity, then farmers may be better off with them than they were formerly. For example, a Lutheran World Relief project in Niger will have built an estimated 3,200 wells by the end of 1987. At an estimated cost of US $400 each, these wells have not only increased subsistence food output from project gardens but have also yielded a marketable surplus of between US $400 and 2,000 per hectare. This has allowed gardeners to pay back the costs of the wells—to purchase seed, fertilizer, and other inputs, and to acquire valuable marketing skills (Cottingham, 1987).

Although it is clearly much easier to conceive of the sustainability of agricultural, forestry, rangeland, and wildlife, systems than of economic development, the concept of sustainable development should also be applicable to all forms of economic and social activity, including industry and human settlements. This can best be explained with reference to the various definitions of sustainability in the literature. As the previous discussion makes clear, in the case of agriculture, or agro-ecosystems, application of the concept is self-evident, as one is talking about systems that are directly dependent on environmental resources and essential ecological functions for 'sustainability'. This is particularly true if we take Gordon Conway's (in press) more technical definition of agricultural sustainability as 'the ability of a system to maintain its productivity when subject to stress or shock', where the stress is 'a regular, sometimes continuous, relatively small and predictable disturbance, for example the effect of growing soil salinity or indebtedness', and the shock is 'an irregular, infrequent, relatively large and unpredictable disturbance, such as is caused by a rare drought or flood or a new pest'.

As noted above, unchecked resource abuse within an agro-ecosystem, whether the result of inappropriate use of petrochemicals and fertilizers, overcropping of erodible soils, poor drainage, etc., can affect overall agro-ecosystem sustainability by increasing either stress, shock, or both. The key is to reduce the resource degradation, and therefore the disturbances associated with it, to a level where the natural processes and function of the agro-ecosystem can counteract them and thus preserve overall sustainability.

Of course the crucial element in all this is that the productivity of the agro-ecosystem is essential to human livelihoods; hence one is really talking about 'sustainable livelihoods' as defined by Chambers (1986*b*) as 'a level of wealth and of stocks and flows of food and cash which provide for physical and social well-being and security against becoming poorer.' Moreover, one of the priorities of sustainable development must be to 'balance' the need for poor people to gain better livelihoods than formerly, with the needs of future generations. Thus, in rural settings where livelihoods are dependent on the productivity of agro-ecosystems and its equitable distribution, one is back to Conway's view of agricultural sustainability as maintaining 'productivity when subject to stress or shock'.

Alternatively, one could take Goodland & Ledec's (1986) even broader definition of sustainable development as 'a pattern of social and structural economic transformations (i.e. "development") which optimizes the economic and other societal benefits available in the present without jeopardizing the likely potential for similar benefits in the future'. Then one can clearly consider as sustainable development any economic activity that raises social welfare with the maximum amount of resource conservation and the minimum amount of environmental degradation allowable within given economic, social, and technical, constraints. In this sense, industry and human settlements are subject to the criteria of sustainable development.

In the case of industry, for example, it is precisely because industrial activity involves some resource use and some waste generation, that it is necessary to find a pattern of activity that is more resource- and waste-minimizing than maximizing.

Absolute sustainability may not be physically possible for any particular pattern of industrial development, but one must still find a pattern that is relatively more sustainable than are others. In other words, because industry is dependent on raw material and energy inputs from the primary sector (agriculture, forestry, fishing, mining, and quarrying, etc.), and the prospect of 100% recycling of waste residuals is still a technical impossibility, it is essential to ensure that the resulting impacts on the environment and its resources are as minimal as possible. As a result—depending on economic and technical feasibility—some of the 'sustainability' criteria that are applicable to industrial activity could include increased recycling, minimal use of non-renewable resources, exploiting renewable resources at a rate less than their natural rate of 'ecologically safe' regeneration, reducing waste-generation levels to well within the assimilative capacity of the environment, and ensuring maximum resource-use efficiency within industrial processes.

Finally, because some form of industry and manufacturing capacity is essential to tackling the mass poverty in Third World countries, emphasizing a 'sustainable' pattern of industrial development is practically as important as emphasizing sustainable agricultural development. Moreover, there are important social criteria that must also be included in sustainable industrial development if we are also to talk about its providing 'sustainable livelihoods'. These criteria are best enunciated by the population affected by industrial development; but, at the very least, they should include providing secure employment and favourable indirect and induced employment effects, the use of technology that is appropriate to the level of skills and knowledge of its local labour force together with introducing new skills which can be easily assimilated through training, and a minimal displacement of traditional economic activities on which livelihoods currently depend. These are similar to the economic and social criteria that should be inherent in sustainable agricultural development, and are broadly consistent with the ES and SS goals discussed previously.

The case of micro-hydrosystems' manufacture and use in Nepal, funded and run by United Mission Nepal, is a good illustration of sustainable industrial development (Hislop, 1987). Hand-processing of rice, with traditional wooden water-mills, produced low yields and kept women working for 18 hours a day in some seasons. Nepal then began manufacturing its own modern cross-flow turbines and accessories for small hydroelectric schemes for about 400 mills scattered across remote villages and run by small entrepreneurs. The turbine-powered mills give better yields and do the work in 15 minutes at the cost of a small percentage of the produce. This frees women's labour for other essential tasks, and with a power output of around 1–7 horsepower the modern turbines make possible a wide range of new activities on top of the traditional rice-milling—including power generation and hence electric cooking which saves fuel-wood.

Another industrial development project that has had a similar benefit in terms of saving scarce wood-supplies is the Kenya Improved Charcoal Stove Programme (Opale, 1987). A whole industry has now emerged around the production of an improved stove design. The efficiency improvements of the new ceramic jiko stove, of up to 30% for charcoal burning, means that the stove pays for itself after 2 or 3 months. By the end of 1985, 180,000 stoves had been sold. This has created a substantial increase in trade for local tinsmiths, potters, and small-scale urban industries producing ceramic liners.

With regard to human settlements, particularly in urban areas, there is a similar case to be made for sustainable settlement development. As Hardoy & Satterthwaite (1984 p. 329) conclude, 'in most cities lack of land-use control and lack of legal alternatives to unauthorised settlements creates a haphazard, sprawling pattern and a density of development too dispersed to allow for cost-effective infrastructure and service provision. It also promotes illegal housing developments on dangerous land-sites, unnecessary sprawl over prime agricultural land, and the destruction or degradation of the natural landscape with little or no provision for public space.' Moreover, 'The housing environments of lower-income groups in Third World cities are among the most degraded and dangerous living environments that exist', and are characterized by 'a lack of readily-available drinking-water, sewage connections (or other systems to dispose of human wastes), garbage collection, and basic measures to prevent disease and provide primary health-care' as well as by 'crowded, cramped conditions, which mean that communicable diseases such as TB flourish—usually aided by low resistance among the inhabitants due to malnutrition' (*ibid.*, pp. 318–9).

There is grave need, therefore, for appropriate human settlements projects to tackle those problems and thus minimize the environmental degradation and vicious poverty-trap suffered by the residents. One interesting example is the Orangi Pilot Project (OPP) in Karachi, Pakistan (Hasan, 1987). Orangi Township is the largest squatter colony in Karachi, with 700,000 people on 5,000 acres [2,025 ha] of land. People have built their own dwellings, and have indicated that their most pressing need is a single, low-cost form of sanitation for the disposal of excreta and wastewater. Participating residents agreed to form local 'lane' organizations to contribute funds and organize work detail. After five years, 1,571 'lane' organizations had built their sewage systems, serving approximately 200,000 people, at a cost of $1.7 million (all but $100,000 funded by residents). Equivalent work would have cost government agencies $8.5 millions. Moreover, the enthusiasm and public learning generated by the OPP has sponsored additional follow-on programmes in housing, women's welfare, and women's work, initiated by the 'lane' organizations.

Economics Revisited

As the above discussion indicates, there are certain development projects and programmes that reflect the principles of sustainable economic development. However, there is yet to be a systematic application of these principles in development policymaking and strategies as a whole. Part of the problem is that the leading policymaking institutions, such as the World Bank, are only just begin-

ning to emphasize the need to incorporate environmental considerations in their development strategies (Conable, 1986; Runnalls, 1986). On the other hand, as the previous sections make clear, the concept of sustainable economic development needs to be made more concise, systematic, and rigorous, before it can be usefully applied in policy-making and planning.

A further problem is that most proponents of sustainable development usually advocate 'grassroots' or 'bottom-up' approaches to development planning, whereas conventional policymaking has consistently been 'top-down' in approach—beginning at the international or national level and filtering down to the regional and local levels. This explains why the conventional economic consensus on development, with its emphasis on economic growth and national economic performance, is more suited to 'top-down' than to 'bottom-up' development.

Nevertheless, the growing recognition that environmental considerations must be incorporated into development strategies is having some influence on policymaking and planning. This influence is beginning to be felt in economics, which is the discipline best able to analyse trade-offs among environmental costs and benefits. There are essentially four different developments in economics, particularly in the sub-discipline of environmental and resource economics, concerned with deriving policy recommendation from the issue of environmental sustainability. These areas can be referred to as 'cost-benefit analysis', 'resource accounting', 'macroeconomic policymaking', and 'sustainability-applied research'.

As was pointed out by the Authors of the classic UNIDO *Guidelines*, the main rationale for conducting social cost-benefit analysis is 'to subject project choice to a consistent set of general objectives of national policy' (UNIDO, 1972). As perceptions of national policy objectives in Third World countries have changed, for example emphasizing the need for scarce foreign exchange and equitable income distribution, project appraisal and planning have been expanded to reflect the new objectives (Little & Mirlees, 1974; Squire & Tak, 1975). Consequently, the recent emphasis on the role of environmental quality and the long-run productivity of natural resource systems in sustaining economic development, has led to further extensions of social cost–benefit analysis to include environmental impacts (Dixon & Hufschmidt, 1986; Dixon *et al.*, 1986). That is, in contrast to traditional project evaluation which considers only the direct project benefits and costs, 'the expanded approach includes the external and environmental improvement benefits (*plus* the benefits from environmental protection), as well as the costs of external and/or environmental damages and of environmental control measures' (Dixon & Hufschmidt, 1986 p. 7). The basic methodology is first to identify and measure the environmental effects, and then, secondly, to translate them into monetary terms for inclusion in the formal project analysis.

However, extending cost–benefit analysis to incorporate the environmental impacts of projects encounters a number of problems. First, physical estimation of environmental effects is often difficult. Second, as most environmental resources are non-marketed common-property 'goods', economic valuation of their services is not straightforward. Third, little consensus exists regarding methods for monetary valuation of 'intangible' environmental goods, such as the need to preserve unknown species for their intrinsic value (Goodland & Ledec, 1986).

Finally, as this expanded approach inevitably raises issues of intertemporal choice, the interest rate chosen to discount the future may determine whether environmental degradation is 'optimal'. It is often stressed that the appropriate discount rate should emerge from the project appraisal process (UNIDO, 1972). In practice, imperfect capital markets, inconsistent data on the productivity of capital, and large variances in domestic borrowing for investment, makes it difficult to establish an economic accounting rate of interest for Third World countries (Phillips, 1986). Furthermore, in many examples of poverty-induced environmental degradation, the sacrifice of long-term sustainability for immediate economic returns implies a high discount rate. This behaviour, however, is itself 'the result of the resource degradation process which compels actions to be taken which imply high discount rates' (Pearce, 1986 p. 13). In other words, the high apparent discount-rates are a reflection of the constraints imposed by environmental degradation rather than the desired social choice.

In contrast to social cost–benefit analysis, resource accounting involves adjusting national income accounts to register both the direct costs inflicted by environmental degradation and the 'depreciation' of natural capital to allow for losses in future production potential (Environmental Accounting Workshop, 1985; Repetto, 1986*b*). Although the national accounts record the income earned from harvesting resource stocks (e.g. fish catch, timber, meat, etc.), the loss of future income through declining resource stocks and deteriorating environmental quality is excluded. By allowing for such 'depreciations' in the natural capital stock, the net contributions of resource degradation to national income are much lower, and more accurately reflect the impact on economic welfare. For example, depreciation of the forest stock in Indonesia due to deforestation and timber extraction was estimated to cost around $3.6 thousand millions in 1982, or approximately 4% of GNP (Repetto, 1986*b*).

Because resource accounting uses the existing system of national accounts, it appeals to economic policymakers. Nonetheless, there are a number of limitations on its application. For one, measuring the stock of economic capital and its rate of depreciation in Third World countries is in itself a complicated task. Given the difficulties in quantifying and monetizing environmental goods, extending depreciation accounting to the stock of natural capital would prove even more difficult. Moreover some natural resources, such as the forest timber and fish stocks of a country, may be readily counted as discrete units, whereas others, such as soils and watersheds, are not easily measurable 'stocks' as such. Finally, accounting for the depreciation of natural resource stocks does not include all the externality, or 'off-site', environmental quality effects. For example, the total environmental costs of deforestation and timber extraction should include the economic costs of soil erosion, siltation of waterways, flooding, and climatic impacts. Thus the direct depreciation loss of $3.6 thousand millions for deforestation in Indonesia must be an underestimation of the total environmental costs of forest depletion.

A more comprehensive economic approach to the problems of environment and development is the integration of environmental and natural resource management directly into macroeconomic policy. This is proposed in two ways: '(a) through the design of investment programs supporting environmental and natural resource objectives, and (b) through promotion of economic, social, and institutional, policies and incentives that influence the environmentally related behaviour of government agencies, major resource users, and countless small-scale resource-using activities, which occur throughout a nation's economy' (Warford, 1986). The appeal of such an approach is that it would rely on traditional economic tools and concepts, such as marginal opportunity cost, to measure the total environmental cost borne by society of depleting a natural resource (Pearce, 1986; Warford, 1986). Moreover, some existing economic policies such as irrigation subsidies, fiscal and financial inducements for livestock rearing, and agricultural export taxation, not only encourage environmental degradation but may also be economically inefficient (Repetto, 1986*a*). Correcting these policies offers the opportunity to pursue both environmental and developmental goals.

Designing macroeconomic policies and incentives for natural resource management may in the long run provide the best potential for initiating policies based on the concept of sustainable economic development. At present, however, this approach has yet to be developed sufficiently for implementation as a source of concise policy guidelines for Third World countries. Along with cost–benefit analysis and resource accounting, this approach faces the difficulty of quantifying and monetizing environmental impacts. There also need to be clearly defined priorities and mechanisms built into macroeconomic policies when the goals of development and environment are not mutually compatible. For example, exploitation of wilderness forestlands may cause irreversible environmental damage over time; on the other hand, the scarce foreign exchange earnings generated by timber and mineral exports are an immediate benefit.

Similarly, the abolition of taxes on agricultural exports may mean higher incomes for cash-crop producers, but the rise in producer prices may encourage the extension of cultivation onto 'marginal' land. Finally, macroeconomic policies are by definition top-down in implementation. Although some degree of flexibility is necessary to allow for regional variations in economic and environmental conditions, such an approach cannot be ideal for encouraging grassroots participation in decision-making. Thus, it is essential that macroeconomic policies for natural resource management be supplemented by projects at the regional and local levels that have sustainability as their primary objective.

Projects and sectoral policies for sustainable economic development are therefore a natural complement to any macroeconomic environment and development initiative. This in turn requires appropriate applied analysis of the sustainability of development projects and policies at the local, regional, and sectoral, levels. For example, as discussed above, Conway (1985 and in press) has developed an approach for assessing the sustainability of agro-ecosystems. Similarly, there is a growing interest in reviews of policies affecting the sustainable development of forest lands, such as the review recently conducted in Indonesia (Government of Indonesia & IIED, 1985).

Until very recently, the issue of sustainability has been largely ignored in conventional economic analysis. As discussed above, the traditional approach to cost–benefit analysis maximizes discounted net income flows. Unless the sustainability of the economic activity generating income is explicitly included as a welfare objective, it may be optimal 'to drive or exploit a system so that it is not longer sustainable' (Tisdell, 1986 p. 10). This is another argument in favour of extending cost–benefit analysis to include the external environmental impacts of projects. As Pearce (1985 p. 21) has argued, however, even if the external environmental costs imposed by resource depletion are estimated, 'there is nothing in the conventional concept of an external cost to account for the decay of ecological processes themselves', and as a result, 'in the absence of perfect information about both perfect and instantaneous response to ecological disequilibrium, the system can be unsustainable'. In other words, because the soil erosion, increased flooding, and sedimentation, accompanying deforestation, affect also other economic activities, those impacts will be counted as external costs; however, any decline in the resilience of the forest system and its ecological functions resulting from further stress, is not strictly an economic 'externality'.

Thus if the sustainability of the ecological processes underlying economic activity is recognized to have value, then sustainability must explicitly be included as one of the objectives to be pursued by development planners and policymakers. As has been stressed throughout this paper, the pursuit of sustainability in turn may require balancing several goals that are spread over three systems—economic, social, and biological etc. As not all of these objectives can be simultaneously maximized, the possible trade-offs for different activities and conditions need to be analysed. Making explicit the types of trade-offs involved is a vital function that economics can provide in applied sustainability research.

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Summary

Increasing recognition that the overall goals of environmental conservation and economic development are not conflicting but can be mutually reinforcing, has prompted calls for 'environmentally sustainable' economic development. Although there are difficulties in defining sustainable development in an analytically rigorous way, there is

still a need to evolve a concept of sustainability that both distinguishes it from other post-war meanings of development and is useful for practical analysis and policymaking.

Economic development is conventionally defined as the 'process whereby the real per capita income of a country increase over a long period of time—subject to the stipulations that the number below an "absolute poverty line" does not increase, and that the distribution of income does not become more unequal' (Meier, 1976 p. 6). This consensus has underlined most post-war interpretations of development, with perhaps the exception of the 'basic needs' approach, which places priority on *improving* the living conditions of the absolute poor.

Sustainable economic development additionally argues that 'real' improvements cannot occur unless the strategies which are being formulated and implemented are ecologically sustainable over the long term, are consistent with social values and institutions, and encourage 'grassroots' participation in the development process. As the primary objective is to provide lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption, and social instability, this process can be viewed as an interaction among three systems: the biological and resource system, the economic system, and the social system. The general objective is to maximize the goals across all these systems through a dynamic and adaptive process of trade-offs.

To be truly useful as a concept of economic development, 'sustainability' must be applicable to all forms of economic and social activity, ranging from agriculture and forestry to industry and human settlements. Policy recommendations are emerging in four areas: 'cost–benefit analysis', 'resource accounting', 'macroeconomic policymaking', and 'sustainability–applied research'. The next stage must be to develop the analytical tools which are necessary to apply the concept of sustainable economic development to various economic–environmental systems.

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