Economy and Ecology: Towards Sustainable Development

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Chapter 1

THE CHALLENGE OF SUSTAINABLE DEVELOPMENT

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Economy and Ecology: A Helicopter's View

Environmental decay is not exclusively a phenomenon of our century. The Greek philosopher Plato already complains in his Critias about the landscape changes in Attica which had transformed the environment into "... bones of wasted body ... richer and softer parts of the soil having fallen away, and the mere skeleton being left" (cited in Clark, 1986, p. 6). Also in many other countries one observes many examples of earlier soil erosion which -as a result of agricultural and forestry activities- has affected the landscape in all time periods between nomadic cultures and modern high-tech agriculture (Wilkinson, 1973).

Even so, until the beginning of the twentieth century, in general, only relatively modest environmental changes were taking place, as the prevailing technological and economic system was unable to alter environmental conditions on earth dramatically. However, especially after World War II mankind's capacity to destroy our habitat has increased significantly, partly as a result of radical technological changes (generating huge amounts of air, water and soil pollutants including many toxic materials), partly as a result of the rise in world population (and its subsequent rise in consumption and mobility patterns). The strive for a concerted development of the economy and ecology -based on a coherent and integrated viewpoint- has stimulated many social scientists to adopt systemic notions and concepts for achieving a balance between natural and socio-economic systems. The functioning of such natural and socio-economic systems has in their view to be studied from the angle of materials inputs and outputs of all production and consumption processes. In this context, new sub-disciplines such as human ecology and environmental economics have come to the fore, in which serious attempts have been made to ensure a merger between economics and ecology (see also Nijkamp, 1978).

An important contribution to the integration of economics and ecology began simply with a reflection on the principle of the materials balance for

resources (extracted or collected, transformed, consumed and emitted) and on the need to take account of an economic viewpoint of such processes (cf. Georgescu-Roegen, 1971 or Kneese et al., 1970).

On the other hand, much thought has been given to the impact that an integration of economics and ecology could (or should) have on economic thinking or on theory building itself (cf. Boulding, 1966; Daly, 1973; Georgescu-Roegen, 1971, 1973; and Kapp, 1970).

Next, attempts have been made to build economic and social accounting systems which could incorporate the measurement of economic welfare and performance together with the measurement of environmental indicators and performance (Fox, 1971, 1985; Juster et al., 1979; Net National Welfare Commission of Japan, 1973; and Nordhaus and Tobin, 1972).

Besides, analytical schemes have been experimented to include, in the general systems of models for planning purposes at national and regional levels, new models that were also able to include environmental evaluation in the decision process of planning (Archibugi, 1974 and Leontief, 1970, 1973).

It is also noteworthy that various theories have been proposed regarding conventional schemes of programme and project evaluation such as cost-benefit analysis, methods and techniques of environmental impact evaluation, and the evaluation of social impacts (Dasgupta and Pearce, 1972 and Pearce, 1978).

Ways and means of 'internalising' environmental damage in production costs (and, likewise, in the production function) have also been discussed, as well as the cost of its management and elimination, with the main emphasis on different systems of taxation (Barde and Gerelli, 1977; Baumol and Oates, 1975; and OECD, 1975).

The integration of economics with ecology has also been approached from the viewpoint of land-use, where economic and ecological processes have the most disruptive effects, and in urban environments (Doxiadis, 1968; and Mesarovic and Reisman, 1972).

The interaction between economics and ecology has next been dealt with for situations with global risks and uncertainties (for instance, Bremer et al., 1987; Clark and Munn, 1986; Meadows et al., 1972; and Mesarovic and Pestel, 1974).

All these research directions are to some extent oriented toward an integrative approach to economics and ecology, i.e. to the design of methods, techniques and tools for a cohesive evaluation, by which values and objectives in both the environmental and the socio-economic area are

simultaneously taken into consideration.

Meanwhile, an increasing political interest has developed regarding the disruption of the earth's natural resources and environmental decay. Despite many efforts, local, national and international policy bodies have been unsuccessful in ensuring a viable economic development trajectory that was compatible with environmental quality. For instance, the big UN Conference on the Human Environment (Stockholm, 1972) has only very moderately achieved the high goals which were set for our planet. The World Commission on Environment and Development, established by the General Assembly of the United Nations in 1983, was assigned the task to provide concrete recommendations for action on the interrelated issues of environment and development, seen from a strategic long-term viewpoint. The Commission Report (1987), "Our Common Future" (often named the Brundtland Report after the President of the Commission) is a remarkable document in that it offers a concrete hope for sustainable development.

Nevertheless, the Report is not utopian in nature. It spells out the major threats to our common future. These are inter alia

- massive poverty (causing amongst others deforestation and urban decay);
- population growth (causing amongst others serious food and housing problems);
- global warming and climatic changes (causing amongst others sea level rise and depletion of the ozone layer);
- destruction of environmental quality (causing amongst others deforestation, desertification and extinction of ecological species).

All such threats call for effective action and the Commission believes that - despite the potential catastrophes incorporated in our modern way of life - human resources, knowledge and capabilities are available to create a sustainable development. Sustainable development is defined here as paths of human progress which meet the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs. It hence requires a fairer distribution of wealth within and among countries and groups in society. In this context, economic growth is not by definition a threat to sustainability, but even the only feasible weapon in the fight against poverty and disaster; with economic growth we can create the capacity to alleviate poverty and solve environmental threats. This requires economy and ecology be merged from a local to a global perspective. This issue of the compatibility of economy and ecology will be further discussed in the next section.

Economy and Ecology: Co-evolutionary Paths

In the light of the observations made in the previous section the question may be raised whether a co-evolutionary and sustainable development of economic conditions and environmental qualities is a feasible option (see also Norgaard, 1984). Such a co-evolutionary development would in our view imply a simultaneous (and preferably parallel) improvement of both the economic system and the environmental system. Or otherwise stated, it would imply a Pareto principle in which an improvement in the one system does not structurally affect the other. In a more recent article, Norgaard (1988) makes a plea for a development model which does not reflect a unilineal view on progress, but one which encompasses a broad understanding of human/environment interaction. Thus co-evolution takes for granted a balance between economic development (all quantitative and qualitative changes in the economy that lead to a positive contribution to welfare) and ecological sustainability (all quantitative and qualitative environmental changes that serve to improve the quality of an ecosystem and hence have also a positive influence on welfare).

In itself, the concept of 'sustainability' of development utilised in the Brundtland Report is not a special novelty in the evolution of economic thinking. The wish to take account of the needs of future generations while, at the same time, programming to satisfy the needs of present generations refers essentially to the opportunity of taking account of objectives in both the long and the medium term; this is an elementary principle of any kind of economic, social and physical planning. However, in the Brundtland Report a plea is made to remove persistent obstacles regarding inertia, routine and ineffectiveness (either governmental or non-governmental), that impedes a faster enforcement and management of an environmental policy.

It is noteworthy that we use here a broad welfare concept in the sense of all (individual or collective) utility derived from the availability or use of scarce resources, no matter whether such utility attributes can be measured in monetary terms or not (the so-called formal welfare concept; see Nijkamp and Soeteman, 1988). Consequently, also environmental measures against the use of toxic materials, ionizing radiation or traffic accidents may be regarded as arguments of a welfare function.

In a recent article, Pearce (1988) adopts a specific position in the co-evolution debate by claiming that a further decline in natural resources beyond a point that we have already reached is actually injurious to economic development. Assuming that sustainability is a necessary condition for economic growth, he argues that the stock of "natural capital" should at

least be kept constant (and preferably increased) while the economy is allowed whatever social goals are deemed appropriate. Clearly, this viewpoint raises important questions concerning the measurability of environmental quality.

In any case, the conclusion can be drawn that sustainable development cannot be measured by means of a single indicator, but needs a broad spectrum of manifest indicators.

For instance, in the framework of agricultural activities, the welfare gains from agriculture should not only be measured by value added created in the agricultural sector, but should also incorporate negative externalities regarding landscape, species diversity or eco-stability (see also Dahlberg, 1986). Clearly, various changes in land use patterns on landscapes may also be due to factors outside the realm of the agricultural system itself (e.g., climatic factors).

Both the economy and the ecology may contribute to societal welfare and incorporate some (limited) degree of substitutability. However, there are convincing indications now that labour, capital and technology are substituted for environmental production factors up to a level which is clearly unsustainable for both systems in the long run (e.g., eutrophication of surface water, or stratospheric depletion of the ozone layer). On the other hand, environmental commodities and amenities (such as forests, fish, drinking water, fossil fuels, etc.) are economically used up to a level which clearly exceeds environmental growth (production) rates; this threatens environmental regeneration potentials. Consequently, both economic and environmental systems need at least a certain minimum achievement level (or threshold value) in order to survive. In this context, Ciriacy-Wantrup (1952, p. 253) has made a plea for using a minimum bequest value in strategic environmental policies, in particular the establishment of safe minimum standards of conservation. Thus the idea of a co-evolutionary development needs a careful consideration of sustainable threshold levels for both the economic and the environmental system.

Thus strategic economic and environmental policy is essentially a risk strategy which serves to minimize the potential mismatch between economic development and ecological sustainability. Strategic considerations under such circumstances may be based on the proposition that the welfare constituents of ecosystems are directly connected to their physical, chemical or biological role in the whole system. Despite the important function of environmental goods in maintaining ecosystems processes, the socio-economic value of such goods is not always unambiguous (cf. Norton,

1986). It may be approximated amongst others by using the following guiding principles regarding the use of an environmentally valuable asset:

(a) use value: the value of an environmental amenity to generate present and future benefits;

(b) risk aversion assessment: potential users are not sure that they will ever use the environmental opportunity concerned, but do not want to lose the possibility to use (or enjoy) it in the future;

(c) quasioption value: potential users have an interest in enjoying an environmental good but are willing to forego an irreversible development in order to preserve future options concerning this environmental good;

(d) moral or existence value: non-users attach a high value to the fact that the scarce environmental commodity is maintained as such;

(e) vicarious use value: non-users want to keep a certain (public) environmental good intact, because they like it when others can enjoy this asset;

(f) bequest value: non-users see it as their moral responsibility (or altruism) to protect and maintain a certain environmental asset for future generations.

Unfortunately, our current economic apparatus has not yet managed to devise an operational methodology for analyzing all the complexities involved in ecologically sustainable economic development (see Opschoor, 1987). This is also witnessed in a statement in the World Bank Annual Report (1985):

> "Degradation and destruction of environmental systems and natural resources are now assuming massive proportions in some developing countries, threatening continued, sustainable development. It is now generally recognized that economic development itself can be an important contributing factor to growing environmental problems in the absence of appropriate safeguards. A greatly improved understanding of the natural resource base and environment systems that support national economies is needed if patterns of development that are sustainable can be determined and recommended to governments."

This lack of understanding is not amazing, because even a quick glance at the history of economic thinking shows that only a few attempts have been made to position natural resources at the heart of economics. Perhaps the best example can be found in the period of the physiocrats, when it was believed that the productive capacity of the natural environment was the

major source of welfare. However, other periods of history of economic thinking have paid less attention to nature as an important production factor. For instance, in classical economics capital and labour, in addition to land, were regarded as the main welfare generators. Furthermore, the classical economists assigned only a minor role to the government being an institution for establishing the framework within which market decisions have to be taken. However, it is interesting to note that also the classical economists were aware of the possibility of a stagnating economy caused by lack of natural resources.

As a consequence of neo-classical thinking, it was taken for granted in the post-war period that nature as such is not the source of welfare, but only the welfare constituents produced by labour, capital, technology and land. Clearly, land and nature have not become irrelevant, witness also the following quotation of Randall and Castle (1985, p. 573): "... there seemed no reason to accord land any special treatment that would suggest its role is quite distinct from that of the other factors. Land could safely be subsumed under the broader aggregate of capital,..."

After the neglect of environmental factors in Keynesian economics, we are the past decades facing a situation where the externalities and limits to growth (with regard to both renewable and non-renewable resources) have become a new focal point of economic research. The major question is, however, how to avoid a 'tragedy of the commons' (Hardin, 1968) in view of the long-term threats exerted by the (seemingly) inevitable and persistent changes in global environmental conditions.

In conclusion, despite a great deal of urgent environmental issues we still need a significant improvement of economic theorizing in this area. Admittedly, at a modest scale some progress has been made, but an operational methodology for long-term sustainability analysis is still missing. The contributions in the present volume have to be seen as attempts at coming to grips with the above mentioned issues. They reflect a wide spectrum of views and approaches and show that this field is still in motion. Various new conceptual frameworks are developed and attempts are made to devise an applicable methodology. However, a major problem in various contributions appears to be a clear view on the notion of sustainability (cf. Pezzey, 1989). This question will be further discussed in the next section.

Planning for Sustainability

Sustainability has become a key concept in current environmental debates. But the interpretation of this concept is less clear in many cases, as this may depend on underlying subjective or ideological views. In this context, Turner (1987) makes a distinction into four basic world views:

- extreme technocentrism: a resource exploitative, growth oriented position;
- accomodating technocentrism: a resource conservationist and managerial position;
- communalist ecocentrism: a resource preservationist position;
- extreme ecocentrism: an extreme preservationist position supported by an acceptance of bioethics.

Various reports presented in the past decade by different international institutions mirror - in one way or another - some of these (ideal-typical) views. The plurality in views and fragmentation in institutional responses however is an indication that a satisfacatory planning paradigm for sustainable development has not yet been found. Nevertheless, the world-wide support for the Brundtland Report indicates that a concensus on desirable future directions has in the mean time emerged on appropriate policy measures and controls (e.g., economic incentives, institutional mechanisms, etc.). In addition, there is a growing conviction that strategic policy thinking is a necessity, even though the precise meaning of sustainable development is not yet entirely clear. There is a clear need for including intertemporal effects (the multiple generations case) and trans-border effects (the echo effects case) in policy initiatives regarding natural resource degradation.

In general, there is a need for promoting policies that ensure a better resource management and conservation and, at the same time, reduce fiscal burdens on government and improve economic productivity. There is not by necessity a conflict between natural resource management and economic development policy, provided all market failures and distortions are adequately coped with. This holds also for countries heavily dependent on their natural resources for sustained economic growth (for instance, Myers, 1984; and Repetto and Gillis, 1988).

It seems to be a plausible assumption that sustainable development will not come into being unless all environmental sacrifices are fully reflected as costs to be charged to economic development. Planning for sustainable development means essentially a management of resources in which the

direction and quality of environmental conditions are permanently monitored so as to have available full information for effective policy response. In this context a system of natural resource accounts might be devised in order to collect and store in a systematic way all relevant information on changes in the stock of (renewable and non-renewable) environmental assets. Such a system of natural resource accounts is essentially the dual side of a system of economic accounts monitoring economic developments. The way such environmental effects are measured (i.e., the economic valuation of environmental effects) is far from easy, but recent advances in the area of social cost-benefit analysis (notably marginal social opportunity cost analysis), multiple criteria evaluation and simulation modelling provide good examples of operational analytical tools. In this respect, also environmental impact assessment has to be mentioned, as this tool has proven its power in those countries where it has become an institutionalized part of environmental planning. A major challenge in the latter area will be to devise methodologies for resource accounting and environmental impact assessment that focus attention on the socio-economic dimensions of strategic sustainability policies.

Sustainability policies should be addressed to all actors involved: households, firms, national and international institutions, cities or regions, and government agencies. Information provision may be seen as a major task of sustainability policies at the micro level. On the other hand, there is also much scope for sustainability policies at the macro level, e.g., international agreements on a reduction of burning fossil fuel, cooperation through coherent multi-national environmental data banks.

In conclusion, planning for sustainability requires a shift in our thinking on the development of our economic system. There is an evident need for more strategic thinking, more cohesive thinking and more multidimensional thinking in order to ensure a compatibility of economic and environmental interests. This means that both the strategic significance of sustainable development and the implications for practical policy strategies have to be envisaged.

In the light of the above observations on sustainable development, the present volume is organized as follows. It starts - in part A - with a collection of refreshing and reflective contributions to the issue of a balanced economic and environmental development. The second part of the book, part B, is devoted to more practical and planning issues in this field, whilst here particular emphasis is placed on environmental assessment and policy evaluation.

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