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Ecology and economics

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Introduction

Ecology in essence means the necessary and feasible harmony between man and nature (C.F. v. Weizsäcker). Economy, however, in general implies disharmony with nature. Use is made of nature both directly and indirectly when raw materials are processed for the production of goods, and nature is polluted by the emissions and wastes of this production. There are, then, two processes in which nature remains the loser; she exchanges natural raw materials for produced waste materials. Besides labor and capital, nature is truly a quiescent exploited third factor of production. How can nature's position in this "game" be improved, her rights guaranteed and her protection provided?

Increasing conflicts between ecology and economy

The use of raw materials and the generation of wastes is, of course, an old issue. Scientific-technological development has, however, made the exploitation of depletable resources increasingly possible, and has led to a growing accumulation of non-decomposable wastes. Nature is no longer able to absorb all of these substances, many of which are not only toxic for nature but for human beings as well.

Efforts to hide emissions and wastes in dumping sites, in intermediate or permanent storage places, to spread them by building high smokestacks, or to dump them into the water have proven only temporarily successful because emissions and wastes are in general "mobile poisons"; they do not stop at borders.

One result of this is the "linearization" of ecological cycles: the natural diversity is reduced, the robustness of the ecosystems declines, ecological symbioses and equilibria break down. As a consequence of these processes, the absorption capacity of the natural environment decreases and environmental pollution increases.

Accordingly, the conflict between economy and ecology can be attributed to two actually or potentially incompatible basic principles:

- the ecological principle of "stability" as a precondition for the sustainability of ecological systems; and,
- the economic principle of "growth" as the inherent logic of the economic systems — or, to put it in

a more precise way, the principles of business profitability, of economic growth, and of expansion on world markets.

Reducing the conflicts — The task ahead

Given the actual or pending ecological crisis, the question if and how these economic principles can be changed, reshaped and finally brought into harmony with ecological principles, on which level, in what way, and at what time, is, of course, a controversial one for both theory and practice. The answer depends, first, upon the respective constellation of interests, both individual and societal; here opinions diverge rapidly and usually quite definitely. The answer also depends upon the ability and the willingness for social innovations, and especially on:

- how one uses the possibilities of applying ecological principles for the self-regulation of the economy; and
- how one judges the possibilities for an ecologically oriented economic policy.

Ecological self-regulation of the economy

To start with, we should remember that most certainly only a small fraction of the environmental problems would exist if the economic contexts had remained so small and comprehensible that producers and consumers would personally be able to recognize and perceive the consequences of depleting resources and polluting nature. Or, in other words, if business profitability, economic growth, and the expansion on world markets could not be guaranteed or increased by externalizing some of the given costs. This is the old but still relevant — because unresolved — problem of the external effects of production.

Scientific-technological development has been, and still is, coupled with negative external effects, i.e., the shifting of costs to third parties, or onto society, future generations, and nature. With respect to environmental problems, all of these components of external effects are interrelated; it is the incarnation of the problematique of industrial society.

Let us take as a recent example of public environmental discussion the pollution of the "ecosystem forest." This example shows:

- the shifting of a part of the costs of production, here in the form of not sufficiently reduced air pollutants, onto nature, which is resistant only to a limited degree, so the forests are dying;
- the shifting of costs onto the succeeding genera-

tions, in the sense of a future with less forests, or only a long term regaining of the reproduction capacity of the soil; and,

- the shifting of costs onto third parties — i.e., partial expropriation of private forest owners — and onto society, in the sense that economic and technical decisions of individual polluters — especially emissions from power plants, transport, and transboundary pollution — impair the well-being and the physical health of society.

The economic system is thus evidently making incorrect calculations with respect to the "ecosystem forest." Both business accounting and national accounting do not include sufficient signals which may prevent pollution that is no longer tolerable for the ecological systems or can no longer be coped with. Conventional accounting shows favorable balances for the production of energy, for automobile producers, and for pollutant exporters (just to stay with the three polluting agents mentioned above), although the "ecosystem forest" is definitely being damaged by the emissions of these economic sectors. Loss here, profit there, compensation does not take place nor is it planned.

One of the pending tasks can therefore easily be described: "Internalize the external effects of production!" Or, in other words: "Shifting the costs back to the economic units that cause the problems," and also "including the ecological component in all investment decision-making." Undoubtedly, decreasing the external effects of production on society, nature, and future generations would be an important strategic element for regaining harmony between ecology and the economy. But, how to proceed in practice?

The principle of integrated cycles: To understand the economy as an integrated cycle, or as recycling in the broadest sense, would mean to reduce systematically the use of depletable resources and the generation of polluting wastes — and this is in contradiction to an economy being organized for quick throughput. In practice, recycling — with glass and paper wastes, old tires, and used batteries — is still at an incipient stage as a systematic economic undertaking. The step from simply disposing of refuse towards an integrated waste economy has not yet been made, in part because many waste products cannot be recycled at all or only at high costs. But it is also true that this step has not yet been made because the right price and cost signals have not yet been set. Preventing waste generation and actively conserving energy are not sufficiently being promoted. And lastly, it has to do with the structural deficits of the accounting procedures which do not entail adequate criteria for measuring diminishing stocks. The result may be contradictory: "increasing monetary income — decreasing natural stock."

Approaches for "ecological accounting" at the factory level and for the integration of environmental aspects into national accounting procedures are promising and have been sufficiently tested. With ecological accounting at the factory level, the amount of energy, materials, wastes, and land uses are computed and, by simulating the given shortage, accounting units are determined which then enter the accounts. Thus a measure is developed which not only may guide investment decision-

making, but also may provide a public information instrument which can contribute to determining and promoting qualitative economic processes.

The principle of sustainability of resource use: This second ecological principle is no longer valid in modern industrial society. Traditionally, forest owners have followed the principle "Do not cut down more wood that can be regrown." Meanwhile, this principle has been undermined: externally produced "acid rain" destroys internal resource conservation. Sustaining the yield of private forest capital is being replaced by indirect expropriation in the form of publicly experienced "dying of forests." Nature fights back by dying. How should society fight back?

The principle of responsibility or liability for the economy is a basic principle to be re-established. With respect to environmental problems, the legal system of many countries and, correspondingly, economic behavior are marked by strict proof of causality. Only when the injured (damaged party) can prove who caused the damages (polluting party) then that party is held liable for compensation. Instead, in some countries — for example in Japan — the statistical probability is sufficient for obligating polluters to compensate for damages. Once this principle was applied, it helped to improve environmental quality through ecological self-regulation of business activities. In addition it strengthened the concept of prevention in environmental policy, and shifted the technical solutions of environmental problems from "ex post" to "ex ante" solutions, i.e., from "end-of-pipe technology" towards "integrated technology." The practical implementation of the principle of responsibility and liability can follow different patterns: general environmental liability, cooperative funds, automatic reporting on emissions, etc.

Ecological orientation of economic policy

Confronted with serious environmental problems, conventional economic policy is increasingly being challenged. Its guiding principles, goals, instruments, and institutions are being questioned, and a new concept is emerging: *ecological economic policy*.

Task — Increasing efficiency and maintaining substance: Conventional economic policy is based on the guiding principle of maximizing flows: volume of production, income, profits, turnover. Kenneth Boulding fifteen years ago called this "throughput economy." Instead, he demanded the "spaceship economy." If he were writing today, he would probably speak of an "ecological economy." This paradigm includes a new guiding principle: "Increasing efficiency and maintaining substance!" Aspects such as environmental compatibility and resource conservation become important, and the structural change of the economy, of products and technologies, according to ecological principles becomes the task

Goal — Environmental stability: With respect to goals, it seems necessary to re-define and supplement the conventional economic policy goals, especially to re-assess economic growth targets and to include "environmental stability" in the catalogue of economic policy goals. The conventional policy goal indicators were developed at a time when environmental pollution was already a prob-

lem but not yet an issue, and since then they have not really been re-adjusted. Economic growth is still measured in terms of goods and income categories (GNP - Gross National Product); the ecological cycle is not included. Economic growth is defined as an increase of income; the effects of this on the stock and quality of resources (natural capital) are not considered. And, finally, in the conventional concept of growth, all monetary transactions are summed up independent of their function. Increasingly more expenditures are included which *per se* cannot be positively assessed but are solely being spent for the necessary compensation for damages previously caused by the economic process (compensatory expenditures).

More qualified goal indicators for economic policy can be gained in various ways: through computations of compensatory expenditures, i.e., assessment of an environmentally related net product (ENP - Eco National Product); combined growth, employment and distribution indices; integrated system of economic and ecological indicators, etc.

Instruments — Resource taxes and emission charges: Regarding the instruments, conventional economic policy relies strongly on two main instruments only: variations of interest rates and of tax rates. From an ecological point of view, taxes and charges are required which, to some extent, can replace traditional taxes. Highly relevant in a situation of unemployment and environmental pollution would be resource taxes (as, for example, an energy tax) and emission charges (as, for example, a charge on sulphur dioxide emissions). Such a combination could help to change the existing incentive structure

in the economy towards increasing resource efficiency and employment opportunities.

Institutions — Structural reforms: Economic policy manifests itself in — and works through — particular institutions. Therefore, the ecological orientation of economic policy requires establishing new institutions and abolishing or re-defining old ones.

As a rule, environmental problems are not confined to the parameters of private ownership nor do they remain within given borderlines. Environmental protection falls within the realm of competence of local, national, as well as supranational institutions. Thus neither the existing civil law, nor the national governmental jurisdiction can provide adequate answers to the actual and imminent environmental crisis. A structural reform of institutions seems to be required by which economic institutions would have to incorporate ecological perspectives and environmental institutions improve their competence, and by which environmental impact assessments would become part and parcel of all economic decision-making.

Conclusion

Establishing a better harmony between ecology and the economy is obviously a tremendous task, conceptionally as well as practically. Its implementation requires a restructuring of the economy and a replenishing of economic policy. To "raise a loan with the ecology," i.e., to rely on ecological principles, that is what matters. Ecological structural change of the economy — and the ecological re-orientation of economic policy — is ultimately the only chance to reconcile the interests of human beings and nature.