INDUSTRIAL RESTRUCTURING FOR SUSTAINABLE DEVELOPMENT - THREE STRATEGIC ELEMENTS

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INTRODUCTION

At a forum on "Industry and the Environment" in New Delhi, Stephan Paulus gave the following definition of ecological modernization: "Ecological modernization focuses on prevention, innovation and structural change towards ecologically sound industrial development ... It relies on clean technology, recycling, and renewable resources ... To introduce such a concept into the economy, it is necessry to coordinate various policy areas, such as industrial, fiscal, energy, transport and environmental policies."[1]

This is actually a rather broad and demanding definition of a concept, proposed to achieve better harmony between economy and ecology. I will, therefore, concentrate on only some aspects of such a concept. First, I am going to present some empirical evidence on the relationship between economic structure and environmental impacts; second, I shall point to some of the deficiencies of environmental policy, and third, I shall put forward some ideas on how to integrate environmental considerations into economic policy.

ECOLOGICAL STRUCTURAL CHANGE OF THE ECONOMY

In both the East and the West, economists, planners and engineers are seeking a solution to the problem of how to change the traditional patterns of resource use. "Perestroika" and "modernization" are two actual catch-words in this process, and new environmental priorities play a part in the envisaged conversion of the economy. Harmonizing ecology and economy in a specific sense relies on the premise that a reduction in the resource input of production (structural change), will lead to an ex ante reduction in the amount of emissions and wastes that have a negative impact on the natural environment (ecological structural change).

In order to clarify the relationship between economic structure, structural change, and environmental impacts, one needs suitable information concerning the material side of production. Environmental protection and resource conservation by the economy (and thus its long-term sustainability) cannot appropriately be described in such terms as income or final consumption. One possibility is to select and compare some indicators describing the environmentally relevant features of the production process. The availability of environmental indicators such as emission and immission data relating to "representative" pollutants - such as sulphur dioxide (SO_2) and nitrogen oxide (NOx) - has grown recently (e.g., the Annual Reports on the Environment by several industrial nations, by UNEP and the OECD).[2] These indicators concern certain negative environmental effects of production.

Less substantial, so far, has been the research on the environmental relevance of the input factors in industrial production, or on the question of what indicators provide environmentally significant information about the structure of the economy. Given the present state of statistics, only a few such indicators can be tested in a cross-national comparison of eastern and western countries.

De-linking Economic Growth from Environmentally Relevant Inputs

Using a set of four indicators (input factors), Janicke et al. have studied 31 countries of both COMECON and OECD with regard to the relationship between economic structure and environmental impacts.[3] The four factors whose direct and indirect environmental significance is thought to be self-evident were: energy, steel, cement, and freight transport. Regarding their patterns of production and consumption, these are environmentally "hard" factors, characteristic of a certain structure and/or stage of economic development.

The main hypothesis of the research was a simple one: Positive environmental effects of structural change of the economy are to be expected by actively de-linking economic growth from the use of environmentally relevant inputs (resources). Such de-linking or (ecological structural policy) would:

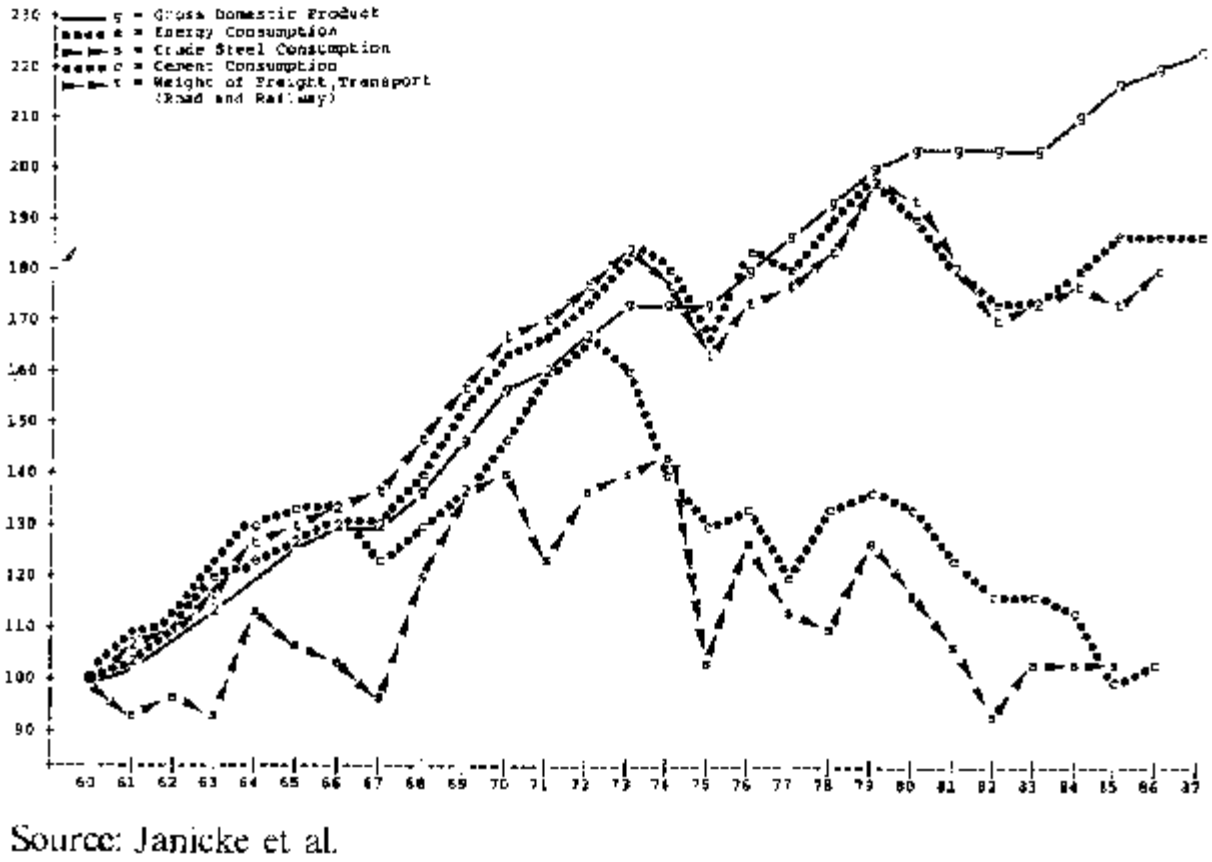
- result in a decrease of resource depletion and/or environmental pollution;
- mean ex ante instead of ex post (end-of-pipe technology) environmental protection; and,
- promote those integrated technologies which touch upon several environmental effects (pollutants) at the same time.

Structural change as a shift of input factors to more intelligent uses, can be conceived as a process of successive de-linking: the contribution of

traditional (hard) input factors to the national product decreases, i.e., they change or lose their function in the development process.

Examples of Successful and Deficient De-linking

Taking the Federal Republic of Germany as an example, Figure 1 illustrates a five-fold de-linking from the growth of the Gross Domestic Product (GDP): The de-linking of energy and cement consumption and weight of freight transport from the GDP became apparent during the 1970s, and was fully established by the end of that decade. Regarding steel, the de-linking process began already in the 1960s. In this way, the structural change of the economy generated environmental gratis effects of various kinds:



Source: Janicke et al.

Figure 1: Structural Economic Change in the Federal Republic of Germany, 1960-1987 (1960 = 100).

- The stagnating consumption of primary energy led to a reduction of harmful emissions (pollutants);
- The decline in the weight of freight transport indicates that the volume of materials employed was reduced rather than increased;
- The fall in cement production represents a direct gratis effect as far as the emissions from cement factories are concerned; with regard to the environmental effects of the construction industry, this decrease coincided with the trend towards labor-intensive renovation of the housing stock, as compared to new construction in the 1950s and 1960s;
- The decrease in steel consumption accounts for a considerable reduction in harmful emissions as far as production and processing are concerned; this drop was strongly marked and partly due to increased recycling activities.

Environmental gratis effects occur when the rate of usage of the input factors (resources) having a (strong) negative impact on the environment remains below the growth rate of the GNP. Comparing the rates of usage of the four slected input factors with the growth rate of the GNP, Janicke et al.[4] discovered three different development patterns:

- The factors having impacts on the environment decline absolutely; i.e., absolute structural improvements are induced corresponding to absolute environmental gratis effects;
- The factors having impacts on the environment remain constant, or increase, but with a lower growth rate than the GNP; i.e., relative structural improvements, corresponding to relative environmental gratis effects;
- The factors having impacts on the environment increase at a higher growth rate than the GNP; i.e., structural deterioration, corresponding to absolute negative environmental effects of economic growth.

In Table 1, 16 out of the 31 countries studied are grouped according to these three development patterns.

Of all the industrial countries investigated by Janicke et al., Sweden went through the most rapid structural change. The drastic reduction in cement production (-41%), the decreasing use of crude steel (-38%), and the decrease in the weight of freight transport (-21%) add up to notable environmental gratis effects absolute structural improvement.

In Japan, the process of de-linking was partly neutralized by the rapid growth in industrial production and thus only resulted in "relative structural improvement."

TABLE 1

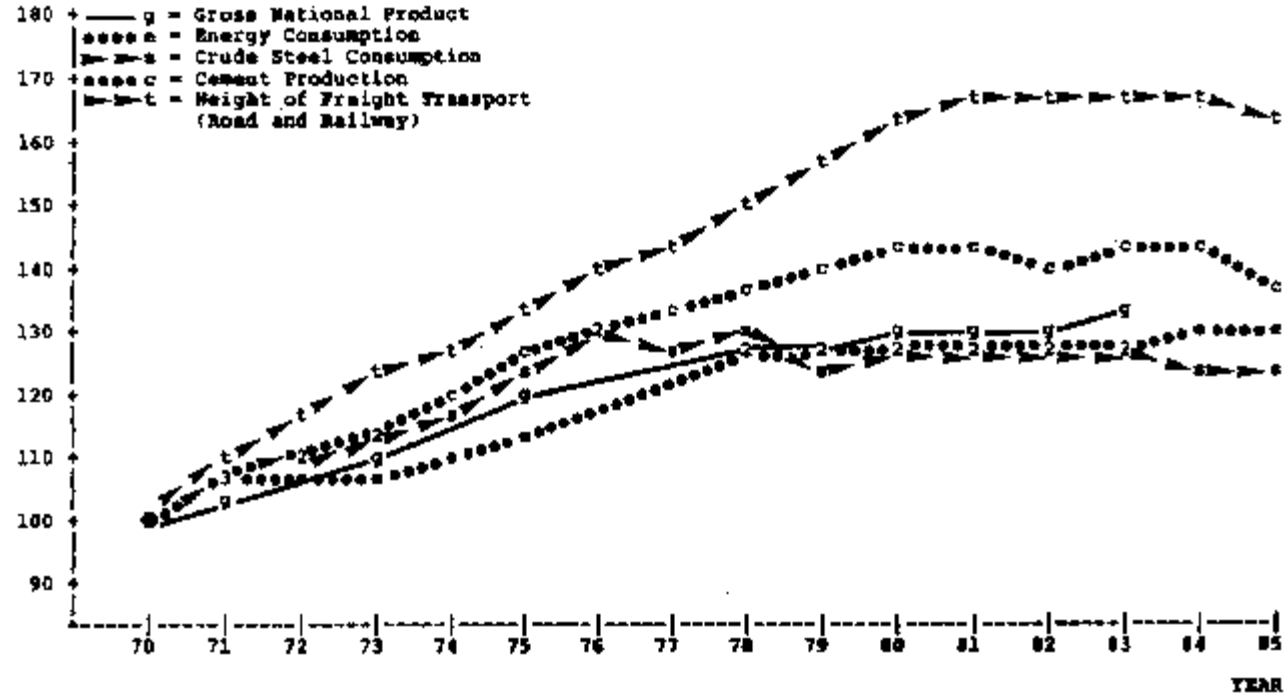
Environmental Impacts Deriving from Structural Change
Percentage Changes 1970/1985

Country	Consumption of Primary Energy	Consumption of Crude Steel	Cement Production	Weight of Freight Transport	GDP *
Group 1: Absolute Structural Improvements					
Belgium	7.1	-24.5	-17.6	-2.2	42.7
Denmark	-2.7	-15.6	-33.2	20.1	40.8
France	30.3	-34.8	-23.4	-14.5	51.6
FRG	13.4	-26.3	-32.8	4.4	38.4
Sweden	26.4	-37.9	-41.2	-21.4	32.7
United Kingdom	-2.3	-43.5	-28.7	-18.2	38.4
Group 2: Relative Structural Improvements					
Austria	32.1	-33.9	-6.0	21.3	54.3
Finland	39.6	14.8	-11.2	12.2	65.7
Japan	37.3	-2.3	47.4	7.5	90.2
Norway	51.1	-21.6	-40.3	34.7	87.5
Group 3: Structural Deterioration					
Bulgaria	74.9	24.9	42.3	77.5	37.3
Czechoslovakia	31.5	22.5	32.3	62.9	33.9
Greece **)	119.3	67.3	162.9	43.1	69.1
Portugal **)	89.0	34.2	133.1	27.4	69.0
Soviet Union	76.3	33.5	35.9	70.2	47.7
Turkey	218.8	184.4	173.2	118.6	118.2

*) Calculation of the Gross Domestic Product percentage changes on the basis of constant (1980) US Dollars. Bulgaria, Czechoslovakia and Soviet Union data refer to percentage changes 1970/83 of the Gross National Product.
**) Transport data only take railway transport data into account.

Source: Janicke et al.

In Czechoslovakia, no significant de-linking of economic growth from the four input factors was discernible (Figure 2). The development profile of this country, with sluggish or even lacking structural change is, to some extent, representative of the other economies of Eastern Europe. The group of countries characterized by "structural deterioration" consists, for the most part, of industrial late-comers. However, Czechoslovakia is a relatively old industrial nation which suffers from high environmental impacts of production.



Source: Janicke et al.

Source: Janicke et al.
Figure 2: Structural Economic Change in the CSSR, 1970 - 1975 (1970 = 100).

Trends Towards Industrial Restructuring

Despite certain analytical limitations of such empirical research - e.g. the selection of only four input factors, several conclusions can be drawn from this international comparison as regards the trends of industrial restructuring.[5]

- Structural change in the form of de-linking economic growth from environmentally relevant inputs was evident in most, but not all, of the countries studied. Fewer than half of them still clung to the traditional modes of quantitiative growth;
- Several countries enjoyed environmental gratis effects as a result of active structural change. In some cases, especially Sweden, these effects were quite considerable;
- In other countries, the possible beneficial environmental effects of structural change were levelled off by the rapid industrial growth pursued. This was especially true for Japan;
- The strong correlation between the level of production (GNP) and environmental impacts, still evident in the 1970s, had dissolved in the 1980s. The high-income countries featured fairly rapid structural change;
- In the medium-income countries, a distinct pattern emerged that there were cases of rapid quantitative growth and cases of qualitative growth, i.e., economic growth with constant or decreasing resource input.

All in all, it is therefore not yet possible to speak of one dominant trend towards industrial restructuring. However, the environmental gratis effects of active structural change are highly evident and thus provide one strategic element of ecological modernization.

PREVENTIVE ENVIRONMENTAL POLICY

Theoretically speaking, environmental policy could be defined as "...the sum of objectives and measures designed to regulate society's interaction with the environment as a natural system: it comprises aspects of rehabilitation, conservation, and structural adjustment."[6] Practice, however, does not conform to such a broad definition. Only parts of the interaction between society and environment become the subject of policy. So far, environmental policy has mostly been designed as react-and-cure strategies concerning air and water quality, noise and waste disposal, with emphasis on the rehabilitation and conservation aspect.

For a variety of reasons, this conventional environmental policy was, and still is, meaningful and very much necessary. It has, however, a number of deficits, some of which are cited in the following, along with some suggestions for overcoming them through preventive environmental policy, i.e., "anticipate-and-prevent strategies."

Environmental Expenditures - Environmental Damages

Since the beginning of the 1970s, when systematic records first began to keep track of the funds allocated for environmental protection, in the industrialized countries the sum of the respective public and private investments has reached large proportions. The industrial society thus appears to be paying through the nose - backpayments for the negative environmental costs of production accumulated in the past.[7]

TABLE 2

Environmental Protection Investments, Manufacturing Sector, Federal Republic of Germany, 1975 - 1985

Year	Total Investments		Waste Disposal		Water Pollution Control		Noise Abatement		Air Pollution Control	
	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices
	In Millions of DM									
1975	3,480	3,090	230	210	900	1,180	260	240	1,310	1,530
1976	3,190	2,830	200	210	820	960	220	260	1,250	1,480
1977	3,150	2,580	200	210	740	850	210	220	1,100	1,250
1978	3,150	2,370	170	180	680	750	200	220	1,100	1,220
1979	3,080	2,190	160	160	740	800	200	210	980	1,020
1980	3,650	3,650	210	210	910	910	240	240	2,290	2,290
1981	3,940	3,410	230	240	950	930	210	200	2,530	2,480
1982	3,560	3,350	200	260	2,350	2,050	200	210	1,610	1,650
1983	3,690	3,370	230	260	2,100	900	220	200	2,070	1,830
1984	3,300	3,100	270	240	1,040	920	220	190	1,960	1,730
1985*	3,620	4,960	330	280	1,060	910	260	220	2,970	2,530
	Average Annual Change in %									
1975/84	+ 1,9	- 0,0	+ 5,3	+ 1,5	+ 1,6	- 2,1	+ 1,6	- 1,6	+ 5,3	+ 1,5
1975/79	+ 4,3	- 8,2	+ 1,3	- 6,5	- 4,8	- 7,9	0,0	- 3,1	- 3,6	- 9,6
1979/84	+ 31,0	+ 7,2	+ 33,0	+ 8,4	+ 6,5	- 2,8	+ 2,0	- 2,0	+ 25,3	+ 13,4

TABLE 3

Total Costs of Environmental Protection, Federal Republic of Germany, in Millions of DM, 1975 - 1985

Year	Industry			Government			Industry and Government		
	Current expenditures	Depreciations	Total costs	Current expenditures	Depreciations	Total costs	Current expenditures	Depreciations	Total costs
	At current prices								
1975	3,200	1,530	4,730	3,000	1,920	4,920	6,200	3,440	9,640
1980	5,160	2,350	7,410	4,690	3,190	8,080	9,850	5,640	15,490
1985	7,930	3,360	11,090	6,910	4,340	10,770	14,760	7,580	22,340
	At 1980 prices								
1975	4,050	1,870	5,930	3,790	2,570	6,360	7,840	4,440	12,280
1980	5,160	2,350	7,410	4,690	3,190	8,080	9,850	5,640	15,490
1985	6,230	2,640	8,870	5,340	4,030	9,370	11,570	6,670	18,240

Source: IIES research project.

In the Federal Republic of Germany, for instance, this sum has come to the handsome total of over 250 billion Deutschmarks (or about 140 billion US Dollars). In a detailed study, Leipert et al. from the International Institute for Environment and Society (IIES) have computed and classified all existing data on investments and expenditures aimed at repairing and protecting the environment. Table 2 shows the total and sectoral environmental protection investments for the manufacturing sector of the German economy for the years 1975 to 1985. Table 3 shows the total costs of environmental protection (current expenditures and depreciations) for both industry and government for the years 1975 to 1985.

Figures like these, however, are ambivalent. On the one hand, they give cause for proud political statements about the successes of environmental protection according to the motto, "the more, the better". On the other hand, they are the absolute minimum of what is necessary to secure the very basis for society's sustainability. At the same time, they symbolize a serious structural deficit of industrial society. Environmental protection expenditures are spent when damage to the natural environment has occurred and can no longer be denied. Belated, they are repairs to the process of economic growth, signs of a "post-fact" policy that reacts to damages (and must react to them) but does not, or cannot, prevent them. Therefore, it seems to be in order to confront the "success stories" with figures on the environmental damage itself. This means, not looking at the current environmental protection expenditures but at the actual damages to the environment.

Again taking the Federal Republic of Germany as an example, a recent estimation by Wicke et al. from the Federal Protection Agency showed that the annual damage to the natural environment is above DM103 billion, or in the order of 6% of the GNP, and not 3% as the OECD had estimated for the industrial countries a few years ago.[8]

Table 4 is based on different estimation methods, using data on actual damage costs and findings from willingness-to-pay studies. Though the results must be taken with some care, the table gives an idea that despite high annual environmental protection expenditures still being enormously high, environmental damages occur annually. Of course, this situation may not only be true for Germany but for many other countries as well.

TABLE 4

Environmental Damage in the Federal Republic of Germany
("Measurable Damage" in Billions of DM per year)

ENVIRONMENTAL SECTORS	ENVIRONMENTAL DAMAGE
AIR POLLUTION	ca. 48.0
Health hazards	between 2.3 - 5.8
Material damage	more than 2.3
Degradation of vegetation	more than 1.0
Forest blight	between 5.5 - 8.8
WATER POLLUTION	far more than 37.6
Damage to rivers and lakes	more than 14.3
Damage to the North Sea and Baltic Sea	far more than 0.3
Contamination of ground water	more than 3.0
SOIL CONTAMINATION	far more than 5.2
Costs of Chernobyl disaster	more than 2.4
Rehabilitation of "yesterday's wastes."	more than 1.7
Costs of preserving biotopes and species	more than 1.0
Other soil contamination	far more than 0.1
NOISE	more than 32.7
Degradation of residential amenities	more than 29.3
Productivity losses	more than 3.0
"Noise rents"	more than 0.4
Grand total of damage	more than 103.5

Source: Wicke et al.

There are more shortcomings of environmental policy.[9] To name a few: Conventional environmental policy usually identifies the given problem too late, so that the ecosystems affected can no longer be saved. As it is pursued as a media-specific policy, i.e., regulating air and water quality, noise or waste, it also runs the risk of lacking coordination between its specific goals, measures and institutions. This, then, may result in shifting a problem from one environmental medium to another, e.g., from air to water or soil, or from one place to another, as is the case with long-range, trans-boundary pollution. In addition, environmental policy often becomes entangled in a debate on principles. If measures must quickly be taken, the argument gets shifted from the "polluter-pays-principle" -- which is advocated in general -- to the "taxpayer-pays-principle", thus switching the burden of environmental protection from the individual polluter to the community, to government or to society at large.

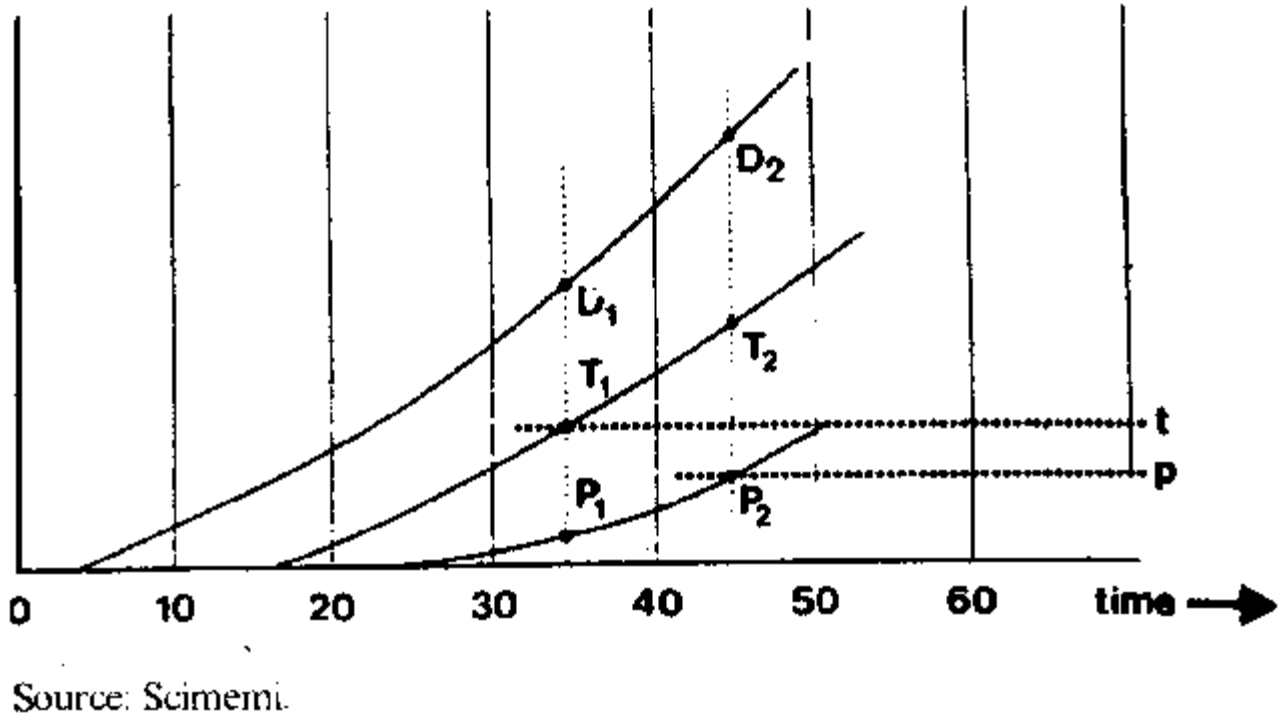
Thus, innovations in planning and implementation are needed. With the concept of preventive environmental policy, it seems one can counter the shortcomings of conventional environmental policy. In order to switch to preventive policy, several conceptual as well as practical constraints have to be overcome.[10]

A first constraint has to do with the particular history of an environmental impact. In cases of yesterday's wastes (or Altlasten), where damage has already occurred, a curative strategy is probably the only conceivable option. In cases where no damage has occurred as yet, but where damage is expected in the future, the choice between a preventive and a curative strategy is basically open. In such a situation, the anticipatory principle means to encourage the first option. As practice often is a mixture between the existing and the new, most policies will actually also include a mixture of prevention and cure. Demanding preventive environmental policy will then mean seeking a better balance between the anticipatory and the reactive component within the policy action.

Basic Conditions for Preventive Environmental Policy

According to Scimemi and Winsemius, one can look at three factors as concomitant policy relevant processes in time: The accumulation of environmental damage; the acquisition of technical knowledge; and the rise in public awareness. The time sequence of these processes, especially the relative timing of their critical level, is decisive for the whole issue of preventive environmental policy. To illustrate the relationship between these three factors, Scimemi has redrawn a diagram suggested by Winsemius, using three separate functions: Level of Damage, Level of Technical Knowledge, Level of Public Awareness.[11] The relative position and the shape of these functions depends, of course, on the specific circumstances (country, environmental sector, historical phase) under consideration. The common case is illustrated in Figure 3.

Within these concomitant processes, a certain stage becomes important - critical level. As illustrated, the technical understanding of the issue reaches a critical level, t, thus ensuring the first of two conditions required for effective policy action, i.e., technical rationality. Public awareness also reaches a critical level, p; at that time the second condition for effective decision-making, i.e., political viability, is fulfilled. It is at this stage that action will be undertaken to avoid the occurrence of further damage.



Source: Scimemi.
Figure 3: Factors of the Environmental Policy Cycle: Damage, Technical Knowledge, Public Awareness

Line D1-D2 indicates the accumulation of environmental damage over time. The accumulation of damage starts at a given point in history (in the diagram somewhere between time 0 and 10). At that point, neither the scientific community nor the general public is yet aware that anything of importance is happening. Line T1-T2 indicates the process of gathering technical knowledge. This process may not start until some time after damage has begun to accumulate (in the diagram somewhere between time 10 and 20), and proceeds gradually. During that phase the public is still unaware of the hazard. Somewhere between time 20 and 30, while technical knowledge increases further, public awareness starts to rise, as indicated by the line P1-P2.

Anyone familiar with developments in environmental policy at national or international level, will be able to recall a number of instances where the process evolved very much in conformity with Scimemi's theoretical interpretation. In this sense, the diagram may thus be considered to be a true representation of real events. (There may be cases, however, where public awareness - line P1-P2 starts earlier than technical knowledge - line T1-T2).

What are now the opportunities to influence these basic conditions of policy action in favor of preventive environmental policy? Figure 3 helps to formulate three general and two specific options.[12]

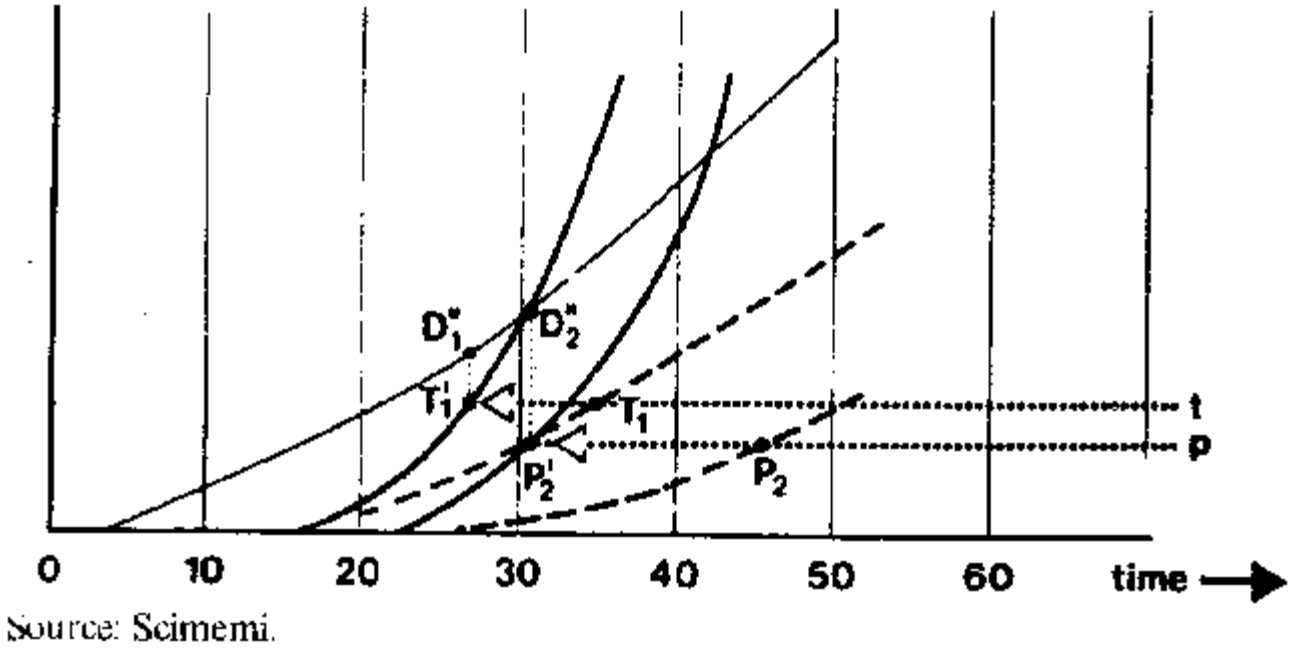
General options:

- Retarding damage accumulation (i.e., sliding the D1-D curve to the right);

- Accelerating technical knowledge (i.e., sliding the T1-T2 curve to the left and/or raising its slope);
- Increasing public awareness (i.e., sliding the P1-P2 curve to the left and/or raising is slope).

Specific options:

- Dynamic environmental standard setting (i.e., lowering threshold t);
- Dynamic public participation (i.e., lowering of threshold p).



Source: Scimemi.

Figure 4: Accelerating the Generation of Technical Knowledge and/or the Development of Public Awareness

These various options all have the effect of making policy decisions possible at a stage when the level of environmental damage is still relatively low or damage is even non-existent. One of these options is illustrated in Figure 4.[13]

Environmental Impact Assessment as Part of Preventive Policy

Acceleration of knowledge and awareness can be promoted through a variety of approaches and methods and depends a great deal on the specific environmental issue at hand. Environmental Impact Assessments (EIA) are increasingly being applied, not only for public but also for private investment projects. They entail efforts to learn more about possible environmental impacts, and are intended to allow appropriate action to be taken before damage has occurred. In that sense, environmental impact assessments can be classified as part and parcel of preventive environmental policy.[14]

During the last years, some headway has been made to institutionalize and standardize EIA procedures nationally, and to a minor extent also internationally. As the EIA procedure is particularly fitting for specific investment projects it allows for the "accelerating effort" to be targeted, and generally also permits the burden of such efforts to be imposed upon the project initiator himself, thus conforming to a precondition of preventive environmental policy, i.e., the polluter-pays-principle. A big deficit, however, remains in how to implement EIA as a preventive procedure in cases of global change, like climate warming or ocean pollution.

The required levels (thresholds) regarding technical knowledge and/or public participation in environmental decision-making, differ widely from one environmental medium and country to the other.[15] The question of "how much knowledge/awareness is enough" normally falls upon the political decision-maker (the European Commission, the government, the environmental protections agency), even if the scientific community (or parts of it) is ready to say "we know enough" and the public (or parts of it) demanding "something must be done." Therefore, stalemates in decision-making on environmental issues are quite frequent. Eventually, this situation can be exploited by opposing agencies, parties, or nations. The dispute between Germany and England on the acid rain problem is just a case in point. The positions of these two countries are reversed when asbestos rather than sulphur is at issue.

What is "enough knowledge/awareness" for one country (agency, party) may not be enough for the other. The normal outcome of such a situation is a compromise over the emission standards to be implemented. They will be weaker than technically/politically feasible because

knowledge/awareness on cause-effect relationships or social priorities is said to be insufficient. Eminent cases in point are the emission standards for SO_2 and NOx in the air pollution field, and the nitrate standard in the water pollution field. Thus, the dilemma of setting stricter emission standards is serious. Meanwhile the forests may continue to die back, and the water may continue to get contaminated.

The conclusion, therefore, is that environmental standard setting must be conceived as a continuous process. With growing knowledge/awareness on actual and probable environmental damages the thresholds for action must be consecutively lowered, i.e., standard setting must by dynamized to make industrial restructuring for sustainable development possible.

This need to come to terms with the future is not unique to environmental policy, as Scimemi rightly observed. Implementing the prevention principle is especially requested in all other domains of policy where collective interests are at stake. One such major domain we have to address when discussing the possibilities and impediments of the concept of ecological modernization is, of course, economic policy.

ECOLOGY AND ECONOMIC POLICY

Conflicts Between Economy and Ecology

"Ecology in essence means the necessary and feasible harmony between man and nature, society and environment" (C.F. von Weizsacker). Economy, however, in general, means disharmony with nature. Use is made of nature both directly and indirectly when raw materials are processed into products, and nature is polluted by the emissions and wastes generated by industrial production. These are, then, the two processes in which nature remains the loser. She exchanges natural raw materials for produced waste materials. Besides labor and capital, nature is the truly quiescent and exploited third production factor. How, then, can nature's position in the "economy game" be strengthened, her rights guaranteed and her protection provided?[16]

The use of raw materials and the generation of emissions and wastes are of course old issues. Scientific and technological development, however, has made it possible to increasingly exploit the depletable resources, and has led to an ever-increasing accumulation of harmful emissions and non-decomposable wastes. Nature is no longer able to absorb all of these substances, many of which are not only toxic to flora and fauna but to human beings as well.

Efforts to hide harmful emissions and toxic wastes - in dumping-grounds, in intermediate or permanent storage-places, to spread them - through high smokestacks and incinerators, or to dump them - into water bodies and abroad, have at best been temporarily successful because many emissions and wastes are "mobile poisons" or reappear in different forms. These activities lead to what Johan Galtun called "linearization of ecological cycles", i.e., the natural diversity is reduced, the robustness of ecosystems declines, ecological symbioses and equilibria break down. As a consequence, environmental degradation increases and the absorption capacity of the natural environment decreases.

Accordingly, the conflict between ecology and economy can be attributed to two (actual or possible) 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 economic systems - more precisely: the principles of business profitability, national economic growth, and world market expansion.

Given the actual and the pending ecological crisis, the question on whether 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 question in both theory and practice, and a challenge to the social sciences. The answer depends, first of all, upon the respective individual and societal constellation of interests. The answer particularly depends upon the ability of and the willingness for social innovations, i.e., on (a) whether the potential of an ecological self-regulation of the economy is used, and (b) how the possibility of an ecological re-orientation of economic policy is implemented.[17]

Ecological Self-Regulation of the Economy

One may start with a general statement: most certainly, only a small fraction of the current environmental problems would exist if the economic contexts would have remained so comprehensible, that producers and consumers would personally be able and liable to recognize and perceive the consequences of their own decisions towads depleting resources and polluting naure. Or, if business profitability, national economic growth, and the expansion on world markets could not be increased by externalizing parts of the ensuing costs. This is the old but still relevant - because unresolved - problem of the external effects of production. Scientific and technological development has been, and still is, coupled with negative external effects, i.e., the shifting of costs to society, future generations, and nature. With respect to the environmental problem, all these components of external effects are relevant.

Let us take acid rain and the ensuing damage to the forests as an example of recent public debate in Europe:

- First, this example shows the shifting of a part of the costs of industrial production, i.e., not sufficiently reduced air pollutants, onto nature, which is resistant only up to certain levels: the forests are dying.
- Second, this example shows the shifting of costs onto the succeeding generations, i.e., a future with less or even no forests, and a limited reproduction capacity of the soil.
- Third, this example shows the shifting of costs onto third parties (i.e., partial expropriation of the forest owners) and onto society, in the sense that economic and technical decisions of individual polluters (especially emissions from power plants, cars, trans-boundary pollution) impair the well-being and the physical health of the population.

Thus, the economic system evidently makes incorrect calculations with respect to the "ecosystem forest". Both business accounting and national accounting do not provide sufficient and adequate signals which may prevent pollution levels that are not tolerable for the ecological system. Conventional accounting shows favorable balances for the productions of energy, for the automobile producers, and for the exporters of pollutants (just to stay with the three sources of pollution mentioned above), although the "ecosystem forest" is definitely being damaged by the emissions from these economic sectors. Losses here - profits there, a compensation does not take place nor is it provided for.

One of the pending tasks both for theory and practice can easily be described: internal and external effects of production, shift the costs back to the economic units that cause the environmental problem, and include the "ecological component" into all investment decision-making. Drastically reducing the external effects of production on society, nature, and future generations would be a necessary step towards regaining harmony between economy and ecology. But, how to proceed in practice and where to put the priorities?

To organize the economy as a materially integrated cycle would, first of all, mean to reduce systematically the use of depletable resources and the generation of polluting emissions and wastes - and this is in contradiction to an economy being organized for quick "throughput". In practice, recycling and clean technology is still at an incipient stage and not a systematic economic undertaking. Especially, the step from simply disposing waste towards an integrated waste management has been made only in a few cases.

Certainly, this is, in part, because many waste products cannot be recycled or only at high cost. But it is also true because the right price and cost signals have not been set. Preventing waste generation and conserving depletable resources are not being sufficiently promoted. This state of affairs, however, has also to do with the structural deficits of the economic accounting procedures which do not adequately measure diminishing stocks. The final outcome may thus consist of two contradictory trends: increasing monetary income - decreasing natural stock.

Approaches towards ecological accounting at the factory level and integration of environmental aspects into the national accounts, however, are promising and have sufficiently been tested. With ecological accounting the amount of energy, materials, waste, land use etc. 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 private investment decision-making, but at the same time provide a public information instrument for determining and promoting qualitiative economic processes.

Another ecological principle is no longer adhered to, that of the sustainability of resource use. Traditionally, forest owners, for instance, have followed the rule, "Do not cut down more wood than can be regrown." This rule is being undermined: externally produced "acid rain" collides with internal resource conservation; accumulated external debt lead to over-exploitation of internal resources. Sustaining the yield of the forest capital is being replaced by indirect expropriation and direct exportation.

One basic principle to be re-established for the sectors and units of the economy is that of responsibility or liability. With respect to environmental problems, the legal system, and also economic behavior, in most countries is marked by the strict proof of causality. Only when the injured (damaged party) can prove who caused the damage (polluting party) then the polluter is held liable for compensation. Instead, in some countries and for some cases statistical probability is sufficient for obligating industry to compensate for damages (collective liability). Once this principle is established by the courts and through legislation, it would quickly help to improve environmental quality through ecological self-regulation of business activities. In addition, it would strengthen the anticipate-and-prevent strategy in environmental policy, and shift the technical solutions for environmental problems from ex-post to ex-ante approaches, i.e., from controlling or end-of-pipe technology towards low emission or integrated technology.

To implement the principle of responsibility or liability in practice, small steps or big leaps could be taken: from continuous reporting on wastes or automatic monitoring of emissions, to collective funds and strict environmental liability.

Ecological Re-orientation of Economic Policy

Confronted with serious environmental damage, 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.

Conventional economic policy is based on the guiding principle of maximizing flows: volume of production, income, profits, turnover. Fifteen years ago, Kenneth Boulding called this the "throughput economy" and opposed it by proposing the "spaceship economy". Writing today, he probably would speak of the "ecological economy". This paradigm is based on a different guiding principle, i.e., "increasing efficiency and

maintaining substance!" Aspects such as environmental compatibility and resource conservation become important, and structural adjustment of products and technologies according to ecological considerations becomes the task.

With respect to the goals, it seems necessary to redefine and supplement the conventional economic policy goals, especially to re-assess the growth target and to include "environmental stability" into the catalogue of economic policy goals.[18] The conventional policy goal indicators were developed at a time when environmental pollution was already a problem but not yet a public issue, and since then they have not really been readjusted. Economic growth is still being measured in terms of goods and income categories only (GNP - Gross National Product), while the effects of this on the stock and the quality of the resources (natural capital) are not adequately considered. In the conventional concept of economic growth, all monetary transactions are summed up independent of their specific function; also, increasingly more expenditures are included which are solely being spent for the (necessary) compensation for damage previously caused by the production process ("compensatory or defensive expenditures").

Qualified goal indicators for economic policy can be defined in various ways: through computations of the compensatory expenditure, i.e., assessment of an environmentally-related net product (ENP - Eco National Product); through combined growth and distribution indices (RWG - Redistribution With Growth); through an integrated system of economic and environmental indicators ("Satellite System"), etc..

Regarding the instruments, conventional economic policy relies strongly on two main instruments, variations of interest rates and of tax rates. From an ecological point of view, new taxes and charges are required which, to some extent, should replace traditional taxes. Highly relevant in a situation of structural unemployment and environmental pollution is the introduction of resource taxes (as, e.g., an energy tax) and emission charges (as, e.g., a charge on sulphur dioxide emissions), and a definite decrease of wage taxes. Such a structural tax reform would change the existing incentives in the economy towards accelerating resource efficiency and increasing employment opportunities.

Economic policy manifests itself in, and works through, particular institutions. Therefore, an ecological orientation of economic policy also requires creating new institutions, and abolishing or redefining old ones. The current debate on the negative environmental effects of decisions by the World Bank and the IMF, and the call for necessary reforms, are just a case in point. The actual and pending environmental crisis seems to require a structural institutional reform by which economic institutions would have to incorporate ecological perspectives, and environmental institutions would have to improve their competence, and by which environmental impact assessments would become integrated into all major economic decision-making.

CONCLUSION

According to the deliberations in the preceding chapters, industrial restructuring for sustainable development of ecological modernization obviously is a demanding concept, both methodologicaly and practically. Its implementation requires a far-reaching conversion of the economy, a re-orientation of environmental policy, and a replenishment of economic policy: "Ecological structural change of the economy," "preventive environmental policy", and "ecological orientation of economic policy" seem to me to be the three main strategic elements to reconcile the interests of man and nature, society and environment. The social sciences - economics, sociology, jurisprudence, political science, psychology - have to develop further the methodological foundations and to improve the institutional arrangements for a successful praticial implementation of such a concept.

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