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## Beyond growth: elements of sustainable development

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**Beyond  
Growth**

Elements of  
Sustainable Development



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## Preface

Imagine what ploughshares could be forged  
if men would lay down their swords.

*The Economist*, on the Brandt Report

In the wake of high human fertility and rapid expansion of industrial activity, many local, regional and global ecosystems have been overburdened, leading in part to irreversible environmental degradation. Even with lower population and economic growth rates, depletion of resources and pollution of the environment are likely to increase. The 'human war on nature' is one of attrition over decades rather than of immediate catastrophe. To end that war, and to resolve the inherent conflict between development and environment, it is necessary to thoroughly explore the development-environment problematique at the local, national and international levels. In particular, society at large, industry, groups and individuals must learn to eliminate wastefulness and shift to lower resource profiles and emission levels.

The report of the World Commission on Environment and Development, *Our Common Future* (called the Brundtland Report), propagated the concept of 'sustainable development'. Long-term survival is at stake; at current trends, future will not work. Rather than exporting Western values and life-styles to the Third World, industrial societies should reconsider their own wasteful life-styles and re-learn 'to do more with less'. No doubt, the search for environmentally sound development strategies and the implementation of respective planning methods are long overdue, in the industrialized as well as in the developing countries. They must be looked at in global perspective. In this book, questions are asked and some answers given regarding a better harmony between economy and ecology, the new 'harmonization game' towards sustainable development in the era beyond growth.

Starting with a theoretical essay on the general options for a new symbiosis between development and environment, the next essays are more empiric. First, an overview is given on the main environmental problems

in the developing countries, and next the interdependence between ecology and economy in the international context is looked at. In a specific essay on water, some of the most threatening environmental issues of the future, water shortage and water pollution, are addressed.

The second half of the book is strategic. In starting with a discussion on the role of indicators in development planning, a much discussed but unsolved problem is reconsidered. In looking at the opportunities and impediments of industrial restructuring, one of the central tasks of implementing sustainable development is empirically examined. Finally, the question of environmentally oriented development aid is considered, taking the Federal Republic of Germany as an example.

The concluding bibliography on the theme of 'sustainable development' shows that an impressive stock of literature already exists on the theoretical and the empirical aspects of sustainability, indicating at the same time, however, that it is now the task of planners and decision-makers to actively transfer existing knowledge and to forcefully implement available expertise in order to secure our common future.

In an appendix, the executive summary of the 1989 report of the Committee for Development Planning of the United Nations is reprinted, as it focuses on the need for a new international development strategy for the 1990s, which to some extent complements the views expressed in the other parts of this book. In addition, the summary of proposed legal principles for environmental protection and sustainable development of the Brundtland Report is reproduced.

At this place, I would like to express my sincere thanks to all those who kindly co-operated in the production of the volume. Johan Galtung and Ignacy Sachs impressed me with their ideas and suggestions on development. Deonanan Oodit and Christian Leipert assisted me in the preparation of the water and the social indicators essays. Martin Jänicke and Gabriele Scimemi provided me with data for the essay on industrial restructuring, and Volkmar Hartje on the one on development aid. Sabine Burmeister put all my library materials in shape for the bibliography. Sebastian Büttner and Inse Cornelssen helped me in correcting the proofs. Last but not least, Angelika Zierer-Kuhnle organized the manuscript and prepared the camera ready copy.

Berlin, January 1990

Udo E. Simonis

# Developing in Harmony with Nature

Most of today's decision makers will be dead before the planet suffers the full consequences of acid rain, global warming, ozone depletion, widespread desertification, and species loss. Most of today's young voters will be alive.

*The World Commission on Environment and Development, 1987*

## 1. Wither Development?

Today the development issue stands at the crossroads. There is no longer a consensus among development planners that quantitative economic growth should be the paramount development objective. In the industrialized countries the social and environmental costs of 'joyless affluence' (T. Scitovsky) have been questioned as much as the ability to revert to the rapid economic growth of the past. In the developing countries efforts towards industrialization have relied too much on foreign financial resources, a practice that aggravated the debt problem, underutilized human resources and overstressed natural resources.

Putting it straight, one can say that the process of economic growth was accompanied by three major problems: the externalization of costs to society (*social cost problem*), to future generations (*inter-generational cost problem*), and to nature (*environmental cost problem*). When the accumulation of such externalities exceeds certain thresholds, it leads to severe consequences: social upheaval, inter-generational conflict, and environmental degradation.

Thus, we have to differentiate between *development* and *maldevelopment* (I. Sachs). Both these outcomes can result from the same rate of economic growth. But there is a great variation in the structural composition of their final product, the rates of exploitation of nature and the kind and distribution of costs, i.e., the externalization of costs to society, to future generations and to nature.

Unfortunately, it is still not easy to measure the rate at which nature is being exploited and the extent to which the stock of depletable resources is being decreased in the process of economic growth. We also lack suitable indicators with which to describe the costs of environmental pollution accurately although some methodological and statistical headway has been made in recent years. Still, the challenge is to grasp the existing economic and environmental crisis as an opportunity to initiate a transition from maldevelopment to development, including the attempt to establish a new national as well as international consensus, or charta, for better harmony between human beings and nature, between economy and ecology.

### 1.1 Development Redefined

Development processes taking place at the expense of others, today or in the future, through inequity and/or dependency, through environmental degradation, or through destroying the life supporting systems for future generations should not be referred to as 'development' but as 'exploitation' (J. Galtung). Such processes have to be counteracted in solidarity with and in the interest of sustaining present and future generations, i.e., 'synchronic and diachronic solidarity' (I. Sachs).

Concepts such as these try to tackle the negative aspects of economic growth and to prevent a repetition of historic failures by focussing on two key factors: *solidarity* and *sustainability*, and by stressing the dynamics between human and social development, and between development and environment.

Human and social development, then, are seen as incompatible with growth achieved at the expense of other humans and other societies. Or, to put it more positively: a person humanly developed will also help to build human development in others; a society socially developed will help to build social development in others (J. Galtung).

With the addition of the *solidarity* aspect, the theory of development would become less atomistic and egotistic and, therefore, more systemic and socially oriented.

The *sustainability* aspect touches upon the problem of shielding a system against damage inflicted upon it from within or without. The problem lies in identifying where unsustainability starts and how sustainability can be achieved. This is certainly a controversial question. Johan Galtung, therefore, stresses the need to present sufficiently precise definitions: 'Eco-development is the exploration of the interfaces between environ-

ment and development. The task . . . is to identify those processes that enhance the environment and at the same time strengthen development, not merely to explore the constraints the environment puts on development and the demands development makes on environment.'

Is it possible to find processes that enable development and the environment to enhance each other? We have been used to thinking only in terms of the opposite; of how development patterns make increasingly exorbitant demands on the environment, resulting in destabilization and further deterioration of the ecosystems. But, positive linkages can be envisaged (cf. J. Galtung):

At the *individual* level, one can link human development to a greater degree of identification with nature, with empathy to the point where one feels part of nature. Accordingly, environmental degradation would be felt with compassion, as 'nature suffering'.

At the *local* level, one can link social development to more local control by organizing integrated production-consumption-recycling systems that people can understand and control; people would experience the consequences of resource depletion and environmental pollution in terms of their own irrational behaviour.

At the *national* level, and even more so at the regional and world levels, establishing such eco-development concepts becomes more complicated and yet necessary, as will be explained later on.

## 1.2 Need for a New Symbiosis Between Man and Nature

As was said, sustainability is an important aspect of development, along with social and intergenerational solidarity. But is sustainable development in harmony with nature at all possible? Can one achieve further growth in industrialized and developing countries and still avoid the depletion of resources and pollution of the environment?

First of all, the postulate to sustain development processes must not lead to a rigid standpoint, like 'keep hands off nature'. Instead, it stresses the need to continuously seek new forms of a symbiosis between society and nature. As René Dubois has pointed out ' . . . human interventions into nature can be creative and indeed improve on nature, provided they are based on an ecological understanding of the natural systems and their potentialities for evolution'. Successes or failures in achieving this necessary symbiosis may account for the rise or fall of civilizations in history.

The key concern with ecological systems in this connection is the problem of *recovery* after the system has been disturbed. A distinction should be made between unassisted and assisted recovery.

*Unassisted recovery* refers to the natural healing power of the system, its ability to renew and regenerate itself. An ecological system's ability to renew itself is expressed in terms of compensatory production of and by the system itself, and its ability to absorb and digest pollutants.

*Assisted recovery* refers to the way humans and society can best assist the process, by not depleting non-renewable resources, by consuming renewable resources with care, and/or by recycling non-renewable resources. Society also can help nature to recover by producing only such waste that is digestible and non-toxic and which can re-enter the eco-cycle, and by banning (among other things) the practice of dispersing the pollutants in diluted form in the atmosphere and hydrosphere, or hiding them in remote areas. In short: depletion and pollution control! Or, as a proverb says: 'Dilution is no solution to pollution.'

Crucial for the questions of renewal, regeneration and recovery is the potential of active *resilience*, i.e., the robustness or elasticity of ecological systems.

Complementary to the resilience of ecological systems is the *flexibility* of social systems. Flexibility is particularly needed to enable society to limit itself in its transactions with the environment, that is, to reduce the use of depletable resources to a minimum and to rely instead on the use of renewable resources and the recycling of non-renewable resources.

At the various political levels, this means encouraging flexibility as an important value. It means promoting the potential for economic and social change, diversity, preservation of options for the future, and prudence in the use of resources. The underlying ethical principle seems to be universally accepted, i.e., *solidarity* with future generations: 'It is the responsibility of the present generation that future life is not endangered by irreversible decisions, by the cumulative negative effects of depletion and pollution.' (I. Sachs)

However, diachronic solidarity should not be separated from the principle of solidarity among the contemporary generations (synchronic solidarity). Undoubtedly, as J.W. Bennett has rightly pointed out, 'man's use of nature is inextricably intertwined with man's use of man'. Remedies for the destructive uses of the environment must therefore be found within the economic and social system itself.

### 1.3 The Case for Qualitative Economic Growth

Following the first studies on the limits to growth in the early 1970s, strong pleas were expressed in favour of 'zero growth rates'. Today, there are good reasons to forego the questioning of growth as such and to concentrate instead on exploring patterns of growth that minimize the negative environmental effects and the use of depletable resources. The challenge seems not to be to stop growth but to redefine the forms, the structures, and the uses of growth. Two issues shall be mentioned to make this point clear.

#### 1.3.1 The Inequality Issue

Henry C. Wallich once said: 'Growth is a substitute for equality. As long as there is growth, there is hope, and this makes inequality tolerable.' Even in the most affluent nations poverty still exists, or is even increasing. The given unequal distribution of income and wealth breeds acquisitiveness and emulation for 'positional goods' (F. Hirsch). Aiming at a zero rate of growth therefore appears to be socially and politically unfeasible at the national level and particularly in the North-South context.

Thus, inequality will always stimulate the demand for rapid economic growth. And, to the extent that rapid growth means depletion (and not recycling) of resources and pollution of the environment, inequality will remain a challenge to a more harmonious relationship between development and environment, between economy and ecology. Two basic answers or solutions are possible: the change from depletion and pollution to recycling of resources and clean technology, and/or managing the inequality issue more effectively.

In other words, the transition towards sustainable development will not be reached unless the economic situation of the developing countries and the less-developed regions of the industrialized countries is improved so that a tenable international and interregional balance is established.

### 1.3.2 The Pollution Issue

It would be a mistake to assume that the rate of pollution of the environment (and the rate of exploitation of nature) is related only to the rate of economic growth, and not to the scale of the economy, the contents and uses of growth. It is a fact that there are cases where the environment has had to suffer during times of rapid economic growth; but there are also cases where the environment has suffered while the economy stagnated.

Even a low rate of economic growth will generate an increasing volume of pollutants unless environmental regulations and standards become more stringent. An annual economic growth of 3 per cent would mean an increase of approximately 20 per cent in the release of pollutants during six years *if* the present environmental standards were not reinforced. A fixed relation between the rate of environmental pollution and the rate of economic growth would apply *if* the consumption patterns, the uses of resources and the technological choices were not amendable to purposive change.

Therefore, instead of questioning growth as such, one should actively explore alternative patterns of growth that minimize the negative social and environmental effects and the use of depletable resources. The challenge is to redefine the actual forms of economic growth, i.e., to define *qualitative growth*.

As we know today, the rate of economic growth as measured by the Gross National Product (GNP) is only a poor indicator of society's actual performance. Although development without growth is hardly imaginable, the same rates of growth may lead either to development or to maldevelopment, the difference between the two being substantial. It is the extent to which growth is associated with social and environmental costs that makes the topic 'development and environment' a political issue, and 'qualitative growth' an economic strategy.

In terms of definition, qualitative growth can basically be looked at from two different points of view. The first would be to account for the social and environmental costs associated with quantitative growth. The second would be to differentiate the composition of the final product, such as by distinguishing between goods corresponding to authentic use-values (or *factual goods*), pseudo use-values (or *positional goods*), and non-values (or *compensatory goods*).

Here, it is not my intention to go into any of these approaches for defining qualitative growth, although I think this to be of utmost importance. Instead, I will first turn to some strategic aspects of the 'harmonization



game', and second to a possible method for harmonizing economic, social, and environmental objectives.

## **2. Strategy for Harmonizing Economic, Social, and Environmental Objectives**

### **2.1 Criteria of Environmental Soundness**

While many social scientists have voiced considerable concern for the trade-offs between economic growth and environmental quality, the possibilities for harmonizing socio-economic and environmental objectives are still largely unexplored. The search for an environmentally sustainable, socially responsible and economically viable growth therefore is still on the agenda. This search calls for a re-assessment of the consumption patterns and life-styles, of the production functions, including the technological choices and of the patterns of spatial distribution of economic activities, i.e., an assessment of both the demand side and the supply side of the economy (cf. I. Sachs).

A first step towards such an assessment would be to review the existing situation according to certain criteria of environmental soundness, such as, e.g., the energy profile, the resource profile, the space-use profile, and the environmental impacts proper. The second step would be to examine the potential options for purposive change on both sides of the economy. In the following, I will briefly focus on both these steps (or fields of action) of the necessary re-assessment of the development process.

### **2.2 Changing Consumption Patterns and Life-Styles**

Theoretically, a considerable scope for changing consumption patterns and life-styles exists, even though they are deeply rooted in the given socio-economic conditions and are very much culture-specific. Individuals, social groups, and society at large should be able to modify the structure of their consumption expenditures substantially and, even more so, their patterns of time-use, including the relative importance given to professional activities in the labour market, to activities in the informal sector, and to time used for cultural and social activities.

Hence, the importance of the debate on *voluntary simplicity*, or *frugality* (Jonas), arising out of environmental considerations and indicating synchronic solidarity among present generations and diachronic solidarity with future generations.

The question 'how much is enough' is being increasingly asked as well, to provide for a socially rewarding use of economic productivity. Together with the idea of a guarantee of a decent minimum standard of living to every human being - 'how much is necessary' - such a provision of 'ceilings' might prove necessary for the discussion on future development strategies. However, it would certainly be premature to expect a rapid change in consumption patterns and lifestyles towards 'voluntary simplicity' or 'frugality'. Most people still consider the pursuit of material wealth and the piling up of 'positional goods' as a good enough goal in life. As Ignacy Sachs put it: 'We are all, to a considerable extent, prisoners of the living past - cultural traditions and long-entrenched habits - and of the institutional maze geared to the promotion of *consumption qua consumption*'. In practice, the prevailing inequality of income and wealth might continue to support the appeal of 'consumerism'.

The given structures, especially those like the design of the cities, the transportation system and the productive apparatus greatly restrict the range of feasible options. The very existence and high cost of these assets act as barriers to changes in the patterns of their use. Reshaping society for less wasteful consumption and yet more rewarding lifestyles therefore cannot and will not happen over night - despite pronounced individual readiness for change. A fairly long period of transition towards more rational consumption patterns is thus to be expected, especially since there may be many powerful vested interests maintaining the structural *status quo* of consumption patterns and lifestyles.

However, less spectacular (and politically less demanding) piece-meal changes that would contribute to harmonizing economic and environmental objectives can, no doubt, be expected, especially at three levels of action:

- Altering behaviour to eliminate careless attitudes and wasteful uses of goods;
- reshaping consumption by means of improving the design and the performance of products (e.g., energy conservation, durability, low emission products);
- exploring equivalent or quasi-equivalent consumption patterns, thus bringing about similar use-values and gratifications with more efficient uses of resources and less severe environmental effects.

The ecological significance of these substitution processes at the demand side have persistently been underestimated in research and in planning practice - among other reasons, because neo-classical economics adheres to the postulate of consumer sovereignty while Marxist economics has overemphasized production theory. Of course, demand and supply are not as independent from each other as these terms and concepts might suggest. It has rightly been observed that changes in consumption patterns and life-styles depend greatly upon the flexibility that the production systems, their products and their technologies allow.

### 2.3 Changing Space-Use

Regional and physical planning can play an important role in harmonizing economic and environmental objectives, provided that suitable location of industrial and other economic activities leads to a better utilization of resources while at the same time reducing negative environmental effects.

Economic and ecological benefits can be derived by systematically exploring the compatibility of the various economic activities and by cutting down unnecessary transport. Although industrial concentration in general provides economies of scale and positive externalities to individual enterprises, it often proves costly in social and environmental terms. Ultimately this means that the traditional concepts of *economies of scale* and *externality* are becoming increasingly obsolete, although we may be slow in recognizing it. For instance, the locational patterns prevailing in many industrial areas make sense only to the extent to which enterprises are allowed to internalize profits and to externalize social and environmental costs. A strong plea can thus be made in favour of more 'coherent production systems', meaning, above all, the departure from redundant exchanges and the rationalization of transportation flows.

Greater flexibility in the *use of time* could also contribute a great deal to alleviating the environmental effects resulting from bottlenecks in the production and transportation process. If information is in fact joining labour, capital, and technology as the fourth important production factor of the economy, and if *information* increasingly becomes a 'public good', then technical advances in telecommunication and data-processing open up new options for a more effective distribution of industrial locations, the revival of small towns and city quarters, and even the ruralization of economic activities - and in this way for a gradual shift from the 'exchange economy' to the 'sharing economy'.

Many decisions made regarding the use of space, however, prove more or less irreversible, and the danger of wrong choices is reinforced by insufficient knowledge of how a given space might be used in the future. Still, there is a need to better integrate physical planning and environmental planning in order to provide more flexibility and to keep open or to re-open the option for future sustainable development.

## 2.4 Improving Products and Technologies

The natural environment is strongly affected by the products a society generates and the technology it uses. The careful choice of appropriate products, product technologies, and process technologies therefore becomes an important focal point for the harmonization of economic, social, and environmental concerns. Most countries are still experimenting with the institutional set-up and regulatory procedures in this field, and I will present a special section on the possibilities and limitations of national and international environmental impact assessments.

It has to be pointed out that criteria of appropriateness, relative to a given economic, social, and environmental context, must first be defined and then be applied to evaluate products as well as technologies. The criteria for environmental soundness proposed above - e.g., *energy profile*, *resource profile*, *space-use profile*, *environmental impacts proper* - could be used for that purpose (together with additional ones such as *employment effects*, *social acceptability*, *international effects*).

In general, the search for appropriate products and technologies should focus on substituting abundant and benign resources for those that are potentially scarce and environmentally disruptive. The 'new rationality' (I. Sachs) is that of combining economic efficiency with environmental effectiveness, of replacing the traditional criterion of GNP growth by broader criteria for success.

It is here that the promotion of *recycling* and *renewable resources* comes into the picture. The still prevalent escalation of 'production, pollution, and anti-pollution', which is an ex-post orientation *per se*, should in the long run give way to low-emission technologies and the design of production systems with closed or integrated cycles, i.e., to an *ex-ante orientation* in economic and environmental policies. Of course, in the short and intermediate term, considerable effort is still required to arrest further degradation of the natural environment, on which our health and well-being ultimately depends.

The three fields of action outlined above in development policy practice can be connected, of course, thus creating freedom for exploring the alternatives in the future, provided there is enough political will, international understanding, and institutional capacity for effective innovation.

### **3. Method for Harmonizing Economic, Social, and Environmental Objectives**

The successful implementation of a strategy aiming at harmony between development and environment, economy and ecology, will to a great extent be conditioned by the institutional set-up and the methodological capability to foster social innovation and engage in new forms of planning. In this section, I will focus on one of such necessary social innovations, i.e., national approaches to and international needs for *environmental impact assessments*.

In 1970, the U.S. National Environmental Policy Act came into force. This legislation was passed to ensure that environmental concerns received adequate attention at all levels of government planning, decision-making and action. It established for the first time the formal requirements that an 'environmental impact assessment' be made and an 'environmental impact statement' be filed prior to the implementation of (certain major) development projects. This widely noted and acclaimed legislation came as a challenge to other nations that were at that time responding to citizens' concerns for better protection of the environment, especially where large projects were being proposed by government or industry.

The question of whether or not to institute new mechanisms or to amend existing mechanisms for environmental impact assessments, found different answers. The pattern emerging in the past decade or so is that most industrialized countries and some developing countries have instituted new procedures designed to give more weight to environmental considerations in planning. However, the majority of countries have preferred to integrate impact assessment procedures into the planning processes that already exist, rather than establishing entirely new processes. These decisions have prompted a great variety in the form environmental impact assessments are undertaken around the world.

The procedures that have been adopted can be distinguished according to whether they are based on *informal* procedures, which are often modified to the needs of specific situations, or on *formal* procedures, which are embodied in legislation and are designed to ensure an inte-

grated examination of the environmental effects of a given project. Similarly, the procedures can be characterized either as *explicit*, leading to the preparation of detailed environmental impact statements, or as *implicit*, meaning the internalization of environmental considerations into the project proposals.

This is not the place to extensively review the environmental impact assessments used on the national level. Instead, I would like to point to some of the limitations of the method, and to end with some suggestions for its further improvement.

The rapid spread of 'environmental impact assessment' as a method is, first of all, proof of the need felt for a harmonization of development and environment. If the violations against nature continue, no doubt more efforts will be required to reverse and prevent them. The great variety of impact assessment approaches illustrates that the respective efforts can take quite different forms. It must be noted, however, that impact assessments are not only or mainly designed, in most countries, to protect the environment. Rather, these assessments may only act as decision-making mechanisms, providing interested actors with information on the probable consequences of a proposed project, including alternatives. Thus, the ultimate decision on whether or not to proceed accordingly, in the end often depends upon specific economic and political considerations. Therefore, it is difficult to determine how successful 'environmental impact assessment' as a method has been. Some general comments are justified, however:

First, the mere existence of an impact assessment process in legal or administrative form, or a given number of impact assessments made, is by itself not a reliable indication of effective performance, i.e., of harmony between development and environment.

Second, comparisons between different national approaches are difficult to make. This is true even in countries where legal requirements have made the process an open one. It is more true in cases where a cloak of administrative confidentiality conceals much from view.

Third, the formulation and implementation of environmental impact assessments requires qualified personnel, especially for coordination and review functions. In many countries, such resources are still in short supply.

Finally, although the effect of sensitizing decision-makers at all levels to environmental considerations may be visible, it is difficult to form reliable judgments about the extent to which this increased sensitivity has been translated into environmentally sound decisions. And here lies a structural problem: if you cannot easily give proof of your efforts at reconciliation of objectives, you might think of abandoning them. In many in-

stances the promise inherent in the method clearly has not been realized. As a result, 'environmental impact assessment' can be seen as an important method, the actual problem of which is its successful implementation.

A recent comparative survey on the environmental impact assessments undertaken noted their shortcomings. In key words, some of these shortcomings were:

- (a) Projects not programmes
- (b) Plants not whole technologies
- (c) Identified impacts not risk
- (d) Identified impacts not trends
- (e) Passive not active response
- (f) Biased not neutral recommendations
- (g) Documents not environmentally sensitive decisions
- (h) Scientifically valid, neutral research not good decisions
- (i) Final assessments rather than adaptive impact assessments
- (j) Token not effective public participation.

Before closing this section on 'environmental impact assessment' as a method for reconciling development and environment, one more problem has to be touched upon and that is the question of the method's *international* application.

'Environmental impact assessment' is easiest to apply within a single jurisdiction. In such cases there is, nominally at least, a clearly defined way of reaching a decision on whether to proceed with a proposed project or programme. However, there is an increasing need to extend the method to cope with environmental problems that are international and sometimes even global in scope.

Examples include climate change, acid rain, stratospheric ozone depletion, the protection of marine resources, and the control of toxic substances. In each of these examples, there have been attempts to undertake inter-governmental assessments, although in some cases the methodology used was not well formulated.

Two kinds of problems can be identified with respect to international environmental impact assessments:

- (1) The 'action' takes place in a few places but the impacts occur over a much wider area. This is the case, for example, with acid rain.
- (2) The 'action' takes place in many places and the impacts are distributed globally. This is the case, for example, with stratospheric ozone depletion and CO<sub>2</sub>-induced climate change.

For the first case, conventional methods of environmental impact assessment can be used. In particular, the assessment should identify the actors involved: Who will gain and who will lose?

For the second case, three problems should be mentioned:

- (1) The variability of the natural environment may be so great that it is difficult to determine whether the 'action' is already causing an impact. Yet, if one waits until a downward trend can be detected with confidence it may be too late to avoid further disruption.
- (2) The 'actions' are often so widely distributed (burning of fossil fuels, for example) that management methods available may produce only incremental changes.
- (3) Assessments of global environmental problems may remain scientific treatises only, and may not be used in actual decision-making.

There is also the question of *state sovereignty*. This may be an impediment that makes it difficult to design an acceptable procedure for environmental impact assessments at the international level. For example, in the last decade several pollutants, such as SO<sub>2</sub>, have been selected for thorough study. However, even though these studies identified substantial environmental damage, internationally, they have had little effect so far largely because they were not accompanied by clear administrative procedures. A main challenge in the future, therefore, will be to develop conceptual and institutional frameworks and methodologies for *international* environmental impact assessments. To do so, thorough comparative reviews could be helpful, especially if several countries would undertake joint studies to compare development projects that have been subject to environmental impact assessments and ask how the project design was modified and why; and to examine development projects that were exempted from impact assessment because of insignificant environmental effects, and ask whether this was correct.

International environmental impact assessment is still in an embryonic state. In order to correct this deplorable situation, two forms of action seem desirable: (a) to examine in detail the methods and procedures to be used for international environmental impact assessment, and (b) to synthesize the experiences with international impact assessment and to identify the problems of implementing it successfully.



#### 4. Conclusions

As assumed, harmonizing development and environment is a formidable challenge for all future planning. *Sustainability* and *solidarity* were identified as the two key principles for this 'harmonization game'.

For reasons explained, it cannot be expected that harmony between economy and ecology is to be achieved, or regained, by resolving complex industrial systems into self-contained entities; individuals, however, may very successfully strive for *simplicity* and *frugality*. Instead of turning its back on the market or the state, society should seek imaginative and innovative solutions for the omnipresent and looming environmental problems.

Economic growth can lead either to *development* or to *maldevelopment*. The task, therefore, is to reduce, and ultimately to minimize the social and environmental costs of economic growth.

*Readjusting consumption patterns, promoting better use of resources, and making more careful technological and product choices* are part and parcel of a strategy for reconciling man and nature. *Environmental impact assessment* is a necessary and promising method and reflects the increased environmental awareness - and also the need for harmonizing development and environment all over the world.



# **Environmental Crisis in the Developing Countries: An Overview**

The two basic causes of the environmental crisis are poverty and misused wealth: The poor in the world are compelled over the short run to destroy precisely the resources on which their long-term subsistence depends, while the wealthy majority makes demands on the resource basis, which in the long run are unsustainable - thus making the poor substitute victims.

*Mostafa K. Tolba*

## **1. Introduction**

The United Nations Environmental Programme (UNEP) and its director, Mostafa K. Tolba, have drawn attention over and over again to the environmental crisis of the world in general and the developing countries in particular. Not only the economic gap between 'North' and 'South', but also the environmental North-South gap has been dramatically aggravated. The more successful environmental policy becomes in the industrial countries - notwithstanding the still persisting deficiencies as to its effectiveness - the more significant becomes the waxing environmental crisis in the developing countries for the world as a whole. Awareness of ecological problems and problems-solving capacities have grown in the past decade, but far more so in the North than in the South. Although the world can, and must, be conceived as a homogeneous ecological unit - the 'blue planet' - with regard to environmental policy it is highly heterogeneous and, indeed, divided. A new theme has come to the fore and the 'North-South dialogue' has to incorporate a new dimension, the ecological dimension.

In graphical words Erhard Eppler has described the vicious circle of the economy and ecology in the developing countries: 'Because more and more people need firewood to cook their millet gruel, more and more trees have to die. Because more and more trees die, the land area on

which millet can be grown becomes smaller and smaller. Because the land area becomes smaller, and the desert makes inroads, more and more people crowd together in places which the desert has not yet reached and thus ensure that they will be reached a little later.' (Third World Yearbook, 1983, p. 22)

The progressive loss of ecological stability and the aggravation of the ecological crisis in the developing countries was distinctly depicted in many pages of the UNEP Ten-Year Report (The State of the Environment 1972-82). In a few pages in the following, the magnitude and dynamics of the environmental crisis in the developing countries will be outlined and the question raised as to the repercussions on the industrial countries, i.e. the common problems and the possible 'common interests', and a (provisional) answer will be offered. The chapter concludes with some strategy proposals.

## **2. General Outline of the Problems**

Following the first world conference on the environment in Stockholm (1972), public opinion and the awareness of the population with regard to environmental issues was sensitized considerable - and not only in the North, but also in the South. Since then, in many countries that awareness of problems has been institutionalized, the environmental problems are being 'dealt with'.

While in 1972 there were only ten countries with some sort of organized environment administration (ministries, councils, commissions and other bodies), they now number about 130, including 90 developing countries. Moreover, the concept of 'eco-development' - as a strategic approach to the harmonization of development and environmental (protection) objectives - has meanwhile found widespread resonance. However, the economic crisis which set in shortly after Stockholm has complicated the situation considerably.

While we now know from experience that low growth rates of the economy alone are not a remedy for the destruction of the environment (as was postulated in the early 1970s), the conflict between (short-term) economic interests and (long-term) ecological necessities has not lessened, but rather become more intense, both in the North and the South. Local, regional, national and international environmental movements have gained in number, but not so much in influence. They find themselves confronted with powerful economic interests, which again and again advance

one argument against active environmental protection measures, namely the loss of the international competitiveness of the economy. In contrast, the job potential of active environmental protection policies has at best been recognized partially, in a few countries and a few economic sectors.

One praiseworthy exception would seem to be the energy-saving initiatives in the wake of the first oil-price hike in 1973, which simultaneously had environment-relieving effects via reduction of resource consumption, and reduction of polluting emissions. That energy-saving, however, was not a distribution-neutral process - neither nationally (a generally familiar fact) nor internationally.

In the oil-importing developing countries, the new situation had negative environmental effects in a double sense: On the one hand, the 'second energy crisis' among the poor had a devastating effect on timber stocks (especially due to the substitution of firewood for kerosene) and hence on the fertility of the soil and on food production. On the other hand, on account of inadequate adjustment of the import structure in most developing countries, the ensuing balance-of-payments crisis gave rise to over-utilization and increased exploitation of exportable natural resources, i.e., sectoral export expansion to stabilize the trade balance. The present situation appears correspondingly bad and the prospects not very encouraging: In the developing countries, the economic and ecological crises are mutually aggravative.

To transform this vicious circle into a virtuous circle for the developing countries it seems necessary, *inter alia*, to change the prevailing methods of resource utilization - to put an end to the processes of deforestation, soil erosion, desertification, etc., brought about by inappropriate industrial and agricultural techniques and by efforts to raise short-term productivity. Alternative development patterns which ensure ecological permanence and lower social costs are known and technically feasible - though not, or not yet, realizable everywhere. Whatever the case, in assessing the prevailing environmental crisis in the developing countries (which will be described in more detail in the following) it is necessary to avoid a false conclusion; namely, that the way out of the current environmental crisis can be one which neglects the functioning of the ecological systems. Instead, a conclusion with respect to the general strategy might read like this: It is vital to determine and to back up the possibilities of attaining an ecologically sustainable, socially desirable and economically productive utilization of the given resources.

### 3. Environmental Problems of the Developing Countries - A Survey

The quoted comprehensive attempt at a stocktaking of the environmental problems of the developing countries - the UNEP Ten-Year Report - begins with a qualification: the data are extremely weak and, what is more, very fragmentary. Neither for the burden on individual sectors of the environment nor for the overall burden is there as yet a reliable international monitoring and reporting system. The national environmental reporting of most developing countries - in the sense of measuring environmental quality - generally has a marked regional bias, e.g. the Sao Paulo region in Brazil. In international environmental reporting, on the other hand, data from the western industrial countries dominate in terms of quantity and quality. The given international environmental reporting has been placed on a par with the economic reporting some forty years ago.

The level and structure of environmental problems can be analyzed on the basis of different reporting concerns: media-specific, area- and sector-specific, regionally and globally specific. Two of the possibilities for environmental reporting on developing countries are presented in summarized form in *Figures 1 and 2*.

*Figure 1: Environmental Trends and Environmental Problems*

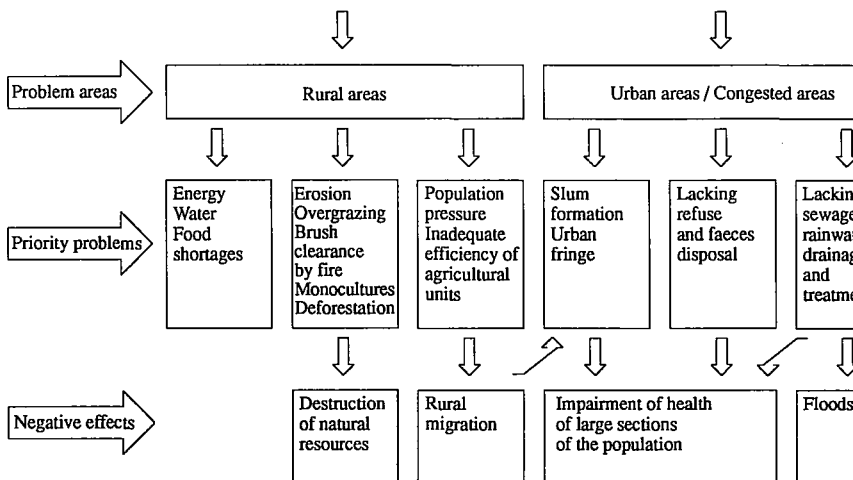
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A. Natural Environment	B. Man and Environment (Social Environment)
1. Atmosphere	1. Population
2. Oceans	2. Settlements
3. Water	3. Health
4. Lithosphere	4. Agriculture and Forestry
5. Fauna and Flora	5. Industry
	6. Energy Supplies
	7. Transport
	8. Tourism
	9. Environmental Education and Environmental Awareness
	10. Peace and Security

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Source: UNEP: The State of the Environment 1972-1982, Nairobi 1983.

Figure 2: Environmental Problems in Developing Countries



The following overview of the environmental problems in the developing countries initially conforms to the broad concept of the UNEP Ten-Year Report. Then, using a sectoral approach, the interdependence of ecological and economic problems in the North-South context will be demonstrated with some examples.

The UNEP report is based on a rough division into the 'natural environment' (A) and the 'social environment' (B). For the natural environment (A), the data and analyses are essentially aggregated, considering the world as an ecological unit, while for various components of the social environment (B), they are grouped according to specific characteristics of the developing countries.

With regard to the *atmosphere* as a subsystem of the natural environment, the data available at the beginning of the 1980s show that, compared to the early 1970s, the CO<sub>2</sub> concentrations in the air have increased considerably and as a consequence, global warming (the 'greenhouse effect') cannot be precluded. The developing countries are a cause of the problem in that their energy structure and their industrialization efforts give rise to a substantial and further increasing CO<sub>2</sub> effect. The developing countries will be particularly affected by this greenhouse effect, since their ecological systems in general are extremely sensitive and their geographical position extremely exposed to sea-level rise.

The precipitation of 'acid rain' and the ensuing problems have increased worldwide and in some areas have taken on dramatic forms. Compared to Northern Europe and North America, the developing countries have so far been less affected, but regionally they have not been entirely unafflicted either. If, and to the extent that the pollutants like SO<sub>2</sub> and NO<sub>x</sub> can be regarded as the decisive factors for the death of forests and for overacidification of the soil, the increase in the emissions in step with the ongoing industrialization and urbanization will confront the developing countries, too, with the ensuing problems. Locally, this process is already well under way.

For example, atmospheric pollution in the big cities of the developing countries has increased drastically and assumed dangerous dimensions. The pollution of the air in Mexico City and Jakarta - to name just two examples - is so severe that smog conditions occur which can be compared to those in London in the early 1950s - a negative example of air pollution control that is still known throughout the world. In contrast to London, however, where an answer was found relatively quickly once the problem was understood, the cities in the developing countries, whose number and size is growing continually, most likely will not be in a position in the near future to guarantee drastic reduction of industrial emissions, fast increase of efficiency of energy production, effective control of the emissions of the



rapidly growing number of private vehicles, etc. In most developing countries, exhaust control systems are still completely unknown, and there is no effective environmental protection authority for industry and trades.

As far as *fisheries* and the *marine eco-systems* are concerned, the UNEP report proceeds from the assumption that at global and regional level no significant impact has occurred, despite the pollution of the high seas (especially by oil) and of inland waters (especially by heavy metals). However, it is found that the actual fish catches lie far below the potential catches possible under competent resource management, and that chronic long-run effects cannot be excluded. The population of several developing countries is highly dependent on fish supplies. Preventing water pollution and improving the management of the stocks of fish therefore rank as important tasks of environmental policy, a fundamental requirement of which is reliable environmental reporting.

The growing world population and the rising water consumption per capita have in several regions already overtaxed the quantity of *water resources*, involving progressive jeopardization of water quality and increased spreading of water-borne diseases. As a political consequence of these facts, the 1980s were officially declared the 'International Drinking Water and Sanitation Decade'. The respective declarations were aimed primarily at the developing countries and correspondingly they are not well known in the industrial countries. By now it has become clear that the proclaimed objectives of the 'Decade' will not be achieved in the developing countries; but it is also true that water in certain regions of the industrial world has become a political theme in the course of that decade.

In the *lithosphere*, similarly disquieting trends can be observed. While in the industrial countries the environmental problems connected with mining activities are being recognized to an increasing degree, though by no means solved (as shown, for instance, by the re-import of continued use of polychlorinated biphenyl, PCB, for which phasing out had been agreed upon), mining output and attendant damage to the environment in the developing countries have increased. In most cases, the necessary balance between extraction of natural resources and the 'repair of nature' has not been achieved so far.

With respect to recycling of industrial wastes and substitutes for mineral raw materials, in developing countries the efficiency of technology is still relatively low. In contrast, recycling of household waste is amazingly efficient as people can make an income out of it. Where the standard of living is high, economical handling of waste materials has to be 're-learned', where poverty prevails, for many it is the only chance of survival.

The UNEP report shows that *food production* has further expanded, but the growing demand could not be satisfied quantitatively and also not

qualitatively. Agricultural productivity of the developing countries has increased rapidly in some cases ('green revolution'), but was accompanied by considerable losses of high-yield soil, desertification, salinization and other consequences of inadequate soil management. In most developing countries, the rural ecosystems are in danger; deforestation and the decrease in species and genetic reserves have assumed dramatic proportions.

These trends resulted in the proclamation of the 'World Conservation Strategy', which essentially calls for conservation of resources by processes of ecologically sound development. Although this initiative is not very well known in many countries, general awareness of the related problems has grown.

According to the UNEP report the real dichotomy between industrial and developing countries is revealed by a closer look at the various realms of the 'social environment' (B). It begins with the dynamic nature and structure of *population growth*.

The birth rates in the developing countries have decreased somewhat but the spatial concentration of the population has increased markedly. In the train of this rapid *urbanization*, local environmental conditions often have deteriorated drastically: increasing air and water pollution, noise, deplorable sanitary conditions and the like.

Towards the end of the 1980s, there were more than 100 cities in the developing countries with a population of over a million, 25 cities had over 4 million inhabitants. If this trend continues, the urban population will have doubled by the year 2000. Projections show that by then 60 cities in developing countries could have a population of more than 4 million, while the corresponding figure for the industrial countries will rise from 16 to 25. By the year 2000, some 18 cities in the developing countries could have exceeded the 10 million mark.

This rapid urbanization process must be assessed against the background of very low incomes. Population concentration in the big cities of the developing countries is beyond the capacity to provide accommodation and municipal services at the same time; the mushrooming of slums and settlements without adequate public services is the result. The proportion of slum inhabitants in the total population of the big cities in the developing countries lies frequently above the 60 per cent mark, and the annual growth rate of such settlements in some cases is above 20 per cent. Inadequate housing conditions and lacking infrastructure, such as water supply and sewage systems, electricity, health care, schools and other services are characteristic of the situation in the big cities of the developing countries and make them evident examples of a lacking harmony between ecology and economy, and of unresolved environmental problems.

The state of *health* of the population in the developing countries reflects this dichotomy. Six diseases which are attributable to given environmental problems are responsible for the death of 5 million children annually. More and more parasites and bacteria have become resistant, a problem which is demonstrated by the renewed rise of malaria. The average life expectancy in most developing countries is still less than 50 years. The great challenge to environmental medicine therefore lies in the developing countries, although at present the subject of chronic long-term effects of environmental pollution in the industrial countries is attracting highest attention.

With regard to the environmental effects of further *industrialization* of the developing countries, the UNEP report is over-optimistic. It confirms the increasing endeavours of governments not to allow the developing countries to become 'pollution havens'. Recycling, it says, has become attractive, although not all types of recycling are free from negative environmental effects. An important requirement for future optimism, however, would be the rapid application of clean technology and the fast replacement of polluting technology. The 'ecological modernization' of the economy, of course, is a global task. The capacity for such an ecological structural change, however, most certainly is not distributed equally between the industrial and the developing countries.

The oil price increases of the 1970s hit the oil-importing developing countries hardest. Appreciation of this fact in the United Nations led to the definition of the MSAC group (most seriously affected countries). The adjustment of the *energy structure* to this change in relative prices in the economy varied from country to country. Common to all was the additional burden on the balance of payments, the aggravation of the debt problem. In some cases, however, this change led to a serious jeopardization of local ecosystems, as a result of substituting additional domestic energy sources for petroleum and petroleum products. Taking this as an example, more attention should be drawn to the environmental effects of changed international trade relations to the disadvantage of the developing countries.

In concluding this overview on the environmental problems of the developing countries, mention should be made of two further problems. The cited UNEP report is rather optimistic regarding the increase of *environmental awareness* and the success of *environmental education* in the developing countries. At the same time, it pleads for more positive and less negative presentations in the mass media, i.e., for 'trend reporting'. The authors legitimize this plea by a reference to the scanty total resources available for propagating environmentally sound development and point to the danger that more funds might be made available for highly publi-

cized environmental scandals than for everyday environmental issues. This stand on the problems can be viewed at critically. Fortunately, the report also states the following with respect to the implementation of environment-oriented strategy proposals: 'The ratio of words to action is weighted too heavily towards the former. And despite the evidence that people's perception of environmental problems has improved, it is less clear that many groups have adapted their life styles in response' (p. 629).

There is another point to be considered: The scarcity of resources for environmental protection measures may not be as great as assumed, if *waste of resources* would be eliminated. The funds spent by the governments of many developing countries for military armament and for local or regional wars in the past have reached extraordinary proportions. The ending of this arms race and the conversion of arms expenditure into efforts to conserve the environment could initiate a return to the very necessary harmony of ecology and economy. In the words of the UNEP report (p. 629): 'The reversal of the arms race and its underlying spiral of costly technology would do much to release resources needed to assure the future of mankind and the environment.'

# **Interdependence between Ecology and Economy or: Common Interests of North and South?**

The ratio of words to action is weighted too heavily towards the former.

*UNEP Ten-Year Report, 1984*

## **1. Introduction**

In the past decade or so, the terms used to describe the economic and ecological interdependence of North and South have changed: 'Only one Earth', 'Global 2000', 'Spaceship Earth', 'Blue Planet', and the like. Their message, however, endures: What is involved for North and South is more than an improved international division of labour - although the economic system is very much in disorder. What is at stake is that man is in conflict with nature and thus on a collision course with his own future. It is, therefore, necessary to learn more about the interdependence between economy and ecology in the international context. This interdependence, of course, assumes a variety of forms. In this chapter, I shall focus only on some of them. Before doing so, I would like to quote from a well-known global report.

The Interdependent Commission on International Development Issues (Brandt Commission) in its report of 1983 identified the urgent need to halt the further deterioration of environmental quality as one of the 'common interests' of North and South. On this point the report stated (p. 126): 'Growing pressure on the available land, increasing use of chemicals, desertification and deforestation are diminishing the productivity of the soil in many parts of the world. The clearance of forests, incautious use of pesticides and fertilizers, and erosion destroy the soil and the agricultural potential of scarce land, and cause serious damage to the environment . . . We therefore emphasize the need for means with which to stop and reverse the processes of ecological decay, which has meanwhile reached emergency proportions.'

The Brandt Commission did not yet elaborate on 'acid rain' and the damage it causes to the forest stock, to soil, buildings, and human beings, and the necessity for an effective international environmental policy. However, only two years later the need was felt that these issues should be discussed by a follow-up commission, the World Commission on Environment and Development (Brundtland Commission).

Other international activities, academic reports, as well as practical work by thousands of environmental organizations bear witness to the increased awareness of the interdependence between economy and ecology, and have contributed towards making that interdependence clearer: Disadvantages for all are to be expected if improved cooperation is not achieved, i.e. there is the threat of global 'negative-sum-games'. In contrast, improved international cooperation can bring benefits for all, i.e. there is the chance of 'positive-sum-games'.

In the following, four broad areas are examined as examples of such 'games', representing at the same time two typical sides of the environmental problem: the depletion and the pollution issue, or the process of influencing natural cycles and creating environmental damages. With these examples I would like to show that not only common problems are involved when talking about international environmental issues but also common or collective efforts must be undertaken by decision-makers at the various levels.

Serious problems of resource depletion are found above all in the South. Many people in the North therefore regard them as 'remote problems'. Conversely, many people in the South consider the existing pollution, caused by technology and products, as manageable or even as solved. They often view the debate on stricter measures on such environmental problems even as 'colonialism in disguise'. Appreciation of the fact that depletion and pollution could be *common international problems* requiring mutually acceptable solutions, may therefore not yet be very marked. However, environmental issues have already become part of the North-South debate, and in future will increasingly be so.

## **2. Resource Depletion Issues**

### **2.1 Decrease in Biodiversity**

About 25,000 plant species and more than 1,000 animal species are considered in danger of becoming extinct due to human activities. One out of ten terrestrial species could die out in the course of the next decade. Extinction on this scale would be without precedent in human history. Roughly two thirds of all terrestrial species, and the majority of the endangered species, are found in the developing countries. The tropical forests alone are the habitat for about 40 per cent of all species.

These few figures are sufficient for indicating the threats that can arise for the overall quantitative stock of the world's animal and plant species from poverty-induced depletion and profit-induced exploitation, i.e. excessive utilization of natural resources. A loss of species of the quoted order of magnitude in the developing countries would also have indirect worldwide effects on the future development of agriculture and industry, on health, and the quality of life in general.

The quantitative loss of existing species also gives rise to impairment of the quality of the remaining species. For example, many plant species in the industrial countries have only a limited genetic basis. The loss of species in the developing countries therefore concomitantly reduces the possibilities of stabilizing or increasing the yield of food plants in the industrial countries. To give a specific example, about 40 per cent of the pharmaceutical products and medicaments currently used are obtained wholly or in part from natural products which come from developing countries. Likewise, the innovative potential, and hence the economic future of biotechnology depends to some extent on the genetic reserves in the developing countries.

Despite this manifest interdependence between ecology and economy the loss of species is continuing worldwide. Why is this so? In the developing countries it is not only knowledge and know-how which are lacking. So far they also have only limited benefits from the utilization of their own resources. There is also a deficit of economically feasible alternatives and, above all, a lack of incentives to protect the existing species. In order to pay for their debt burden and to balance the returns due to decreasing world market prices, export of material resource commodities at a faster rate is promoted, leading in many cases to serious environmental degradation. This cause-and-effect chain has especially severe consequences in countries which in their trade activity rely on the export of a few resources only.

*Conclusions:* Obviously, in the developing countries the incentives are too weak or just non-existent for the needed long-term protection of species. Due to the logic of day-to-day survival, utilization of resources and sustainability of ecological systems are not yet compatible. Once utilized or exported, ecologically valuable resources are lost. These relations exemplify the responsibility of the industrial countries when it comes to harmonizing ecology and economy internationally. The ecological-economic interdependence in the North-South context implies that any significant loss of species will in the long run adversely affect health and prosperity in both the industrialized and the developing countries. Therefore, North and South should recognize their common interests in effectively curbing the rapid decrease in the diversity of species, and should develop a collective effort to tackle the related problems.

## 2.2 Loss of Forests

Complex in structure and rich in species composition, forests represent a set of the principal natural formations of the world. The forests are menaced by two major environmental hazards: Forests in temperate regions are afflicted by air pollution, and forests in the tropics are subject to depletion through excessive cutting, slash-and-burn agriculture and cattle ranching.

Atmospheric pollution results from the combustion of fossil fuels and the emission of sulphur and nitrogen oxides together with other industrial effluents into the air. These air-borne pollutants spread over considerable distances and interact chemically and photo-chemically, producing acid precipitation, photo-chemical oxidants, etc. These exert insidious damage on forests, especially the more sensitive coniferous forests. Hundreds of thousands of hectares of forests are seriously damaged or actually destroyed in Germany, Poland, Czechoslovakia, and progressively in France and Switzerland.

Tropical rain forests are being exploited to an extent and in a manner which should be regarded as ecologically and economically intolerable. Estimates of the diminution of timber stocks in tropical regions due to changes in utilization and degradation vary, but the message is clear. FAO and UNEP in 1983 arrived at an order of magnitude of 14 per cent by the year 2000, or 7.6 million hectares per year - the figures being calculated for alternative utilization and closed tropical forests only. Including degradation of forests, one arrives at corresponding figures of 40 per cent or up to 20 million hectares per year. In contrast, reforestation in the developing



countries currently accounts for only about 10 per cent of the areas cleared of timber.

According to a joint study by the World Resources Institute and the World Bank presented in October 1985, approximately 40 per cent of the formerly existing tropical forests have already been destroyed, and the estimation for the year 2000 is that the trend could add up to a further 220 million hectares. It is more than likely that the tropical forests of Africa and Latin-America will succumb to such processes as are now underway in the Himalaya, a spiral of deforestation and erosion with all its possibly disastrous consequences. In a long-term perspective, the developing countries and the world as a whole will have to pay heavily for this rapid loss, if it goes on unchanged. (The authors of the joint study estimated that only about 8-10 billion dollars spent now could stop the trend).

From an individual or micro-economic point of view, these activities are pursued for the purpose of short-term profit and income generation; from the macro-economic point of view, to achieve economic growth and employment, and to improve the balance of payments position. From a global view, there is in fact a South-to-North transfer of natural resources. What is more, there has also been for nearly one decade now a South-to-North transfer of monetary resources due to high interest rates, and not a massive North-to-South transfer (just to recall to memory a proposal of the Brandt Commission). For the world economy as a system, the question of the ultimate distribution of the income flow (incidence) deriving from the utilization of nature may remain an open question, but the loss of the stock of natural resources is definite.

The patterns and causes of deforestation differ from region to region and from country to country: provision of settlement areas, conversion to pasture-land and for cattle ranching, use as firewood, charcoal production, export of timber for industrial purposes . . . Energy needs are one major cause of increasing deforestation in developing countries, and in turn, those needs are greatly aggravated by it. Locally, the shortage of firewood in many African and Asian countries is acute, leading to a 'fuel-wood crisis'. The interrelatedness of ecological systems gives rise to a number of serious consequences. A UNEP report describes the cardinal problem in a few plain words (p. 167): 'The imperatives for survival lead to action like cutting the last wood on slopes prone to erosion to secure warmth and cooking for the present, even though it means crops and fuel-wood for the future are at risk.'

There are other factors that deserve more international discussion, particularly:

- the import of natural resources, especially of precious tropical wood, by the industrial countries, and

- the economic activities of multinational corporations providing the respective exports from the developing countries.

Long-term ecological effects can result from short-term economic decisions: erosion, floods, climatic changes - all of which ultimately jeopardize the capacity to export raw and processed materials. According to UNEP estimates, the forest reserves in Thailand, Malaysia and the Philippines in the event of continuing intensive exploitation would be largely exhausted in less than 20 years.

In the light of such trends, the prevailing local and national timber production and forest clearing practices have become global problems. Therefore, the rediscovery of a traditional (ecological) principle of forest management at a worldwide level would seem to be of utmost importance: 'Do not cut down more timber than can grow to replace it!' Simple as the implementation of this principle may be under normal economic conditions, it proves extremely difficult when those conditions are distorted.

*Conclusions:* In many developing countries, short-term crisis decisions are diminishing the ability to take long-term decisions: Intensified forest utilization to secure short-term energy supplies (firewood, charcoal) poses a threat to long-term sustainability on the basis of local resources; deforestation aimed at increasing timber exports for short-term stabilization of the balance of trade, in the long run actually jeopardizes the country's export capacity.

Therefore, rapid depletion of tropical forests is a threat for both the developing countries and the industrial countries. Although the direct and immediate effects of deforestation occur in the developing countries, the long-term ecological and economic repercussions are highly significant for the industrial countries as well. Some of the consequences of 'doing too little' and 'acting too late' will be irreversible. Nevertheless, or precisely for that reason, joint action is essential now. The industrial countries and the developing countries do have common interests, though for different reasons, in achieving a more rational utilization of resources.

### **3. Pollution Issues**

#### **3.1 Industrial Production and Environmental Standards**

In the past two decades, a considerable part of the industrial investments in the developing countries (about 40 per cent) came through external channels, mostly via multinational corporations. These investments cause

specific negative environmental effects. In addition, the internal industrialization efforts of the developing countries, the products and technologies, often follow unadapted foreign models and may, therefore, have severe negative effects on nature, society, and on future generations.

Regarding foreign direct investment in developing countries, a large portion goes into the utilization and exploitation of natural resources, such as fuels, minerals, timber, fish etc., the final consumption of which, however, mainly takes place in the industrial countries. Recent studies by OECD and UNCTAD have demonstrated the trend towards re-locating certain traditional industrial polluters, such as steel, aluminium, asbestos, toxic chemicals etc., in the developing countries, which themselves so far have not yet assigned any high priority to environmental protection when negotiating agreements with multinational firms. Taxes, foreign exchange controls and technology transfer were and still are the dominating themes. As a result, such agreements contain no or only limited references to or provisions for protecting the environment.

According to a study of 21 such agreements relating to mining, 9 provided for absolutely no measures, and 12 for only general measures to prevent environmental damage. None of these agreements contained anything like a complete set of strict environmental standards. In consequence, generally no substantive pressure is being exerted by the developing countries on the industrial countries (or on individual multinational firms) to switch the commercial advantage resulting from low environmental standards in their own favour, or to stop environmental damage right away.

Probably, in later years one might have to differentiate these questions into 'pre-and-post Bhopal', as with the discussion on chemical risks in Europe as pre-and-post Seveso. However, the Bhopal accident not only shows that there is a problem of differing environmental and human safety standards but also that enormous efforts will be needed to implement stricter standards.

In a contribution in the 'Environmentalist' (No. 2, 1985) the respective imperatives for decision-makers were put as follows:

- Proper location of hazardous or toxic industries, including the re-examination of existing locations.
- Firms buying and selling technology from abroad should insist on the necessary safety precautions.
- Government inspections should be made more stringent.
- Trade unions, and other social groups, should take a deeper and more sustained interest in industrial safety and health.

- A general clause casting the responsibility for ensuring the safety and health of employees on the employer should be incorporated in the statutes.
- Legislation should make it necessary for the agencies responsible to pay compensation to accident victims. The laws regarding compensation are insufficient and the responsibility of multinational corporations 'vis-à-vis' their subsidiaries not specified.
- Parent organizations should make sure that their subsidiaries in developing countries enforce all safety regulations and keep all environmental standards.

In summary, the Bhopal accident indicates that it is necessary to thoroughly re-examine policies, and this should include: safety precautions, factory laws, compensation laws, reporting systems, crisis management facilities, industrial location, design of systems, technology choice procedures, technology acquisition regulations, toxicology research, inspection and regulatory processes for risky technology, active involvement of trade unions and workers. A God-like task, one might say . . .

*Conclusions:* There is a need for action with respect to harmonization of environmental standards - not only regionally (e.g. catalytic converters for private vehicles in Europe), or in the West-East context (e.g. measures against transboundary air pollution), but also in the North-South relations. In particular, the developing countries might eventually become 'pollution hells'. They also run the risk of losing markets for their products in the industrial countries due to low environmental standards in production. As national environmental policies in the industrial countries become more effective they are faced with a growing risk of imported environmental hazards, e.g. by re-importation of the prohibited DDT via the import of foodstuffs from the developing countries. The need for the developing countries to pay attention to environmental protection regulations therefore will multiply if they want to increase their share in the world market.

It is for this reason that I am in sympathy with a joint report by UNCTAD and UNEP on the interrelationship between resources, environment and foreign trade which presented the following proposals:

- The governments of the resource-rich developing countries should initiate environmental legislation forthwith.
- In all agreements on the extraction of natural resources in developing countries stronger emphasis should be given to environmental protection measures.

- Taxation of resource extraction and resource export should be improved and the revenue be used to finance the treatment of existing or emerging environmental problems.

A well functioning international system requires adherence to mutually agreed upon rules. This should apply not only to economic rules, but also to the environmental 'rules of the game'. Probably, the environmental standards and protection regulations must not be completely identical in industrial and developing countries. But that does not mean that the developing countries can abstain from environmental protection and exploit their natural resources - or allow them to be exploited - in the future as they have in the past. Multinational firms operating in developing countries should be required to adhere to environmental standards no less stringent than those prevailing in the industrial countries.

### 3.2 Deficiencies of Environmental Policy

Theoretically speaking, environmental policy can 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 restoration, conservation, and structural adjustment. Practice, however, does not conform to such a broad definition. Generally, only selected parts of the set of relations between environment and society may become subject of environmental policy. So far, environmental policy has mostly been designed as react-and-cure strategies concerning the control of air and water quality, noise abatement, and waste disposal, with emphasis on the restoration aspect. For a variety of reasons this conventional environmental policy was and is meaningful and still very much necessary. It has a number of deficits, however, some of which are serious. The need is to reach the stage of preventive environmental policy, i.e. anticipate-and-prevent strategies.

React-and-cure strategies of environmental policy have many shortcomings. They are, first of all, expensive. The measures employed take effect so late that the ecosystems involved often can no longer be saved. Only a part of the relations between environment and society is envisaged. Policy is pursued as a media-specific policy, i.e. separately controlling air, water, noise and waste. Thus, it runs the risk of lacking coordination between its measures, what may result in shifting the environmental problem from one medium to another (e.g. from air to water or soil) and, through spatial displacement, from one place to another (e.g. long-range, transboundary air pollution or transport of toxic waste).

In addition, reactive environmental policies may become entangled in a dilemma of principles. If immediate steps simply must be taken, the argument gets shifted from the 'polluter-pays-principle' - which is advocated in general - to the 'taxpayer-pays-principle', thus distributing the burden of environmental protection from the individual polluter to the community, to government, or society at large.

Preventive environmental policy can counter these shortcomings. However, to pave the way towards a transition from react-and-cure strategies to anticipate-and-prevent strategies, conceptual innovations as well as institutional and organizational changes are needed.

Conceptual innovations are called for because of

- the tasks to be accomplished (e.g. significant reduction of emissions) and the need to find solutions that are economically feasible;
- the need to identify future environmental problems at an early stage (e.g. the environmental impacts of new investments);
- the priorities for action have to be set in time.

Implementing preventive environmental policy is difficult because

- it is confronted with problems of complexity and uncertainty;
- new political procedures are required that are not sufficiently tested or not staffed (e.g. environmental impact assessments);
- new institutional arrangements and special administrative skills are needed in order to make anticipatory action effective (e.g. enacting preventive measures and programmes).

Furthermore, a new and broader perception of preventive environmental policy seems needed. Beyond established environmental policy the decisions in other established policy areas impinge on environmental quality. This is especially true for those policy areas that have a part in regulating the material cycle and corresponding technical systems, particularly agricultural, industrial, and energy policy. This means that for preventing environmental pollution it is necessary to ask if ecological approaches have been incorporated into these traditional policy areas, or how ecological thinking can be introduced into policy areas relevant to the natural environment. What is at stake is to make administrations ecologically sensitive.

In short, preventive environmental policy means that production, communication and transport systems should be ecologically re-adjusted. Information on environmental problems - and the respective curative management capacities - must be supplemented by more and better information on the causes of environmental problems, such as:

- polluting emissions and hazardous wastes,

- products and technical processes that deplete resources and pollute the environment.

There are some factors which favour such a change, and others that make a shift towards preventive environmental policies difficult - despite all the preparatory, conceptual work done by OECD, UNEP and other experts. To mention just a few such factors which in some way or other will determine environmental policy in the future:

- The necessary information gain for the environmental institution will simultaneously mean a relative information loss for other institutions. This will change the pattern of administrative competence and political power, and not only in the sense that the minister for the environment will gain and the economics minister will lose influence.
- Furthermore, there are the interests of those individuals, firms and authorities, whose actions are to be continuously and publicly reported on from an environmental perspective.
- Finally, as practical environmental policy in most countries is patterned according to specific environmental media (air, water noise, waste) and not according to a systemic ecological and holistic approach of policy, it may be possible to accomplish only a partial and gradual transition towards institutional arrangements favourable to preventive environmental policy, a policy that prevents harmful emissions from the very beginning or brings them down to low and digestible levels.

*Conclusions:* The path that future national and international environmental policy should take is clear: It must transform from react-and-cure strategies to anticipate-and-prevent strategies. This implies a drastic switch from polluting products and emission-intensive technologies to cleaner products and low-emission technologies. In order to follow that path, it would be necessary to know better to what extent the existing institutions of environmental policy, the given goals, and the instruments used, have failed. Evaluation of past failures is a prerequisite for the deployment of future options.

May I end with a symbolic picture: I think that the seriousness and the intensity with which depletion as well as pollution issues are discussed, will very much depend on the time horizon and the international orientation of those participating in the discussion. The more you look into the future and across the national boundaries, the clearer the interdependence between economy and ecology becomes. A plea for such 'telescopic viewing of problems', however, may seem strange to many people at first. Nevertheless, it might prove significant as a perspective for considering the interdependence of ecology and economy in the international context.

## Appendix

### *Resolution on Environmental Pollution\**

Adopt as an international principle that depletion of resources and pollution of the environment should be at minimal achievable levels.

In the implementation of this principle, there should be:

- (1) emphasis given to stimulating general environmental awareness and the development of environmental expertise;
- (2) improvement of environmental monitoring and reporting systems and of the efficiency of environmental protection agencies;
- (3) support for the environmental protection activities of social groups and non-governmental organizations;
- (4) promotion of national programmes for clean technologies and low waste products, and elimination of international barriers to the adoption of such programmes;
- (5) integration of environmental impact assessment procedures into all major economic and political decisions;
- (6) a code of environmental conduct for multinational firms and donor agencies agreed upon;
- (7) continued reliance on command and control measures, including strict liability, designed for changing environmentally harmful production and consumption patterns;
- (8) provision of economic measures designed to (i) encourage the reduction of emissions by polluters and (ii) impose the costs of pollution on the polluters.

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\* Approved at an international meeting of environmentalists, economists and technicians at the Aspen Institute in Berlin (West), October 13-16, 1985.



# **Water and Development: Water Scarcity and Pollution and the Resulting Economic, Social and Technological Interactions**

We need a watchdog to let us know that burglars of environmental quality are in the neighbourhood. Unfortunately for this quality, there are far more burglars than there are watchdogs.

*Herbert Inhaber*

## **1. Overview**

### **1.1 Water: The Fundamental Resource**

Water is indispensable for the welfare of human beings and their natural environment. Its importance is such that it can mean life or death, prosperity or poverty; it can even be the cause of conflict and war.

Water is made available to support life on earth through the hydrological cycle. Every year, about 453,000 cubic kilometres of water are evaporated from the surface of the world's oceans. Approximately 90 per cent of that volume returns to the oceans as precipitation. The remainder, some 41,000 cubic kilometres is transported by the prevailing winds over the continents where it combines with some 72,000 cubic kilometres of water evaporated from the land masses to provide a gross continental precipitation of about 113,000 cubic kilometres. It is this annual cyclical flow of water that sustains the natural and human ecosystems. More than half of the continental precipitation goes to recharge soil moisture and groundwater flows. The rest ends up in rivers and is returned to the seas to complete the cycle.

Thus, freshwater is a renewable resource by virtue of the cyclical flow between sea, air and land. It is also a finite resource because more or less the same volume is made available each year. At present, there is an annual renewable supply of some 8,300 cubic kilometres. This is equivalent

to several times the amount needed to sustain a moderate standard of living for the current population. However, on account of variations in climate and the vagaries of weather, the hydrological cycle does not distribute water equally over the continents. Therefore, water is not at all plentiful everywhere and is not always available when and where it is most needed.

## 1.2 Demand for Water

Demand for water usually refers to the use of water as a commodity in household and municipal activities and as a factor of production in agriculture and industry. During this century, demand for water has soared with rapid population growth, industrialization, urbanization and agricultural production. Available estimates indicate that between 1900 and 1940, world water use doubled from 400 billion cubic metres, while population increased by about 40 per cent. After the second world war, water demand accelerated further, raising withdrawal to over 700 cubic metres per capita by 1970, or 60 per cent higher than in 1950. Water use in both agriculture and industry increased twice as much during those 20 years as it had over the entire first half of the century.

The bulk of world water use is claimed by *irrigated agriculture* which accounts for about 70 per cent of total withdrawals. About one third of today's agricultural harvest comes from 17 per cent of the world's cropland that is irrigated. Between 1950 and 1982, the area under irrigation increased from 94 million to 261 million hectares. While irrigation in general has made possible considerable increase in yields, the prevailing methods and technologies of irrigation result in considerable waste of water. In actual fact, a large volume of water is removed from the local water supply through evaporation and transpiration and losses in distribution systems. Less than half of the water withdrawn for irrigation goes back to a nearby stream or aquifer where it can be re-used.

*Industry* is the second major water-using sector of the economy. It accounts for about a quarter of water use worldwide. By far the largest single industrial use of water is in energy production in plants powered by nuclear energy and fossil fuels. Compared to agriculture, industrial water use removes a much smaller fraction of water from the local water supply through evaporation and transpiration. Most existing power plants have 'once through' cooling systems that send water back to its source after it passes through the plant. Fully integrated water cycle systems, however, are still rare. The cause for concern in this connection is not so much the

volume of water withdrawn but the discharge of heated and sometimes polluted water back to its source where it threatens aquatic life and through daily intake human health.

About two-thirds of the rest of industrial withdrawals is used by five industries, namely, primary metals, chemical products, petroleum refining, pulp and paper manufacturing and food processing. Withdrawals for these industries are not likely to increase much further in industrial countries with established water pollution laws and conservation policies in effect because most pollution control techniques recycle or reuse water, thus reducing the demand for new supplies. In point of fact, the specific industrial use of water (i.e., water use per unit of production) has declined and will decline further in the future. It is expected, however, to increase in the newly industrializing countries (NICs) with weak (or non-efficient) conservation policy, and particularly in the developing countries. In most of the developing countries, at present, industry accounts for less than 10 per cent of total withdrawals of water. Since most developing countries are just embarking on the industrialization path, water demands for power generation, manufacturing, mining and materials-processing are poised for acceleration, particularly so if water-intensive technology is adopted.

*Residential and other municipal uses of water* ('domestic' demand) account for approximate 10 per cent of water withdrawals in many countries and only about 7 per cent of total withdrawals worldwide. In industrial countries where population growth is low or declining and where most households are already adequately supplied with water, growth in domestic demand in general is slowing and will continue to do so. The largest increase in demand for domestic water will thus occur in the developing countries where freshwater supply is not yet generally available in sufficient quantity and quality.

Estimates indicate that in many developing countries where water is supplied through a public stand post, daily usage ranges between 20-70 litres per capita. In areas where women walk long distances to draw water, usages are close to the biological minimum of 2-5 litres per person daily. The fact that water-borne diseases are widespread in developing countries, has directed worldwide interest towards mitigating unhealthy conditions by providing safe water close to the home, in amounts adequate to maintain decent standards of hygiene. To achieve such standards, people in the developing countries need to use considerably more water than they do at present.

### 1.3 The 'International Drinking Water and Sanitation Decade'

In the hope of avoiding a future water crisis of global dimensions, the United Nations Water Conference adopted the 'Mar del Plata Action Plan' in 1977 which led the General Assembly to launch the 'International Drinking Water and Sanitation Decade' (IDWS) in 1980. During that decade which is now drawing to a close, appreciable progress has been made in bringing fresh water and sanitation services to people in the developing countries. Available estimates indicate that on average some 190,000 additional people per day may have gained access to safe drinking supplies from 1981 to 1990. New and improved water supplies have been provided to over 690 million people during the course of the decade and the pace of construction of new facilities has increased three-fold. Improved sanitation facilities have reached an average of some 115,000 additional people per day. However, despite these accomplishments, the ambitious task of providing water and sanitation to all has remained largely unmet.

By 1990, the total number of 'unserved' people in the developing countries (excluding China) in need of safe water supply is expected to be 1.2 billion and 1.8 billion in need of sanitation facilities, from a total population of 2.9 billion. The reasons for the shortfalls are numerous and vary from region to region but continuing population growth, economic stagnation, budgetary constraints, growing urbanization and inefficient water management seem to be the key hindrances.

In spite of the large increases in water withdrawals for irrigation, industrial and domestic uses foreseen, total use worldwide is still likely to be less than half the stable renewable supply at the global level by the year 2,000. Projections made by hydrologists indicate, however, that meeting demands by the year 2000 could require virtually all the usable freshwater supplies in North Africa and the Middle East. Use in Southern and Eastern Europe as well as Central and Southern Asia could also closely approach the limits of available supplies that can be safely tapped.

### 1.4 The Need for a Global Water Resources Strategy

By the year 2000 world population most definitely will have reached 6 billion, and forecasts for the next century indicate a population even in the order of 10 billion or more. Already at present, with a world population of 5 billion, water is a scarce resource in many parts of the world. Some 80 countries with 40 per cent of the world population suffer from serious

water shortages. Therefore, it is high time that a global water resources strategy for the 1990s is formulated and implemented by all nations.

Water resources management needs to address not only the existing constraints imposed by the hydrological cycle itself but also those induced by rapidly growing water demands for health and sanitation, industry and agriculture, by on-going land degradation in catchment areas and irrigated fields, by water pollution, by natural hazards such as floods and droughts, and by conflicting interests of riparian countries sharing international river basins. The basic objectives of a global water resources strategy for the 1990s should thus be to (a) find ways and means for providing safe drinking water and sanitation facilities for all people on an urgent basis, (b) develop adequate water resources to meet the demand in agriculture and industry, (c) promote institutional and human resources for efficient water management, (d) implement measures of water conservation and pollution control, (e) enhance international cooperation, and (f) mobilize financial resources for water management.

## **2. Major Water Problems: Scarcity and Quality**

### **2.1 Water Scarcity**

Water scarcity is increasing rapidly with a growing world population, urbanization and the process of economic growth. However, the availability of freshwater resources per capita varies widely from place to place and region to region. Asia and Africa are the two continents facing the greatest water scarcity.

In *Asia*, water supply per capita is less than half the global average and the continent's run-off is the least stable of all the major land masses. In India, for instance, 90 per cent of the precipitation falls between June and September and the bulk of the run-off flows into the Ganges and the Brahmaputra basin in the North. Western Asia is semi-arid to arid and is generally characterized by limited availability of water resources. Even under existing patterns of water use, the amount of water needed for the various purposes is expected to double between 1980 and 2000. Several countries, such as Bahrain, Kuwait, Democratic Yemen and Syria are now, or expected to be by the year 2000, at a point where total demand for water will either equal or exceed the available supplies.

In *Africa*, the situation is one of under-development of water resources relative to needs and potential and uneven distribution of water resources.

Two-thirds of the African countries have at least one-third less run-off than the global average. The Zaire river which accounts for about 30 per cent of the continent's renewable supplies flows through sparsely populated rain forest. In addition, Africa has the Nile, the longest river in the world and there are large fresh water lakes such as Lake Victoria, Lake Turkana, Lake Chad and Lake Rudolf. Africa also has, however, the largest deserts in the world, the Sahara in the North and the Kalahari in the South. Groundwater resources are known to exist in almost all parts of the region, but reliable quantitative data are not available.

Many areas of the world are semi-arid, having a climate whose rainfall variability is devastatingly high and where droughts are a recurrent feature. The largest contiguous region with the highest variability of rainfall of over 40 per cent consists of North and Sub-Saharan Africa, the Arabian peninsula, Southern Iran, Pakistan and Western India. Similar high variability is characteristic of the Southwestern United States, Northern Mexico, Southwestern Africa, Eastern Brazil and Chile and large parts of tropical and sub-tropical Africa. In the Sahel, rainfall is not only unreliable but has actually been on the decline. There is much less rainfall today than 50 or even 30 years ago.

The limits set to freshwater availability by nature over the years have been exacerbated by man: Population growth, expansion of irrigation and industrial use of water have led to intensive development of water and land resources which through improper management has given rise to various types of water problems and land degradation. Water losses are another example. The water distribution systems have leaks and pipe bursts. In developed countries these may mean that 25 per cent of the water put into the supply system never reaches the customer; in developing countries the losses in distribution may be much higher.

*Population pressure* on the land in some parts of the world has led to reckless deforestation of upland watersheds which has caused soil erosion, droughts and floods. The result is that an estimated 6 million hectares of dry land turn into desert each year. One major effect of deforestation is that the return flow of water to the atmosphere from wet foliage and from transpiration is interrupted. The water is thus left for infiltration and/or direct run-off.

In Malaysia, for instance, the conversion of natural forests to rubber and palm oil plantations has doubled peak run-off and cut dry season flows in half. In the Amazon basin, the massive deforestation occurring at present, is expected to generate large-scale and probably world-wide disturbances in hydrological conditions, such as reduced evapotranspiration, therefore increased flood run-off and reduced precipitation. Though not easy to quantify with accuracy, it is estimated that deforestation at the cur-

rent rate of some 15 million hectares a year is reducing run-off in the developing countries by as much as expensive new dams and reservoirs are augmenting it.

*Irrigation*, the world major water user, is also contributing to water scarcity. Water used for irrigation, whether coming from aquifers or rivers, is partly transferred to the atmosphere. Only excess water is returned to the river basin. A major example of such irretrievable loss to the water cycle is the falling water level of the Aral and Caspian Seas, having more than just regional environmental impacts. Moreover, in several regions where surface water availability is scarce, irrigation has necessitated groundwater mining. In this way, more water has been extracted from aquifers than is recharged naturally. Excessive groundwater pumping is taking place in several areas of the world, such as Southern India, Northern China, Israel, Syria, and the Arabian Gulf states.

Given existing climatic conditions and current population projections, it is estimated that the *per capita global water supply* will decline by up to 24 per cent by the end of the century and the stable, reliable component of that supply is expected to drop from 3,000 to 2,280 cubic metres per person per year. In addition, if the projected climate change from the rising concentration of atmospheric carbon dioxide ('green house effect') materializes, water supplies will diminish in some areas already chronically short of water, including major grain-producing regions of North China and the United States. (They may, however, increase in other areas, like Bangladesh.)

In 1975, at least 19 developing countries had to cope with natural water supplies of less than 500 cubic metres per person per year. This means some 200 cubic metres (or less) of actual availability - taking into account losses incurred in the process of tapping and harnessing the natural supplies for particular uses. By the year 2000, an additional 10 countries could find themselves in a similar situation and by the year 2025 a further 8 countries could be added to the list.

In addition to these 37 countries, another 16 countries would have less than 1,000 cubic metres per person per year available and could thus be regarded as approaching a situation of severe scarcity.

Since the overall flow supply of water is more or less constant, though with changing local availability, one driving force causing more and more countries to experience water shortages is rapid population growth. Anywhere between 15 to 25 Northern African and sub-Saharan African countries may face serious problems with water shortages by the year 2025. Most of these African countries facing water shortages, in the sense of average per capita water availability, are also countries whose agricultural sectors need higher than average inputs of water for food self-sufficiency.

In such cases, industrial and household demands for water will strongly compete with the agricultural sector for the limited quantities of water available, thus making food self-sufficiency an elusive goal.

## 2.2 Water Quality

Concern about water resources relates not only to its quantity but even more so to its quality. Water bodies throughout the world are becoming increasingly subject to a variety of pollution loads, with sometimes irreversible consequences.

Pollutants are of various types, such as organic compounds, inorganic salts, metals, nutrients, particulates, gases, radio-nuclides, heat, micro-organisms, etc. Pollution derives either from 'point' or 'non-point' sources. Point sources, for instance, are discrete 'end-of-pipe' discharges, industrial waste-water effluent or waste from the municipal sewerage system. Non-point sources, by contrast, have an impact over a diffuse area, are mobile and thus less amenable to control.

*Mismanagement of irrigation* has caused widespread water quality problems such as salinization, alkalization and water-logging in a large number of countries. It is estimated that water-logging and salinization are sterilizing between 1 and 1.5 million hectares of fertile soil annually. The problem is particularly severe in India and Pakistan where an estimated 12 million hectares have already been degraded. Moreover, drainage and run-off from fertilized crops, certain heavy organic loadings, sediments, micro-organisms, and high concentrations of nitrogen and phosphorous nutrients washed away into low lying streams, rivers and lakes are contributing to oxygen depletion, eutrophication and undesirable growth of aquatic plants and weeds. Excessive irrigation and the all too frequent postponing of the drainage aspects investments to a later stage due to short-term financial difficulties turn into long-term resource depletion.

One of the most acute problems is caused by the increasing *infusion of nitrates* into drinking water, leading to possibly serious threats to human health. This problem is already widespread in areas of intensive agriculture in Europe and is manifesting itself in the USA and USSR. The increasing use of fertilizers in the developing countries would imply that similar problems can be expected there also.

The *fouling of water courses and lakes* by untreated discharge of industrial waste and sewage has proceeded swiftly in the last decades. All over the industrial world, waste water treatment facilities have been set up at



considerable cost in recent years. Consequently, river water in some cases has shown quality improvement, although long stretches of numerous rivers still remain heavily polluted. Despite increased municipal water treatment in the industrial regions, lakes and rivers have been undergoing increasing eutrophication. This type of pollution is caused mainly by the run-off of pesticides, herbicides and fertilizers from agricultural lands. Since the 1950s, there has been a substantial increase in the concentration of phosphates and nitrates in the inland water of many countries. Two of the most spectacular cases of eutrophication are lake Balaton in Hungary and Lake Lemán in Switzerland. Eutrophication is also a major problem in certain sources of community water supply, such as artificial lakes and reservoirs, in particular in several Latin American countries.

Pollution of inland water bodies is thus not restricted to industrial countries but is a growing problem throughout the developing world where pollution control is either non-existent or unable to keep pace with the increasing environmental impacts of production and consumption. For generally the same reasons as in the industrial countries, agricultural expansion has had considerable adverse impacts on water quality. Growing urbanization and industrialization have caused more damage. Most urban centres in the developing countries lack adequate facilities for the collection and disposal of domestic and industrial wastes. This results in urban run-off highly polluted with pathogens and organic materials, which again may have serious impacts on the quality of nearby surface waters and shallow groundwaters. A glaring example is Mexico city where more than 15 million people are already concentrated in an area of only about 425 square miles. Here and in many other cities of the developing countries open sewers and surface run-off after rain create 'rivers of sewage' which contaminate the local water supplies.

*Urban centres* witnessed rapid concentration of industrial plants and the resulting water pollution over the last decades. In Latin America, urban industrial complexes were established, producing petroleum, petrochemicals and steel. Oil and gas processing urban centres have mushroomed in the Middle East. Energy, chemical and metallurgical industries have expanded rapidly in urban China and so have heavy industries, steel processing and petrochemical plants in urban India.

The major industries in the *traditional sector* of the developing countries responsible for causing widespread water pollution are those processing primary products such as sugar, oil seeds, minerals, coffee, hides and oil palm. The 'classic' example is India where 70 per cent of total surface waters are thought to be polluted. Of 78 rivers monitored in China, 54 were reported to be seriously polluted with untreated sewage and industrial waste. Numerous Malaysian rivers are becoming ecological disasters;

more than 40 of them are so polluted that they are devoid of fish and other aquatic animals.

Water quality is also degraded by *air pollutants*. Sulphuric acid and anions of other strong acids from electric power plants using fossil fuels, car exhausts and agricultural wastes carried by atmospheric moisture pollute the rain water thus affecting the soil and the water bodies. So far, the consequences of trans-boundary air pollution are particularly severe in Northern Europe and North-Eastern America. Tens of thousands of lakes in Sweden, Norway, North-Eastern USA and Canada have turned acid, with particularly severe harmful effects on the fish populations.

Awareness and knowledge of *groundwater pollution* have increased in recent years. The causes of groundwater pollution include seepage from land fills, leaking septic tanks, cesspools, waste and toxic chemical dumps, and run-off from fertilized fields. High concentration of nitrates in groundwater, far above allowable concentration in drinking water, is considered the worst form of groundwater pollution in parts of Europe and North America. The problem, however, is not restricted to the industrial countries. Although at present information on the quality of groundwater in the developing countries is still very meagre, it is quite likely that pollution is on the march under the soil surface all around the world.

### 2.3 Major Impacts of Water Scarcity and Water Quality Degradation

In view of the vital importance of water to life and economic and social progress, the rapidly increasing water scarcity due to declining per capita freshwater supplies and the water quality degradation due to pollution pose major challenges in the coming decade and beyond.

Many countries in the semi-arid zone are among the poorest in the world. In some, water is already or is likely to become a serious constraint for socio-economic development. While enlarged irrigation will be necessary here to achieve a satisfactory level of food production, the demand for water for domestic and industrial purposes will also grow, thus increasing competition among the various uses. Even now many of these countries already are unable to supply safe water for drinking and sanitation purposes to the bulk of their populations. Each year an estimated 12.4 million deaths occur in the world from unsafe water and dirt-related diseases. Poor environmental sanitation is a critical link in the chain of diarrhoeal diseases that affect young children in developing countries and claim the majority of deaths in the 0-5 year age group. Contributing fac-

tors are unsafe or insufficient water supplies and the lack of safe means of human waste disposal. Consequent health problems created by those conditions include gastro-intestinal, viral and bacterial infections, various intestinal parasitic infestations that drain an already limited food intake and aggravate malnutrition and also skin and eye diseases.

If current trends persist, deforestation and irrigation will continue to deplete resources and increase environmental degradation. Deforestation has influenced precipitation in upland areas and the manner in which precipitation is released into streams, rivers and the cropland below. The growing number of floods and droughts in some parts of the world are also linked to deforestation. Moreover, soil and wind erosion due to deforestation depletes the soil of its nutrients, reduces the depth available for roots to take hold and thereby reduces land productivity. When the soil is carried away to rivers, lakes and reservoirs, ports and waterways become silted up, reservoir capacity declines and the severity of floods increases.

The mismanagement of irrigation has led to the sterilization of some of the best and most productive soils. It is estimated that on account of water-logging, salinization and alkalination large areas of irrigated land are being abandoned each year. In the United States, some 20-25 per cent of all irrigated land or more than 4 million hectares suffer from salinization. The problem is widespread in Eastern and Western China, the Indian Subcontinent, Central Asia and Asia Minor, the Aral-Caspian lowlands, the Caucasus, Southeastern Europe, the Middle East, North and West Africa and the plains of North and South America.

Water pollution causes adverse effects on flora, fauna and human beings. The growing incidence of pollution thus has wide-ranging negative impacts on man and the environment.

### **3. Fields of Action**

#### **3.1 Demand Management**

In order to ensure that the finite amount of water that is provided through the hydrological cycle is adequate to meet the still growing demand for water in the world, it is absolutely necessary to reverse the past trends of water consumption, to find innovative ways of conserving water and to develop new water supplies. Both the development of water resources and the use of water, i.e., the supply and the demand side of water, need to

take into account likely adverse impacts on the environment generally and on land resources in particular. Economic activity and municipal use of water need to ensure that the water bodies are kept free of pollutants so that the stock of water is available for careful use.

The immediate course of action most definitely must centre on water conservation, through *rational utilization* of water resources and *technical innovations*. In most industries, the water used for cooling and other processes does not need to be of drinking quality. A large proportion of the water initially withdrawn for industrial purposes can be recycled several times before it is finally disposed of and the efficiency of water technology can be increased further, including fully integrated water recycling systems. In several industries, such as iron and steel and even mining, it is already economically feasible to recycle water. The paper and pulp industry, which has long had the 'reputation' of being one of the largest consumers and polluters of water, is yet another sector where successful efforts have been made to recycle water after use. For the manufacturing industries, the cost of water on average is only about 3 per cent of total costs. On account of such low cost, incentives for using water more efficiently must come from strict water allocations, stringent pollution control requirements or through water pricing. In the industrial countries, greater attention has recently been paid to re-using treated waste water. This practice, however, is not yet universal. Re-use of waste water has been advocated mainly for non-potable purposes, such as agricultural irrigation, cooling, and industrial in-plant recycling.

Developing countries are well and probably even better placed to take advantage of *new water technologies* than old industrial countries because installing water efficiency and pollution control into new plants in general is much cheaper than retrofitting old ones. Some of the technologies available are capable of reducing water use and waste water flows by up to 90 per cent. Information on these technical options should be disseminated systematically. Technology transfer thus could contribute vastly to alleviating water supply and pollution problems in the emerging industrial countries. While the scope for waste water re-use so far is relatively small in developing countries, since many of them do not have sewerage systems that collect the used water, there is large scope for building new industries with water recycling systems. Moreover, domestic waste water could be collected and used after treatment for agricultural purposes.

The need for raising the *efficiency of irrigation* is even more compelling since irrigation claims the bulk of many nations' water supplies and is generally rather inefficient. Saving even a small proportion of water in irrigation will free a large amount of water for other needs. Increasing the efficiency of irrigation would call for improvement in technical infrastructure

and adoption of more efficient management methods. For instance, lining irrigation canals can save water by minimizing seepage. Even more effective would be the avoidance of the use of more water than is necessary through careful assessment of the specific water needs for crops in various places, education of farmers on optimal use of water and adoption of more efficient irrigation technology.

Regarding methods of irrigation, it seems that drip irrigation would be the most efficient system. Given the wide range of efficiency of the various available systems - some 40-80 per cent for gravity flow, 75-85 per cent for a centre pivot sprinkler, and 60-92 per cent for a drip system - use of more efficient methods would need to be combined with sound management to ensure the best result. Farmers could also drastically reduce water withdrawal by scheduling their irrigation according to the actual weather conditions, evapotranspiration rates, soil moisture and water requirement for particular crops. Coordination of the use and management of groundwater and surface water can significantly increase the total efficiency of irrigation water in particular agricultural regions. Other available options to reduce the demand pressure on freshwater are the use of brackish water and treated waste water for irrigation of salt-tolerant crops and for supplying certain industrial users.

Compared to irrigation and industrial use, *household and other municipal use of water* is much less. Storing, treating and distributing this water as well as collecting and treating the resulting waste water is relatively costly. Therefore, actively conserving water and increasing the efficiency of household and municipal water use would ease these financial burdens and would enable water and waste-water utility companies to scale down the capacity for new plants, water mains and sewer pipes and also to cut energy and other costs for purification technology associated with municipal water supplies. The efficiency of use can particularly be increased through technically upgraded household fixtures and appliances, like improved toilets, dishwashers, washing machines and shower heads. Installing individual water metering systems in many cases would be a promising additional method of demand management.

### 3.2 Augmenting Water Supply

A region's freshwater availability can be augmented in several ways; for instance by *cutting losses through evaporation* by underground storage instead of storage in surface water reservoirs. The costs while high seem reasonable compared to alternatives involving grandiose schemes. At present,

more than 20 countries have projects to artificially recharge groundwater but in only a few of them has the practice been implemented on a larger scale. Underground water storage may hold special potential for developing countries, subject to the destructive flooding and perennial dry spells of monsoon climates. Many aquifers are recharged unintentionally by seepage from irrigation canals. In such cases, managing groundwater in conjunction with surface irrigation water can help prevent water-logging and salinization and may allow for the expansion of the irrigation area without developing additional surface water sources.

Several, though not too many technically feasible and economically viable new options are available for *increasing freshwater supplies*. Of the non-conventional ways to augment freshwater supplies in a particular region such as seeding clouds to induce precipitation, towing icebergs, desalting sea and brackish water, transporting water by tankers, the latter two appear to hold the greatest short-term potential. As a matter of fact, with the oceans holding 97 per cent of all the water on earth, desalination of sea water might eventually offer the solution to a limited renewable supply of freshwater. Several desalination technologies such as distillation, electrodialysis, reverse osmosis, have been developed, but since they are highly energy-intensive, they are so far too expensive for use, except probably for countries that have non-marketable supplies of natural gas or for islands which rely on tourism for a large share of their income. Transporting large quantities of water by tanker has increased recently as the unit cost of transport by tanker has declined.

Besides augmenting water supplies indirectly through conservation and by direct means - as discussed above - another major field of action must be *stricter pollution control*. Pollution control goes hand in hand, to a large extent, with water conservation in industry, agriculture and municipal water management. However, additional measures are needed, particularly to avoid eutrophication of surface and groundwater through careless use of fertilizers and other chemicals in agriculture and to prevent pollution of water through long-range, trans-boundary air pollution. Avoiding water pollution obviously calls for preventing all forms of hazardous pollutants from getting into the water bodies. In the developing countries, preventing pollution of municipal water and controlling industrial waste water will pose the major challenges because of the general lack or the inefficient functioning of sewerage systems. Groundwater pollution is also becoming more frequent, costly and very risky for human health. These problems will have to be tackled, however, to prevent an already bad situation from getting worse.

### 3.3 Providing Safe Drinking Water and Sanitation Facilities

While increasing efficiency of use of household and municipal water is necessary in the developing countries, expanding the quantitative supply of water for drinking and sanitation purposes is of utmost importance. During the 'International Drinking Water and Sanitation Decade', the 1980s, much of the effort has been directed to supplying drinking water and sanitation facilities in urban areas. Coverage of urban areas (excluding China) in terms of drinking water supply is likely to reach 78 per cent by 1990 as compared to 76 per cent in 1980, and 67 per cent in 1990 as compared to 56 per cent in 1980 in terms of sanitation services. This accompanies an estimated 49 per cent increase in the urban population of developing countries (excluding China). The percentage of the rural population supplied with drinking water has increased from 31 to 49 per cent, while the total population rose by 17 per cent. As far as rural sanitation is concerned, the percentage of rural population in the developing countries with adequate services is expected to increase only slightly (from 14 to 18 per cent) by 1990.

Progress achieved - and what is expected - with regard to drinking water and sanitation varies significantly from region to region, albeit for different reasons. In *Africa*, because of the rapid growth of urban population - from 158.5 million in 1985 to a projected 332 million by the year 2000 - progress in providing water and sanitation services has been particularly slow. Current trends predict that the number of urban dwellers without an adequate supply of water may even increase from 25.7 million in 1980 to more than 87 million by 2000, while the number without adequate sanitation may rise from 41 million in 1980 to as many as 106 million by 2000. Drinking water supply in Africa is expected to remain inadequate for about 50 per cent of the rural population or about 240 million people, while about 350 million people might be without adequate sanitation facilities by the year 2000.

In the *Asia and the Pacific region* (excluding China), the urban population provided with adequate water supply is expected to double between 1980 and 2000. Nevertheless, the number of urban dwellers without an adequate supply of drinking water is estimated at some 300 million, from an estimated urban population of 763 million. In spite of the fact that urban sanitation coverage has risen at a faster pace than population, the number of urban dwellers without coverage could be as many as 450 million by the year 2000. Progress in the rural supply of water seems to have been quite significant. It is therefore to be expected that in Asia and the Pacific region as many as 78 per cent of the rural population could be supplied with at least the minimum water requirements. Progress in the provi-

sion of rural sanitation, however, has been slow. By the year 2000, as many as 1.2 billion people out of a population of some 1.4 billion might be without adequate sanitation facilities.

In *West Asia*, urban dwellers are expected to achieve full drinking water and sanitation coverage by 1990. However, only 57 per cent of the rural population is expected to have adequate drinking water compared to 48 per cent in 1980. With regard to sanitation, no real progress seems to have taken place in the region and the number of rural dwellers without adequate services may actually have increased.

In *Latin America and the Caribbean*, efforts at improving water supply and sanitation coverage (with emphasis on urban coverage) started earlier than in the other developing regions. By 1980, an estimated 83 per cent of the urban population had water supply services and 74 per cent had been provided with sanitation facilities. In sharp contrast, coverage of rural areas remained low for water and sanitation, 41 per cent and 11 per cent respectively. Despite the progress made in the 1980s, large numbers of the urban poor in this region remain without adequate water and sanitation services. In view of the rapidly expanding urban population the number of urban dwellers without adequate drinking water supply is expected to rise from 40.5 million in 1990 to 45 million by the year 2000. The number of people without adequate sanitation might remain unchanged at some 60 million. With regard to the rural population, coverage will have reached 56 per cent and 31 per cent respectively, for water supply and sanitation at the current rate of expansion.

#### 3.4 Management of Natural Hazards

Another major field of action lies in the management of natural hazards, particularly droughts and floods. The occurrence of droughts has become more frequent, causing breakdowns of agricultural and pastoral systems, widespread dislocation of communities - '*environmental refugees*' -, and substantial losses of human lives and livestock in many parts of the world, particularly in Africa. There is an obvious need for drought management using the accumulated experience of countries that in the past have successfully overcome that problem. Likewise, and as is well known, measures to arrest desertification are urgently needed to prevent further depletion of land resources.

Flood control is yet another area that calls for effective action in many developing countries where crippling damage caused by floods frustrate



efforts to break the 'vicious circle' of poverty. In addition to short-term damage control measures, long-term structural measures such as control of flows by the construction of new dams and inclusion of flow storage capacity in multi-purpose dams are needed in areas where the incidence of floods is particularly severe, such as in Asia and Latin America and the Caribbean.

#### 4. Water Policies

##### 4.1 Conflicts among Objectives

The specific objectives of water policies vary from country to country and therefore each country may need to formulate its own policies. The main objectives, however, are universal. They include conservation of water resources, development of new water resources, preventing water pollution and satisfaction of present needs without undermining future needs (*sustainable development*).

In the developing countries, provision of safe drinking water and water for sanitation purposes remain top priority tasks. At the same time, however, competition is growing from other sectors, mainly agriculture and industry. To meet the growing national demand, it will therefore be necessary to find ways and means to accelerate new water resources development. This will require, *inter alia*, an improved administrative and institutional capability for assessing national water availability and projecting future sectoral demands. Achieving optimal allocation will require establishing of sectoral priorities and more effective allocative mechanisms, particularly *water pricing* and/or *rationing* water via quota systems.

Competitive demand pressure is also growing between regions, particularly between the urban and the rural sector. The urban-rural conflict has actually existed all along in most developing countries. A change of policy will be needed to achieve a more equitable allocation between these two sectors, since the urban sector has generally been given priority consideration. This may pose a major challenge to policy makers. The rural sector in general is more difficult to supply with safe drinking water and sanitation facilities. On account of the costs involved, reliance on large and expensive projects is unlikely to meet rural needs. Dependable supplies of water for drinking and sanitation as well as irrigation in rural areas might be better achieved through small projects, using groundwater or protected sources

from local catchment areas and through community activation, particularly grass-root organizations.

The general scarcity of public finances will support a policy change geared towards greater *community participation* in water resources management and towards full or at least partial cost recovery. Cost recovery through some form of water pricing would help achieve several goals simultaneously, such as efficient allocation of water, water conservation and pollution prevention.

The philosophy of sustainable development calls for avoiding water pollution and land degradation. A number of options are available to preserve the ecological balance in rivers and streams and to avoid land degradation. Preventive action and anticipatory strategies against pollution are generally to be preferred to costly pollution clean-ups and curative measures which would have to be subsidized by the state. Irrigation and use of fertilizers and other chemicals particularly need to be rationalized to prevent harmful effects on water, land and people. Where private interests do not coincide with social interests, governments can invoke the 'public trust' doctrine to protect likely damage by private agents. Where demand is already at the limit of available supply, strict regulations are necessary to put water on a sustainable footing.

#### 4.2 Costs and Benefits of Alternative Solutions

In many developing countries, supply of water is limited not only by natural availability but particularly by lack of adequate, well-maintained infrastructure. Where expansion of population coverage is necessary, new infrastructure will obviously have to be built. On account of the high cost of building new infrastructure, however, the first step should be to *rehabilitate infrastructure* that is in a state of disrepair or not usable at all. Moreover, governments should ensure regular maintenance of existing infrastructure since this is less expensive than the costly overhaul of dilapidated infrastructure.

Many governments still rely on conventional *dam construction* and large *diversion projects* to relieve regional water stress and water shortage. However, the engineering complexities of such projects and their threat of ecological disruption, multi-billion dollar price tags and long lead times do not offer much hope that they will deliver water in time and at reasonable cost. Unless deforestation and erosion are stopped and irrigation systems better managed in the developing countries, large projects may waste

capital, undermine the productivity of the soil and also displace indigenous population. Furthermore, even the most grandiose schemes will not be the ultimate solution to regional water problems. The best any dam or diversion project can do is to slow down the depletion of given supplies or delay the occurrence of shortages. In such cases, it could be less costly to change settlement programmes to places where adequate water supplies are available or to effectively reduce water demand through some kind (price or quota) of demand management.

The cost benefit issue has recently given rise to a fundamental discussion on the justification of *irrigation investments* in terms of grain prices needed to cover costs. In developing countries, capital costs for large-scale irrigation projects on average amount to about \$ 5,000/hectare whereas those for small-scale projects such as tube-wells and line lift pumps amount to only \$ 1,000/hectare. In view of this cost differential, large incremental grain yields would be required to justify large-scale systems. In the past, large projects have contributed only 1/3 to 1 ton/hectare in yield increase as against a requirement of 1.5 to 2.5 tons/hectare to justify costs. It is therefore preferable both from the ecological and the economic point of view to concentrate efforts on irrigation systems that involve low capital costs only.

It was already said that generally more thought must be given to carefully consider the costs and benefits of alternative technical solutions to water development, water conservation and pollution prevention. Cost-benefit-analysis must play a special role in avoiding 'white elephant' projects and to rationalize the ranking of project priorities and the actual design of projects.

## **5. Improving Water Resources Management**

### **5.1 Information Base and Information Exchange**

Inadequacy of water and water related data persists worldwide, especially, however, in the developing countries. So long as systematic and reliable data are not available, design of water projects will remain guesswork, use of water resources haphazard and waste of resources and loss of lives will continue.

The need for a better and more comprehensive *information base* cannot be exaggerated. It goes without saying that planning of and investments in water resources development have to be based on a thorough

understanding of the natural resources available and the ecosystems affected. For instance, the variability of rainfall, evaporation, floods and droughts is considerable. Therefore, schemes designed to be effective and to prevent waste have to take into account both historical and current variability data.

*Hydrological forecasting*, which is of enormous economic and social importance, relies on prior knowledge of how river basins and channels would respond to precipitation of varying intensity and duration. This calls for a study of past records of rainfall, snowfall and river flows and of the relationships among the various factors. Accuracy of hydrological forecasting can save substantial amounts of resources. In Asia, for instance, it is estimated that the average annual material costs of flood damage amount to over US\$ 3,000 million.

Better data are also needed on *groundwater recharge*. The main problem in groundwater use in the humid zone is to determine where to construct a well in order to tap the water needed. In the dry climate, however, the rate of recharge of an aquifer has first to be estimated in order not to over-exploit its potential for groundwater delivery. Without such information, one runs the risk of early depletion of the resource.

Gathering information on water resources is not a once-and-for-all effort, since climatic variables are subject to fluctuation. Seen internationally, variability tends to be much larger in dry regions where precipitation is scarce than in better endowed humid regions. Furthermore, fluctuations in run-off tend to be a multiple of fluctuations in precipitation. Consequently, arid and semi-arid regions are extremely sensitive to climatic variability. This sensitivity poses particular problems to decision-making in the absence of adequate empirical data.

Data on completed projects also need to be collected for continuous *monitoring and assessment* of the various economic, social and environmental aspects of such projects in order to avoid mistakes in other projects and in the future. Site-specific information gathering on the various aspects of water resources must be supplemented by improved exchange of information, particularly between similar climatic regions. The continuing incidence of salinization and water-logging, for instance, is evidence of an insufficient transfer of knowledge.

These and other problems have arisen in many parts of the world and are still occurring because of failure to apply the knowledge that already exists. In many cases, this knowledge has simply failed to reach the decision-makers.

## 5.2 Education, Training and Research

To ensure a more efficient and responsible use of water resources, it is essential to improve information about the existing and emerging water problems. The given channels of information transfer about water suffer from various shortcomings. Oral transfer of information through lectures and courses is effective but reaches only a limited number of people. Audio-visual channels, such as films and television, can play an important role in the future. So far, the interest taken by journalists in disseminating information on water supply and water demand generally falls short of the importance of these subjects to the general public.

New links need to be established in view of the prevailing situation. One way this could be accomplished would be to have a professional corpus of *information mediators* with the task of transmitting technical and scientific information to the general public by different media and in various forms.

The Mar del Plata Action Plan of 1977 recommended that countries should give high priority to conducting *surveys* in order to determine the national needs for administrative, scientific and technical manpower in the water resources field. Most developing countries have not yet undertaken any such survey. Gaps between the supply of and demand for *trained personnel* continue to be a major problem in water resources management. The lack of trained and experienced engineers, for instance, has tended to increase the costs of irrigation projects in many countries, and the possible benefits of irrigation have been reduced due to the lack of trained water management personnel and by farmers inexperienced in irrigated agriculture.

There is, in addition, an urgent need for water resources *institutions* to adapt knowledge and technology transferred from abroad. The need for applied research is most critical in Africa. More than half of the African countries have neither research institutes nor facilities for dealing with water resources and little has been done so far to improve the situation. The situation is better in the other developing regions.

## 5.3 Low-Cost, Low-Risk Technology

A substantial proportion of the project failures in water resources management is to be attributed to the choice of inadequate technology. Given the relative scarcity of resources in the developing countries, the need for

choosing *appropriate technology* cannot be over-emphasized. So far, however, there has been no general agreement on the criteria for technology choice in water resources management. The least cost technology, for instance, may not be the most economically efficient, nor the least risky, nor may it be so in all places. Moreover, in water resources management it is not always easy to translate costs and benefits into monetary terms and to judge the relative economic efficiency of different techniques. A number of criteria have been put forward for choice of technology such as simplicity, dependability, labour-intensity, local raw-material intensity, cost-effectiveness, speed of construction, environmental and social side effects, etc. The relative merits of particular techniques for a given project probably cannot be decided *a priori*. Wide dissemination of information on known techniques would, however, provide users and investors with a wider range of options.

#### 5.4 Scope for Economic Policy

Economic policy should particularly aim at increasing efficiency in the management of water resources. Regarding the development and conservation of water resources, it has become necessary to keep costs down through the choice of economically efficient low-cost techniques relying where possible on local materials, and to move away from reliance on grandiose schemes to smaller projects. It is also important to ensure the continuous maintenance of installed water-supply capacity which will be less costly than a major rehabilitation of infrastructure.

In many countries it will be necessary to drastically change or to stop the existing *water subsidy policies* in order to expand coverage and reliable services. The ultimate beneficiaries of water investments, particularly, will have to bear a larger share of the costs of project development, operation and maintenance. The polluters should be liable for the damage they do to the environment (*'polluter-pays-principle'*). Cost recovery through *water pricing* (and also through *effluent charges*) has been strongly advocated by economists, particularly for those countries where the lack of financial resources has all along been a major constraint to water resources development. However, perspectives differ on the extent to which governments should aim for cost recovery. For instance, where the rural population is unable to contribute more than it does at present; if the only techniques available were beyond their means or if significant health, economic or social benefits might be lost, then greater cost recovery from users would not be advisable.

In times of increasing water scarcity it may no longer be justifiable - if it ever was - to subsidize irrigation projects which raise users' income by increasing yield. Furthermore, irrigation projects tend to raise the value of farm land located in the command area of an irrigation scheme substantially, thus benefitting the lucky farmers at the expense of the tax-payers generally. However, full cost recovery may not be feasible everywhere, given that in many developing countries the cost per hectare of building new irrigation systems exceeds per capita GNP. It is generally agreed that inefficient operation and poor maintenance of an established irrigation system is largely a result of the farmers' perception that they have no responsibility for the system. Having farmers pay some share of the water costs would, instead, give them a stake in the system besides generating public revenue to improve operation and expand coverage.

*Water pricing* would further other important objectives such as economical use of water, distributional equity and pollution prevention. Users who have to pay for the water they use will have an incentive to use only the amounts of water they really need, when additional amounts entail higher costs. Much of the profligate waste and inefficiency in today's use of water results from policies that promote the illusion of 'abundance of water'. Water pricing, instead, would promote both a more economical use of water and a more efficient allocation of water. Achieving distributional equity is often in conflict with economic efficiency and attempts to achieve both involve compromises or trade-offs among objectives. As a matter of fact, regulations and prices of any type, including systems of quotas, marginal cost pricing for irrigation water and effluent charges reflect various conflicting goals, such as the need to encourage efficient use of water, the desire to recover capital costs from users, the intention to favour small farmers and the need to preserve the environment. The challenge is to find reasonable combinations of regulations and prices most conducive to the achievement of these goals.

In the future, it will become increasingly important that water users be made to pay for treating the water they pollute or purify the used water themselves. Water bodies cannot be expected to provide a source of high quality water and at the same time dilute an increasing tonnage of waste dumped into them each year. Particularly, dilution cannot maintain adequate water quality in a society undergoing rapid industrialization and urbanization. Industries should therefore be required to pay the full cost of water in their production processes, including the cost of discharging it in a form suitable for re-use or digestible for the environment. Appropriate *pollution control standards* need to be generally implemented and discharge of effluents by industries to be limited. Experience in the industrial countries has shown that cleaning-up water pollution is extremely costly.

The developing countries cannot afford to subsidize such cleaning-up and increase investments in irrigation systems and drinking water services at the same time.

## 5.5 Institutional Development

A number of both developed and developing countries have established some kind of legislation regulating the ownership and use of water. In spite of the progress achieved so far, appropriate and effective legislation is still lacking in many countries, particularly that dealing with the development of new water supplies, the conservation of water and the prevention of water pollution.

Likewise, varying degrees of progress have been made regarding legislation to establish mechanisms for co-ordinating governmental departments and organizations in the public sector, with sub-sectoral responsibilities such as urban water supply, rural water supply, hydrology, hydro-meteorology, pollution control. There is further need to establish appropriate *co-ordinating mechanisms* and to adequately define functions and responsibilities down to the project level.

A persistent difficulty in most countries is that of creating effective links between the water sector and other environmentally critical sectors, such as agriculture, industry, transport and energy. The weak links between water and irrigation and water and livestock development are examples of this shortcoming; others are health, urban development, hydro-power and water transportation.

Most of the institutions for water supply in developing countries since the 1950s have been established in response to the growing demand in the urban areas. The pre-occupation with the provision of urban services has seriously hampered the development of rural services. Moreover, the *urban-biased institutions* were often modelled on those in the industrialized countries and the techniques used were transferred without much modification from those places. Such institutions and techniques are particularly inappropriate for rural communities which are less accessible and often only marginally tied to the cash economy. Much the same can be said for institutions established to manage irrigation and drainage. For investments in rural water supply of developing countries to be effective, significant institutional changes are needed. The devolution of responsibilities to small-scale institutions seems to be particularly important. Women play a very important role in water conservation and water use in many parts of



the world. The establishment of community organizations has been helpful in cost recovery of projects, and in maintaining supply structures.

As far as overall *assessment* of water resources is concerned, activity has actually been on the decline in many developing countries. Inadequacy of financial resources, lack of qualified manpower and a shortage of equipment are seen as the major constraints. The situation concerning time-dependent data is bad, particularly with regard to groundwater, water quality and data on evaporation. The situation regarding time-independent hydrological data is just the same.

Drastic cuts in allocations to the water resources sector in several developing countries have led to wholesale *dismantling of networks* that were developed at great cost in the 1960s and 1970s. For instance, in the case of the Lake Victoria Basin and the Upper Nile, where there were once 70 stream-gauging stations, only 7 remain. These waters can no longer be monitored and assessed on an adequate basis. The situation varies from region to region but seems to be worst in Africa. Disastrous long-term effects of such institutional de-developments are likely in several parts of the world.

## **6. International Cooperation and Management of Conflict**

### **6.1 Knowledge and Technology Transfer**

Effective management of water resources requires knowledge on how best to use water. In developing countries, decisions on water use in general are unscientific and therefore haphazard. As a result, a lot of water is being wasted. This situation needs to be remedied.

Transfer and dissemination of knowledge are probably the most effective forms of international assistance since they increase the number of people capable of handling new ideas and material equipment. One proposal for accelerating the transfer of knowledge calls for a thorough redeployment of international assistance activities to focus on that goal. While knowledge transferred from developed countries can be helpful, its application to particular situations needs to take into account differences in climate, geology and other local factors; otherwise mistakes are likely to occur, possibly resulting in problems such as salinization and water-logging. Local technical capabilities are thus absolutely necessary in order to evaluate the applicability of imported technology and/or to adapt such technology to local conditions.

## 6.2 River Basin Management

Around 40 per cent of the world population live in international river basins. The amount and quality of water available to countries in river basins are influenced by the activities in the co-riparians. In addition, the relationships between upper and lower riparians cause special problems: the larger the irrigated area in upstream countries, the less available amounts of water to downstream countries; the greater the pollution activities in upstream countries, the poorer the quality of water received by downstream countries.

*Africa* is the continent where most of the river systems are international - in the sense that the river basins are shared by several countries. Of the 9 international water bodies shared by 6 or more countries, 5 are in Africa. The Niger runs through 10 countries, the Nile and Zaire through 9 countries, the Zambezi through 8 countries and Lake Chad is shared by 6 countries. Nearly 60 per cent of the surface area of Africa is accounted for by shared river and lake basins and at least 80 per cent of the total surface area of 20 African countries lies within international basins. This makes Africa particularly liable to the cooperation problems encountered when shared water resources are to be partitioned between the countries within the joint water divide.

Inter-governmental commissions or planning agencies have been established for coordination and integrated development of several basins - like Gambia, Kagera, Lake Chad, Niger, Nile and Senegal. However, progress in most cases has been rather slow and it is to be expected that problems associated with the management of international rivers in Africa will become more complex and intense than ever before. For instance, when Sudan requires more water for irrigation, it can come only from the Nile. This, however, would be detrimental to Egypt which already uses all the water it can get. Similarly, the construction of dams in Ethiopia may be essential to develop further land for irrigation in Somalia. With strained relations between Ethiopia and Somalia, this may not be a feasible short-term solution. Furthermore, countries depending on hydro-electric power from the Kariba and Volta dams have to agree among themselves to release adequate amounts of water for irrigation needs. There has been considerable reluctance so far - especially at the Kariba - to release water for irrigation at the expense of hydro-electricity generation.

In *Western Asia*, where some 95 per cent of the average annual discharge from rivers emanates from river basins shared by two or more countries, only two cooperation agreements for the development of shared river basins exist so far. The joint Syro-Jordanian Commission is empowered with integrated planning and development of the Yarmouk

river basin and the Trilateral Commission on the Euphrate river deals with the collection and analysis of river flow and rainfall data. In this region, however, tensions among riparian countries are likely to grow with increasing demand for water.

In *South America*, international river and lake basins account for about 75 per cent of the total flow of water. Thus far, international cooperation covers only 15 of the region's shared basins and most of the agreements are restricted to exchange of information, research and joint studies. The only two working multilateral agreements are those on the Plata river basin and the Amazon basin.

In *Asia and the Pacific region*, some 65 per cent of the drainage area of rivers is from river basins shared by two or more countries. In this region a number of cooperation agreements have been reached on shared river basins. For instance, the Permanent Indus Commission which regulates the allocation of water from the Indus river basin between India and Pakistan, the agreement between China and the Democratic People's Republic of Korea for the joint development of the Yalu River, the Joint Rivers Commission for the Ganges and the Brahmaputra between Bangladesh and India, the Interim Committee for the Co-Ordination of Investigations of the Lower Mekong Basin, and agreements between Afghanistan and the USSR on the Amu river basin, between Afghanistan and Iran on the Helmand river basin, and between Malaysia and Thailand on the Golok river basin. No doubt, in the future, as the demand for water increases and pollution from agricultural and industrial sources grows, regional or international cooperation agreements (most of which are loose and lacking in coverage) will have to be strengthened to ensure equitable and effective use of water, pollution prevention and development of new water resources.

The position of the different countries in an international river basin may be convergent, for instance, when countries have *common interests* in increasing the dependable flow in the river by water storage, flow control schemes, etc. This seems to be the case with rivers such as the Nile and the Senegal. In other cases, strong competition may develop between the interests of upstream countries and those of downstream countries. The Rhine is an example of divergent interests on water quality - with Switzerland, France and the Federal Republic of Germany polluting the water on which the Netherlands has to base large parts of its drinking water supply. The Ganges is an example of competition for water quantity, with flow diversions in India creating dry season problems in Bangladesh.

At the UN Water Conference in Mar del Plata (Argentina) in 1977, considerable interest was shown on the issue of international river basins. Many downstream countries joined in a call for an international 'code of

*conduct'*, or convention; upstream countries, however, stressed sovereignty over their natural resources. Therefore, some basic questions still need to be answered to promote effective regional and international cooperation on the use of shared water bodies.

### 6.3 International Water Strategy for the Future

While there is much to be said in favour of comprehensive approaches, a realistic strategy should not be so ambitious as to put it beyond the realms of feasibility. As proposed, the key elements of a water strategy for the future should include (a) ways and means for providing all people with safe drinking water and sanitation facilities, (b) development of adequate water supply to meet the demand in agriculture and industry, (c) institutional and human resources development for efficient water management, (d) water conservation and pollution control, (e) international cooperation, and (f) financial resources mobilization for water management.

Provision of drinking water and sanitation facilities remain two of the most pressing problems in nearly all the developing countries despite some progress made during the 'International Drinking Water and Sanitation Decade'. In the future, greater efforts are needed in favour of the rural populations which was neglected or difficult to reach. To ease water demand pressure in the urban areas, it will, *inter alia*, be necessary to discourage the further growth of cities.

Development of adequate water resources for irrigation also remains a top priority objective in many developing countries. The proportion of agricultural production based on irrigation has exhibited a downward trend. The initial emphasis, however, should be on rehabilitation or improvement of existing schemes, to be followed by expansion into new areas, taking due consideration of efficient water use.

The need for effective international cooperation among riparian countries is greater now than ever before because of the growing water demand in all co-basin countries and because of increasing water pollution. Over a third of the 200 international river basins are not covered by any international agreement while only some 30 have cooperation arrangements. Clearly, efforts are needed to formulate and reach consensus on an international 'code of conduct', or convention, in the utilization of shared water basins so that the water needs of some countries are not undermined by irresponsible use of water resources by other countries. Im-

proved international cooperation is also necessary regarding transfer of knowledge and technology in the water resources field.

An essential element of the strategy for the future should be the acceleration of institutional and human resources development without which adequate water supplies cannot be achieved, nor can efficiency in the management of water resources be enhanced. A major change for many countries may be decentralization of responsibility for water supply and sanitation activities and substantial participation of communities and non-governmental organizations in project planning, operation and maintenance.

To achieve these goals, developing countries need to mobilize sufficient financial resources and allocate adequate personnel resources to the water sector. This shift of policy could be alleviated and should be accompanied by (i) introducing cost recovery schemes, where water is currently subsidized, (ii) encouraging active participation of local communities in the construction, operation and maintenance of facilities, and (iii) allowing the private sector to play a more important role in water resources development.

At the global level, a network of institutions has already been established to coordinate water policies. Initially, the UN Administrative Committee on Coordination (ACC) formed the Intersecretariat Group for Water Resources in 1978 to coordinate the work of all the United Nations agencies dealing with water resources. Following the declaration of the 'International Drinking Water Supply and Sanitation Decade' in 1980, the executive heads of UNDP and WHO created the Steering Committee for Co-operative Action for the decade. This group includes 11 agencies with programmes in water supply and sanitation and utilizes the UNDP Resident Representative in each developing country as a focal point for coordinating such programmes. Both groups have been quite active during the 1980s. Nonetheless, a greater degree of coordination of the activities of multilateral institutions and bilateral aid agencies would further enhance the impact of external assistance. Furthermore, the World Bank and the regional development banks will have to reconsider their investment priorities, particularly by switching from large-scale to small-scale water projects.



# Social Indicators for Development Planning

To many it will always seem better to have measurable progress towards the wrong goals than unmeasurable (and hence uncertain) progress towards the right ones.

*John K. Galbraith*

## 1. Social Indicators - What For?

Although there is no generally recognized definition of social indicators, there is agreement, in the planning literature and in practice that social indicators should record the results of socio-economic, social and political processes that fall outside the areas normally covered by economic indicators. Demarcation from economic reporting - a characteristic feature of the attempts to define social indicators - points at the same time to the origins of scientific and social interest in social indicators. The increasing awareness, at the end of the 1960's, of the unfavourable concomitants of rapid economic growth in the industrial countries had resulted in harsh criticism of the established method of measuring growth which, in fact, was equated with people's welfare. Development planners and economic decision-makers associated or identified a high growth-rate of the gross national product (GNP) explicitly or implicitly with a high growth-rate of social and individual welfare. It was exactly this identification of economic growth with increased welfare that caused criticism of the conventional measurement of economic growth and pushed the demand for social indicators.

Criticism was expressed at two levels. Sociologists pointed to the 'economistic reduction of the welfare-concept' in the current use of economic variables. In their view, the conditions for measuring welfare by means of economic variables no longer existed. The adverse effects which accompanied economic growth, particularly in respect to the social and physical environment were not recorded in economic accounting or were falsely declared as favourable effects. In the view of this line of criticism, it seemed necessary to construct a system of social reporting with which the

quality of life and its trends could be revealed, beyond the narrow economic sphere.

The second line of criticism focussed on the actual inadequacies of the GNP as the predominant measure of welfare. This debate took place largely within economics. Some of those taking part in the discussion were advocating an improvement of the GNP-concept, in the sense of making it more adaptable as a welfare indicator. In the course of this discussion, Sametz (1968), Nordhaus/Tobin (1972) and the study group of the Economic Council of Japan (1973) submitted calculations of a revised, welfare-oriented national-product-variable (the net national welfare index - NNW), in which 'negative' welfare items (such as environmental protection costs, environmental damage, losses due to urbanization) were deducted from the conventional GNP, and 'positive' welfare items (such as monetary equivalents of leisure and non-market activities) were added.

The potential of this approach for an improved development planning has never been seriously tested. One reason being the consensus that it is necessary when extending the monetary approach to non-market spheres of human activity. Yet, even economists and planners who tended to be sceptical about the possibility of new conventions for economic accounting, advocated social indicators with which to express the non-economic aspects of the quality of life more clearly and directly.

## **2. Reasons for Using Social Indicators in Development Planning**

The criticism of economic growth as the major goal for society that started at the end of the 1960s and beginning of the 1970s was not confined to the industrial countries. At the same time when the welfare effects of economic growth were being questioned in the industrial countries, a debate arose on the success or failure of growth policy in the developing countries, and on the suitability of GNP as an indicator of development.

In an atmosphere of euphoria over modernization, development planning in many countries had been based on theories borrowed from the West, and on the strategies of growth-maximization that derived from them. Development assistance believed in the 'trickle-down' postulate of the theory of economic growth. Maximization of GNP was thought to set in motion a chain of structural changes which, in turn, would ensure that the 'fruits of growth' were passed on to the mass of the population.



This 'trickle-down' postulate is rooted in neo-classical growth theory, and abstracted in the Harrod-Domar model, which formed the basis of most development plans in the 1950s and 1960s. The Harrod-Domar model, in its simplified form, is based upon the assumption that growth depends upon the accumulation of capital - and, in expanded form, upon the availability of foreign exchange and the domestic saving capacity. Development assistance as financial aid, and industrialization as a motive force for growth, are rooted in these assumptions.

On average the developing countries had achieved high rates of growth of GNP; yet the 'fruits of growth' had not reached the mass of the population - on the contrary: the gap between the 'haves' and the 'have-nots', between the urban elites and the rural poor, the educated and the illiterate, the employed and the unemployed had widened. Three decades of statistically measured economic growth had in very many cases not led to 'development', or how should we read the following facts of the late 1970s: About 1,000 million people in the world were undernourished in the sense of suffering from extensive deficiencies of calories and protein; 1,000 million people were inadequately housed; 1,000 million were illiterate; 1,300 million people earned less than the equivalent of 100 U.S. dollars a year and thus formed the hard core of poverty; 1,500 million people had no continuous access to medical care, 1,700 million no access to clean drinking water, and for about 1,700 million people life expectancy was less than 60 years (McHale and McHale 1979).

Thus, the expected results from policy programmed for a high rate of GNP had not materialized. Whereas in the industrial countries disillusionment set in connection with increasing environmental pollution accompanying economic growth, in the developing countries it was particularly the experience of the deteriorating patterns of distribution in the course of growth - or, in more concrete terms, the inadequate contribution of the 'fruits of growth' to reducing absolute poverty and satisfying basic human needs.

## 2.1 The Unsatisfactory Results of Growth-Oriented Development Planning

Development planning and economic policy stamped with Western growth-theory were directed mainly towards promotion of the so-called modern (formal) sector of the economy. A process of exponential growth was to be set in motion in the modern sector by means of a high rate of investment, it being assumed that the transmission of the growth-stimuli to

the traditional (informal) sector would bring about improvement of the living conditions to society at large.

However, in most developing countries the upswing in the economy resulted in an accentuation of the disparities in the conditions of life. On the one hand, only relatively few people profited from the expansion of the mostly capital-intensive market production and of market income. On the other hand, for parts of the population in the traditional sector the conditions of life deteriorated owing to adverse repercussions of the expansion in the modernized, monetary sector of the economy. The migratory movement of 'downgraded' parts of the rural population into the 'cancerously' expanding urban conurbations and the increasing use of agricultural land for export-oriented production accompanied by neglect of domestic supply, are examples of such adverse effects of a one-sided growth policy that disregards the environmental and social consequences.

When the economic and social inequalities of growth policy directed towards capital accumulation in the modern sector were becoming more pronounced, questions arose regarding both development planning and economic policy, and particularly the measurement of development by means of the traditional national accounts: the economic orientation of the development concept fell into the cross-fire of criticism.

Increasingly, the adoption of Western production and consumption models, the application of capital-intensive techniques, and the influence of Western institutions were interpreted as expropriation of autochthonous skills and cultural values. The debate began as to what should be understood by development and what should be the main objectives of development planning in the developing countries. In this debate, sociological and psychological theories and theories of comparative cultural anthropology gained in importance. A characteristic feature was a recall of own cultural traditions, which had been devalued, as barriers to development, in the course of modernization.

## 2.2 The Move towards Basic Needs-Oriented Development Planning

In the debate on development planning, this new sensitivity to the inadequacies of a transplanted growth policy and to the desirability of preserving cultural traditions led to a paradigm shift. As an alternative to the traditional growth-oriented development strategy and the trickle-down hypothesis, development planning since the beginning of the 1970s has been directed increasingly towards the concepts of 'basic needs' and 'redistribu-

tion with growth'. These new concepts focussed on problems which the traditional, growth-oriented policy was unable to deal with, namely the inadequate satisfaction of basic needs for large parts of the population.

A basic-needs policy, of course, is not incompatible with growth policy *per se*. Rather, they address different priorities. Traditional economic growth policy has social consequences which are reflected in the (low) level of satisfaction of basic needs. Basic needs-oriented policy has economic consequences (and preconditions) which can be measured by the absolute level and the distribution of real economic growth. Basic needs-orientation therefore means above all that the priorities of economic activity are set differently, that attention is devoted primarily to the distribution of the produced goods and services. It is, in this sense, an attempt to synthesize the growth-objective with the objectives of fair distribution and of active involvement of people in the development process.

A prerequisite for the realization of this new development paradigm is institutional change, e.g. the redistribution of arable land. Political and/or economic power-structures often stand in the way of a more even distribution of goods and services and a pattern of production directed towards basic needs. It would therefore be naive to deal with a concept of basic needs to the exclusion of the dominant power structures in a given developing country. It is this disregard of the very real political and institutional factors that is so characteristic of the traditional growth-oriented approaches of development planning.

The basic needs-strategy adopted by the World Employment Conference of 1976 and confirmed by the UN General Assembly, included the notion that satisfaction of the basic needs of the population must be the primary objective of development planning and of any actual development plan (Article 1). According to the definition adopted at that conference, basic needs embrace: the regular minimum requirement of food, housing and clothing for the individual and his family, and also vital public services, especially drinking water, sanitary installations, public transport and health, and educational facilities (Article 2).

Development planning concerned with the fulfillment of these basic requirements cannot rely on traditional economic accounting only. Neither the situation with regards to the specific basic needs categories nor the success or failure of development projects and programmes towards covering basic needs are adequately registered or indicated by the GNP figure. Additional, different data are called for, an information system which directly measures the social consequences of economic growth in general and of development planning in particular. This means that a system of social indicators is required with which the actual situation, the desired situation, the deficiency of supply in each particular case and the

Table 1: *Social Indicators for Life Expectancy, Health and Education - Selected Countries*

	Ethiopia	Bangladesh	Malaysia	Mexico	Zambia	Sri Lanka	Tunisia	Germany, Fed. Rep.
1. Life expectancy at birth (years) (1985)	43	50	66	67	50	68	61	72
2. Infant mortality rate (at age 0-1) (1985) <sup>1</sup>	168	123	28	50	84	36	67	10
3. Population per physician (1981)	88,120	9,700	3,920	1,200	7,800	7,460	3,900	420
4. Percentage of the population with access to safe water (1975)	6	53	62	62	42	20	70	99
5. Daily calorie supply per capita (1985)	1,681	1,899	2,684	3,177	2,137	2,385	2,836	3,474
6. Adult literacy rate (per cent) (1975) <sup>2</sup>	10	26	60	76	39	78	55	99
7. Number enrolled in primary school as percentage of age group (1984) <sup>3</sup>	32	62	97	116	188	103	116	99
8. Number enrolled in secondary school as percentage of age group (1984) <sup>4</sup>	12	19	53	55	17	61	32	74

1. The infant mortality rate is the number of infants who die before reaching 1 year of age, per thousand live births in a given year.

2. The adult literacy rate is the percentage of the total population represented by persons aged 15 and more who can read and write.

3. An age-range from 6 to 11 years generally considered as primary-school age.

4. An age-range from 12 to 17 is generally assumed.

Source: World Bank: World Development Report 1980, 1987, Washington, D.C. 1980, 1987, p. 150, p. 280.

success or failure of activities in the various areas of basic needs can be determined and evaluated.

In *Table 1*, some social indicators related to basic needs are presented for a number of selected countries. In accordance with the basic needs-concept, the indicators should also provide information on the distribution within the respective areas of needs. Basic-needs policy therefore has an egalitarian feature in that it refers to the question of the fulfillment of a certain minimum welfare position (welfare standard) for all in the different areas. From an egalitarian standpoint, there is improvement in the welfare position only if representative social indicators indicate an increase in the portion of the population that has reached these minimum standards. In the following, the distribution aspect and other aspects of an appropriate system of social indicators for developing countries are discussed by presenting several examples or models.

### **3. A Social Indicator System for Developing Countries - The Drewnowski Model**

The Drewnowski system-model was developed at the United Nations Research Institute for Social Development (UNRISD), which contributed significantly to the methodology of development measurement. The model aims at a quantification of those social and economic goals of development planning oriented directly at the improvement of the living conditions of the people.

The indicator-system is only one, though important, part of a comprehensive concept of socially-oriented development planning. The variables of the indicator-system work within the scope of the new development paradigm as arguments of an extended objective-function of development planning. The effects of economic growth on the various components of welfare are thus revealed and become assessable by means of statistical measures.

Drewnowski develops, for the purpose of political evaluation of the new measurement tools an '*interdependence table*', modelled on the Leontief-type of input-output table. The intention is to present the interrelationships between the economic production and consumption variables, measured by economic indicators (such as gross and net national product, consumption, investment), and the other components of the quality of life, measured by social indicators. For the evaluation of the success of converting economic output into welfare-relevant results, the con-

cept of 'welfare effect' is evolved, while for the evaluation of the feedback effects of the welfare position (welfare standard) on the conditions of production, the concept of 'productivity effect' is evolved. The possibility of constructing a 'welfare generation function' (effects of production upon welfare) and a 'social production function' (effects of the welfare position upon production) is mentioned.

Using the interdependence table as a basis, Drewnowski presents a model of social development planning. It differs greatly from purely economic planning models. On the one hand, social variables representing welfare objectives directly are integral constituents of the objective function. On the other hand, explicit account is taken of the interdependence between economic and social variables.

The aspects of the quality of life that are to be incorporated in the indicator-system should be quantitatively observable and relevant to the whole society, and should be interpretable as signs of improvement or deterioration of the conditions of life. They are flow variables as well as stock variables. The flow variables are combined in an *index of the level of living* (= the flow of welfare), and the stock variables are combined in an *index of the state of welfare*.

In the following, I will concentrate on the proposals for the quantification of the 'level of living'. The level of living is thought to be determined by the degree of satisfaction of needs resulting from the consumption of goods and services produced within the given period, and by other non-produced conditions of life. The 'state of welfare' reflects, at a given point in time, the specific characteristics of the population having experienced the flow of welfare for a substantial period of time.

The quantification of the *level of living index* conforms to an activity-concept. Starting-points are the production processes by means of which the respective needs are to be satisfied. Admittedly, only those processes are incorporated in which the political system can influence the conditions of life. The indicators reflect primarily the individuals' disposal over resources which they use and consume, and not necessarily the direct satisfaction of individual needs.

The selected *nine* components in the Drewnowski indicator-system (see *Synopsis I*) can be assigned to three groups.

In the first group, those categories of basic needs are contained which should not be absent from any conceptualization and measurement of the level of living: (1) nutrition, (2) clothing, (3) shelter, (4) health, (5) education.

The second group contains two components: (6) leisure and (7) security. Here, the underlying idea is the need for protection and safety which is expected to be guaranteed by society: protection against intensity and duration of work that are harmful to health, and against social hazards to which people are potentially exposed.

The third group relates to the environments in which the members of society live. It consists of two components: (8) social environment (incl. recreation) and (9) physical environment. Under the assumption that satisfactory relations with other members of society are a basic human need, in component (8) the question is asked as to how far the population is satisfied with its life in society and with its social communication. The subject of component (9) is how far the population is satisfied with the natural environment in which it lives. These nine components of the Drewnowski indicator-system are made operational by means of 27 individual indicators.

For the overall assessment of the trend of the *level of living*, aggregation of the 27 indicators into one combined index is thought to be necessary. For this, the individual results in the various components of the indicator-system are weighted on the basis of a framework of so-called 'critical points', referring to characteristic threshold values of the satisfaction of needs. So far, well-founded, objective threshold values - in the sense of minimum requirements for a decent quality of life - are fixed for few areas only, the area of nutrition is probably the best example here. In the other areas, they must be supplemented by socially justified norms based on the views on 'minimum standards', 'adequate standards' and 'affluent standards' of needs satisfaction which prevail in society (or at least are predominant). In view of the fact that the relative weight of a component varies for the individual and the whole society with increasing satisfaction of the respective needs, Drewnowski is in favour of a sliding weighting-scale. (Other details of the model can be found in *Synopsis 1*).

## Synopsis 1: Level of Living Index: Computation Table

Critical points of indicators		"0"	"100" "M"	"A"				
Designation of sub-ranges of cardinal indicators expressing respective levels of need satisfaction		Intolerable	Inadequate	Adequate	Affluent			
Corresponding grades of ordinal indicators		IV	III	II	I			
Intermediate indicator index values for cardinal indicators		0	0 $0 < I < 100$	100	100 $100 < I < Y_A$	$I_A$		
Intermediate conventional index values for ordinal indicators		0	0	50	100	150	200	200
Components	Indicators	Units of Measurement	Determination of cardinal indicators sub-ranges and ordinal indicator grades					
1. Nutrition (food intake)	a) Calories intake	Calories intake per day per head as percentage of norm	Below 60% of norm	60% and more but less than 100% of norm	100% and more but less than 133% of norm	133% and more of norm		
	b) Protein intake	Protein intake per day per head as percentage of norm	Below 60% of norm	60% and more but less than 100% of norm	100% and more but less than 200% of norm	200% and more of norm		
	c) Percent of non-starchy calories	Percent of non-starchy calories in food intake	Less than 10%	10% and more but less than 40%	40% and more but less than 60%	60% and more		



*Synopsis 1 (Continuation)*

2. Clothing (use of clothes)	a) cloth consumption	Cloth used for clothing sold to consumers and twined into ready-to-wear garments per year per head	None	Less than 15 m <sup>2</sup>	15 m <sup>2</sup> and more but less than 50 m <sup>2</sup>	50 m <sup>2</sup> and more
	b) Footwear consumption	Footwear pairs sold to consumers per year per head	None	Less than 3 pairs	3 pairs and more but less than 6 pairs	6 pairs and more
	c) Quality of clothing	Ord. ind.	Most primitive	Poor	Satisfactory	Sumptuous
3. Shelter (occupancy of dwellings)	a) Services of dwellings	Ord. ind.	No permanent dwelling	Rustic or unfit for habitation	Conventional fit for habitation	Conventional with all amenities
	b) Density of occupancy	Rooms per inhabitant	Less than 1/4	1/4 and more but less than one	1 and more but less than 1/2	1 1/2 and more
	c) Independent use of dwellings	Housing units per household	Housing unit unidentifiable or less than 1/2 housing unit per household	Less than one but more than 1/2 housing unit per household	One housing unit per household	More than one housing unit per household
4. Health (health services received)	a) Access to medical care	Ord. ind.	No access whatsoever	Access limited	Access adequate	All needs for medical care fully satisfied
	b) Prevention of infection and parasitic disease	Percentage of deaths not due to infection or parasitic disease	Below 66%	66% and more but less than 96%	96% and more but less than 99%	99% and more
	c) Proportional mortality ratio	Percentage of deaths which occur at age the of 50 years and over to the total number of deaths	0%	Less than 80%	80% and more but less than 90%	90% and over

## Synopsis I (Continuation)

5. Education (education received)	a) School enrolment ratio	Enrolment as percentage of norm	No enrolment	Less than 100%	100% or more but less than 150%	150% and more
	b) School output ratio	Not dropped out as percentage of enrolled	All dropped for	Less than 90%	90% and more but less than 100%	100%
	c) Teacher/pupil ratio	Teacher/pupil ratio as percentage of norm	Tuition not received	Teacher/pupil ratio below 100% of norm	Teacher/pupil ratio at or above 100% of norm but below 200% of norm	Teacher/pupil ratio at or above 200% of norm
6. Leisure (protection from over-work)	a) Leisure time	Hours free from work per year	Less than 3,640 hours free from work per year (badly over-worked)	3,640 hrs. and more but less than 6,336 hours free from work per year	6,336 hrs. or more but less than 6,816 hrs. free from work per year (not over-worked)	6,816 hours or more free from work per year (comfortable)
	7. Security (security assured)	a) Security of the person	Law and order broken down (war, civil war, regime of terror)	Law and order badly maintained (riots, gangsterism, hoodliganism)	Law and order adequately maintained	Law and order well maintained
	b) Security of the way of life	Ord. ind.	Economic chaos	No employment or sickness insurance, no pension schemes, not sufficient savings	Unemployment and sickness insurance, pension schemes and/or savings sufficient to maintain a minimum level of living	Complete coverage by insurance or pension schemes and/or savings sufficient to maintain the present way of life

## Synopsis 1 (Continuation)

8. Social environment (social contacts and recreation)	a) Labour relations	Ord. ind.	Riots, repeated strikes and lockouts	Tension in labour relations	Labour relations satisfactory	Labour relations good
	b) Conditions for social and economic activity	Ord. ind.	Political oppression rampant	Occasional strikes	Satisfactory conditions for social and political activity	Good conditions for social and political activity
	c) Information and Communication	Ord. ind.	Social prejudice	Difficult conditions for social and political activity	Information and communication satisfactory	Information and communication ample
	d) Recreation: cultural activities (music, theatre, cinema, visual arts, book reading)	Ord. ind.	Isolation within a village community	Information and communication restricted	Cultural activities adequately developed	Cultural activities well-developed
	e) Recreation: travel	Ord. ind.	Lack of cultural activities	Rudiments of cultural activities limited	Participation popular	Participation enthusiastic and active
	f) Recreation: sport and physical exercise	Ord. ind.	Immobility	Travel occasional with a limited perimeter	Frequent travel by various means mostly within the home country	Frequent travel of distinct educational and cultural value within the home country and abroad
9. Physical environment	a) Cleaness and quietness	Ord. ind.	No participation whatsoever	Occasional participation	Systematic practice of one type of exercise	Systematic many-sided practice of physical exercise
	b) Public amenities in the neighbourhood	Ord. ind.	Conditions unbearable	Conditions unsatisfactory	Conditions satisfactory	Conditions good
	c) Beauty of the environment	Ord. ind.	No amenities	Amenities inadequate	Amenities adequate	Amenities good
			Depressing ugliness	Mediocre	Acceptable	Inspiring

#### 4. A Physical Quality-of-Life Index for Developing Countries - The Morris Model

Morris et al. made an approach to improved development planning with the physical quality of life index (PQLI). This approach is less ambitious than Drewnowski's, but nevertheless very interesting. While stating that the GNP is still the most commonly used measure of 'development', they criticize its structural weaknesses. They conclude, that in so far as development planners in developing countries and donor agencies are focussing on the distribution effects of projects and on the fulfillment of basic needs, they will need not only new strategies but also additional measurement systems.

According to Morris et al. a measure of development which, in particular, allows international comparisons must satisfy several criteria: It should allow more than just one development-path to be taken; it should avoid ethnocentrism (i.e., standards which reflect the values of particular societies or social groups only); it should measure results, not inputs; it should be easy to construct and understand. (Here, the authors seemingly were influenced by Johan Galtung's fulminant statement: 'An indicator which anyone with five years of schooling cannot understand within five minutes is not an indicator, but an instrument of control.')

Morris et al. consider these criteria to be fulfilled for three social criteria only: 'life expectancy', 'infant mortality', 'reading and writing ability', which make them useful indicators for measuring physical well-being and for measuring success (or failure) in relation to identifiable goals. The international data basis for these indicators is quite satisfactory; they are not ethnocentric, objectively measurable and internationally comparable.

The average '*life expectancy*' at the age of one and '*infant mortality*' can be considered good indicators of important aspects of development. They express, so to say, the sum of the effects of nutrition, health, income and environment. The reading and writing ability of the poor groups of population ('*literacy rate*') indicates in a way the extent to which they participate or can participate in the economic and social development process.

The PQLI-model, however, follows the fascination GNP has as a unique measure, by the formation of a composite index (overall index). For each of the three individual indicators mentioned, the respective degrees of fulfillment of the countries (regions, tribes, social groups) that are to be compared are first plotted on a scale from 0 to 100, in which '0' is the lowest and '100' the highest degree of fulfillment. An overall index is then obtained on this basis, consisting of the simple arithmetic mean of the three (equally weighted) indicators. This procedure makes it possible to easily carry out international (national, regional) comparative surveys

(cross-sectional comparison). (The methodological problems involved in the production of a time-series comparison of the three individual indicators and of the overall index are more complex and would require more space than is available here. They will therefore not be described here. The reader should refer to the relevant literature.)

In *Table 2*, a cross-sectional comparison of this kind is presented for a number of selected countries, and they are related to and contrasted with the traditional GNP-indicator.

The PQLI, based on three social indicators, which in turn provide important information on social processes, is the sum of complex relationships for which no theoretical explanation provides clear-cut weightings. Its components are therefore given the same weight in each particular case. Due to the fixing of a lower limit (lowest performance) and an upper limit (highest performance), the PQLI measures the relative position of a country within a certain range, in contrast to the GNP-index, which is open-ended at the top.

Generally speaking, the PQLI-index provides an important instrument for development planning, particularly because achieving a high index-value conforms to a consensus of opinion on the underlying indicators, not only nationally but also internationally. The PQLI-approach in all probability allows to close existing 'gaps' (regarding life expectancy, infant mortality, literacy rate), i.e. it allows objectives to be defined which are in fact achievable. It does not convey the picture of a 'hopeless race' - even though for a developing country it may take a few generations to reach the index-value of a given developed country.

The PQLI-index is interesting also with regard to the question as to whether it correlates with the GNP. Respective studies have shown that the GNP per capita does not explain the PQLI-index well - an indirect pointer to the potential significance of this planning method for development policy. Morris et al. paraphrase this conclusion in a short sentence: 'Money is not everything.' A further diversification of the model might also be suggested. It could, for instance, be applied to investigate other spheres of development, such as income-groups, ethnic groups, town/country-differences, etc.

*Table 2: Economic and Social Indicators for Selected Countries  
(Beginning of the 1970s)*

	GNP per capita 1974 (in \$)	PQLI (index)	Life ex- pectancy at birth (years)	Infant mortality (per 1,000 births)	Literacy rate (in %)
Afghanistan	110	19	40	182	8
Pakistan	130	37	50	124	16
Sri Lanka	130	83	68	45	81
India	140	41	50	139	34
Tanzania	160	28	44	162	15-20
Kenya	200	40	50	119	20-25
Central African Rep.	210	18	41	190	5-10
Bolivia	280	45	47	108	40
Nigeria	290	25	41	180	25
Ghana	430	31	44	156	25
Korea, Rep. of	480	80	61	47	88
Cuba	640	86	70	29	78
Algeria	710	42	53	126	26
Taiwan	810	88	69	26	85
Mexico	1,090	75	63	61	74
Iran	1,250	38	51	139	23
Gabon	1,960	21	41	178	12
Ireland	2,320	96	72	17	98
Libya	4,640	42	53	130	27
Netherlands	5,250	99	74	11	98
United States	6,670	96	71	17	99
Qatar	8,560	32	47	138	10-15
United Arab. Emirates	11,710	34	47	138	20

Source: Sewell et al. 1977.

## 5. A Growth-with-Distribution Index for Developing Countries - The Chenery Model

As has already been shown, it is possible to use in development planning an index which reflects several goals at one and the same time. A development index which combines the growth objective and the distribution objective (or an economic indicator and a social indicator) is contained in a joint study by the Institute of Development Studies, Sussex, and the Development Research Center of the World Bank (Chenery et al.). The authors suggest as a starting-point the following simple welfare function of a society:

$$G = W_1G_1 + W_2G_2 + W_3G_3 + W_4G_4 + W_5G_5$$

in which  $G$  is the index of the increase in total welfare,  $W_1$  (etc.) the weight of group 1 (etc.) and  $G_1$  (etc.) the rate of increase in income of a particular group over a particular period of time (year). Then the GNP is the case of an index in which the weight for the increase in income of each group, e.g. one-fifth of the population, is assumed to be simply the portion of the total income (GNP) in each particular case that this one-fifth represents. If we consider the actual pattern of distribution of the gross national product in the developing countries, the problems of the GNP-index for development planning again becomes obvious:

One fifth	1.	2.	3.	4.	5.	Total
Share of national income	53	22	13	7	5	100

According to these figures, the share of the national income in the developing countries that is allocated to and represented by the upper two-fifths of the population (income groups) is 75 per cent. Thus, in this respect, the growth rate of GNP is essentially a measure only of the increase in income of the upper 40 per cent of the population (income groups), while the remaining 60 per cent, the majority of populations, is conceptually of low importance. The problems of the historically most important development indicator, the GNP, thus again become evident, yet in another way.

An alternative '*measure of welfare*' would be to distribute the weights W in the above function proportionally, for example conforming to the principle of democracy, 'one man - one vote', i.e. equal weight for each fifth of the population. The ratio between the upper fifth and the lower fifth on the income scale in the developing countries is about 53:5 (or 11:1); in the case of such an '*Equal-Weights-Index*' (EWI) an increase in income in the lower fifth would thus be given eleven times higher weight than an increase in income in the upper fifth of the population. Conceptually, this would be an easy task for development planning, practically it would be a 'revolutionary' step forward.

If we replace the relatively abstract 'one-fifths' of national income with actual social groups - e.g. small farmers, the urban poor - then the great developmental potential of this methodological approach of combining growth objectives with distribution objectives becomes even more obvious.

If, in view of the disastrous distribution of income in most developing countries, the planners (the government, the donor agency, the international institution) were of the opinion that the task of planning primarily should be one of increasing the income of the above mentioned social groups (or that of the lower 40 per cent of income-recipients) then the projects and programmes of policy would have to be formulated accordingly: This means that low weight (no weight) would have to be given to the further income-increase of the upper social groups (regions, countries), and high weight (all weight) to that of the lower social groups (regions, countries). The practical effect of such a '*Poverty-Weights-Index*' (PWI) could thus be tremendous.

Weighted indices of this type offer a wide range of options for systematic analysis and development planning that conform more closely to the actual conditions and needs of the development countries than does the inadequate theoretical framework which has hitherto formed the basis of planning and of international development assistance. (The reader might also just ponder the possible significance of such an approach for policy in the industrial countries.)



## **6. Theoretical Models and Reality of Development Policy - A Look to the Future**

The above deliberations have shown that for an ex post analysis of development and for the ex ante planning of future development of a country (a region, the world), it is necessary to redefine the concept of development. Until the 1980s it was, and today occasionally it still is, widespread practice to equate 'development' with 'economic growth', expressed as increase in the gross national product or in income per capita. The growing awareness of the many serious problems persisting in the developing countries despite the growth of GNP has resulted in questioning the validity of this key 'development'-indicator, and in increased scepticism as to the favourable effects of a policy based on that indicator.

A social indicator-movement arose which attained some momentum, being fed intellectually from individuals, university and research institutions. In association with this, the typology of developing countries was refined and development strategies were theoretically diversified; the debate concerning target group-oriented development assistance began, and the debate on the 'New International Economic Order' started.

Nevertheless, it was and still is premature to talk about a U-turn in practical development planning in the sense of our topic. Despite all the fundamental criticism, the traditional economic indicators - particularly the GNP-index - continue to dominate in most national and regional development plans, and also in international development assistance which still is based primarily on economic indicators in regard to recipients, projects and programmes. The social indicator-movement has formulated new questions and has revealed many weaknesses of traditional planning; but in the actual development planning of most developing countries and international institutions, social indicators have at best assumed a supplementary, not a dominant function.

To inquire into the causes of this situation means pointing not only to deficiencies of research, but also to problems of method associated with the definition and use of social indicators. The examples given have demonstrated some of these problems. Nevertheless, the possible practical significance of these (or similar) approaches to reforming development planning seems by no means to be played out.

For reasons of substance as well as of method, for reasons of cooperation between scientific disciplines and integration of technical planning, the debate on social indicators in development planning must go on. The decision as to what development is or should be has not been made once and for all. This decision is still under discussion, repeatedly.



# Industrial Restructuring for Sustainable Development: Three Points of Departure

In many countries, the traditions of living in harmony with nature provided no immunity to the evils of industrialisation - and no special wisdom in dealing with those evils. Recent experience is a more powerful teacher than remote experiences . . .

*Margaret McKean*

## Introduction

At a Forum on Industry and the Environment in New Delhi Stephan Paulus gave an interesting definition of *ecological modernization* which could be used as a guideline for the ensuing restructuring of industry: 'Ecological modernization focuses on prevention, on 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 necessary to coordinate various policy areas, such as industrial, fiscal, energy, transport and environmental policies.'

This, actually, is a rather demanding definition of a concept, proposed to achieve better harmony between economy and ecology. In the following 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 ecological dimensions into economic policy. These three points can be regarded as necessary though not sufficient points of departure towards sustainable development in the future.

## 1. Ecological Structural Change of the Economy

In both the East and the West, economists, planners and engineers are seeking for solutions to the problem of how to change the given patterns of resource use which are, no doubt, unsustainable in the long-term. 'Perestroika' and 'modernization' are two topical catchwords in this process, and new environmental priorities play a part in the envisaged restructuring 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 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 and environmental impacts, one needs suitable information concerning the material side of production, for environmental protection and resource conservation by the economy - and thus its long-term sustainability - cannot appropriately be described in such terms as income, investments and 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 data relating to 'representative' pollutants - like sulphur dioxide (SO<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), and nitrogen oxide (NO<sub>x</sub>) - has grown recently (e.g. the Annual Reports on the Environment by several industrial nations, by UNEP and the OECD). These indicators concern certain negative environmental effects of production. Less is known on the environmental relevance of the input factors in industrial production, or on the question of which 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. Excluding the developing countries in this study thus is for methodological reasons only and does not mean that the results are not relevant for them.

### 1.1 De-Linking Economic Growth from Environmentally Relevant Input Factors

Using a set of four indicators (input factors), Jänicke et al. have studied 31 countries of both COMECON and OECD with regard to the relationship between economic structure and environmental impacts. 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 of the economy 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 active *de-linking* policy (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;
- promote those *integrated technologies* which touch upon several environmental effects (pollutants) at one and the same time.

Structural change as a shift of input factors to more efficient uses can thus 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.

## 1.2 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; as regards steel, the de-linking process had already begun in the 1960s. In this way, the structural change of the economy generated *environmental gratis effects* of various kinds:

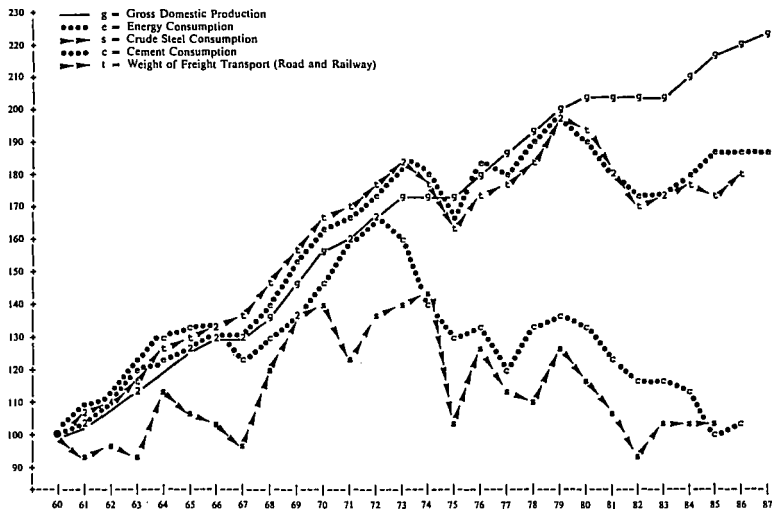
- The stagnating *consumption of primary energy* led to a reduction of harmful emissions (pollutants).
- The relative decline in the *weight of freight transport* indicates that the volume of materials employed was reduced rather than increased.
- The fall in the use of *cement* represents a direct *gratis effect* as far as the emissions from cement factories are concerned; this decrease coincided with the trend towards labour-intensive renovation of the housing stock, as compared to new construction.

- The decrease in *steel consumption* accounts for a considerable reduction in harmful emissions as far as processing is 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 GDP. Comparing the rates of usage of the four selected input factors with the growth rate of the GDP, three different development patterns emerge:

- 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 GDP; 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 GDP; i.e. structural deterioration, corresponding to absolute negative environmental effects of economic growth.

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



Source: Jänicke et al.

Year

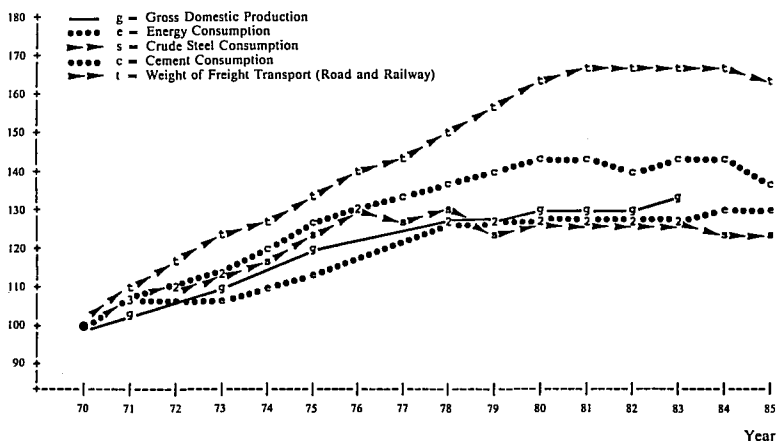
In *Table 1* (p. 102), 16 out of the 31 countries studied are grouped according to these three development patterns.

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

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

In *Czechoslovakia*, no significant de-linking of economic growth from the four input factors took place (see *Figure 2*). The development profile of this country, with sluggish structural change, is to some extent representative of the other economies of Eastern Europe.

*Figure 2: Structural Economic Change in the CSSR, 1970 - 1985*  
(1960 = 100)



Source: Jänicke et al.

*Table 1: Environmental Impacts Deriving from Structural Change - Percentage Changes 1970/1985*

Country	Consumption of Primary Energy	Crude Steel	Cement Pro- duction	Weight of Freight Transport	GDP*
<i>Group 1: Absolute Structural Improvement</i>					
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	32.4
<i>Group 2: Relative Structural Improvement</i>					
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	27.4	7.5	90.2
Norway	51.1	-21.6	-40.3	34.7	87.5
<i>Group 3: Structural Deterioration</i>					
Bulgaria	74.9	24.9	42.3	77.5	37.3
Czechoslovakia	31.5	22.5	37.3	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	33.4	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: Jänicke et al.



### 1.3 Trends Towards Industrial Restructuring

Despite certain analytical limitations of such empirical research (as, for example, the selection of only four input factors), several conclusions can be drawn from this international comparison as regards to the trends of industrial restructuring:

- 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.
- Several countries enjoyed environmental gratis effects as a result of active structural change. In some cases, especially for Sweden, these effects were quite considerable.
- In other countries, the possibly 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 (GDP) 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 in 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 of industrial society.

## 2. 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. 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 pollution, noise, and waste, with emphasis on the rehabilitation aspect.

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
1975	2,480	3,090	170	210	900	1,110	200	240	1,210	1,530
1976	2,390	2,830	200	230	820	960	220	260	1,150	1,380
1977	2,250	2,560	200	230	740	850	210	230	1,100	1,250
1978	2,150	2,370	170	180	680	750	200	220	1,100	1,220
1979	2,080	2,190	260	160	760	800	200	210	960	1,020
1980	2,650	2,650	210	210	910	910	240	240	1,290	1,290
1981	2,940	2,810	250	240	950	910	210	200	1,530	1,460
1982	3,560	3,250	390	360	1,130	1,030	230	210	1,810	1,650
1983	3,690	3,270	290	260	1,100	990	230	200	2,070	1,820
1984	3,500	3,100	270	240	1,040	920	230	190	1,960	1,750
1985	5,620	4,940	330	280	1,060	910	260	220	3,970	3,530
in Millions of DM										
Average Annual Change in %										
1975/84	+3.9	-0.0	+5.3	+1.5	+1.6	-2.1	+1.6	-2.6	+5.5	+1.5
1975/79	-4.3	-8.2	-1.5	-6.6	-4.1	-7.9	0.0	-3.3	-5.6	-9.6
1979/84	+11.0	+7.2	+11.0	+8.4	+6.5	+2.8	+2.8	-2.0	+15.3	+11.4

Source: IIES research project.

For a variety of reasons, this conventional environmental policy was and still is meaningful and very 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.

## 2.1 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, the sum of the respective public and private investments has reached large proportions. Industrial society thus appears to be paying through the nose - back-payments for the negative environmental costs of production accumulated in the past.

In the Federal Republic of Germany, for instance, this sum has reached the handsome total of over 280 billion Deutschmarks (or about 150 billion US dollars). In a detailed study, Leipert et al. from the International Institute of 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 - presumably - 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. They are, in fact, repairs to the process of economic growth, signs of a 'post-fact' policy that reacts at a rather late stage to damages (and must react to them) but does not, or cannot, prevent them. Therefore, it is necessary to confront the 'success stories' of environmental protection expenditures with figures on the environmental damages themselves.

Table 3: Total Costs of Environmental Protection Investments, Federal Republic of Germany, in Millions of DM, 1975 - 1985

Year	Industry		Government		Industry and Government		
	Current Expenditures	Depreciations	Current Expenditures	Depreciations	Current Expenditures	Depreciations	Total Costs
At Current Prices							
1975	3,200	1,520	3,000	1,920	6,200	3,440	9,640
1980	5,160	2,250	4,690	3,390	9,850	5,640	15,490
1985	7,930	3,160	6,430	4,340	14,360	7,500	21,860
At 1980 Prices							
1975	4,050	1,870	3,790	2,570	7,840	4,440	12,280
1980	5,160	2,250	4,690	3,390	9,850	5,640	15,490
1985	6,230	2,640	5,340	4,030	11,570	6,670	18,240

Source: IIES research project.

Again taking the Federal Republic of Germany as an example, a recent estimation by Lutz Wicke from the Federal Environmental Protection Agency showed that the annual damage to the natural environment is above 103 billion DM, or in the order of 6 per cent of the GNP, and not 3 per cent, as the OECD had estimated for the industrial countries some years ago.

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 illustrates that despite high annual environmental protection expenditures still 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
<i>Air Pollution</i>	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, etc.	between 5.5 and 8.8
<i>Water Pollution</i>	far more than 17.6
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, etc.	more than 3.0
<i>Soil Contamination</i>	far more than 5.2
Costs of Chernobyl disaster	far more than 2.4
Rehabilitation of 'yesterday's waste'	more than 1.7
Costs of preserving biotopes and species	more than 1.0
Other soil contamination, etc.	far more than 0.1
<i>Noise</i>	more than 32.7
Degradation of residential amenities	more than 29.3
Productivity losses	more than 3.0
'Noise rents', etc.	more than 0.4
Grand total of damage	more than 103.5

Source: Wicke.

There are more shortcomings of conventional environmental policy. To name a few: Environmental policy usually identifies the given problem too late, so that the ecosystems affected cannot survive. As it is pursued as a *media-specific* policy, i.e. separately regulating air and water quality, noise or waste, it also runs the risk of lacking coordination between its specific goals, measures and institutions. And 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. *Preventive environmental policy* - it seems - can counter the shortcomings of conventional environmental policy. But in order to switch to preventive policy, several conceptual as well as practical constraints have to be overcome.

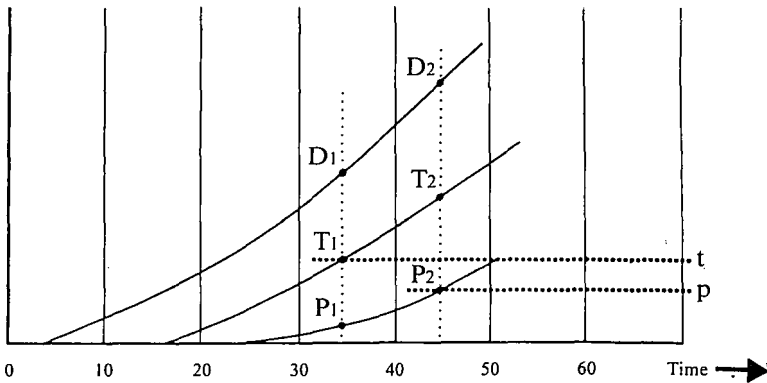
One constraint has to do with the particular history of an environmental impact. In cases of yesterday's wastes, when damage has already occurred, a curative strategy is probably the only conceivable option. In cases where no damage has occurred as yet but where damage is expected for the future, the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

## 2.2 Basic Conditions for Preventive Environmental Policy

According to Scimemi and Winsemius one can conceive three factors as concomitant policy relevant processes in time: The accumulation of environmental damage; the acquisition of technical knowledge; and the rise of 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*. The relative position and the shape of these functions depend, of course, on the specific circumstances (country, environmental sector, historical phase) under consideration; the common case is illustrated in *Figure 3*.

*Figure 3: Factors of the Environmental Policy Cycle: Damage, Technical Knowledge, Public Awareness*



Source: Scimemi.

Line  $D_1 - D_2$  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 time 10). At that point, neither the scientific community nor the general public is yet aware that anything of importance is happening. Line  $T_1 - T_2$  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 may still be unaware of the hazard. Somewhere between time 20 and 30, *public awareness* starts to rise, as indicated by the line  $P_1 - P_2$ .

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.

Recalling past developments in environmental policy at the national or the international level, it is easy to recognize that the processes evolved very much in conformity with Scimemi's theoretical interpretation. Thus, the diagram may be considered to be a true representation of real events. (There are cases, however, where public awareness - line  $P_1 - P_2$  - started much earlier than technical knowledge - line  $T_1 - T_2$ .)

What are now the opportunities to influence these basic conditions of policy action in favour of preventive environmental policy? *Figure 3* helps to formulate three general and two specific options:

*General options:*

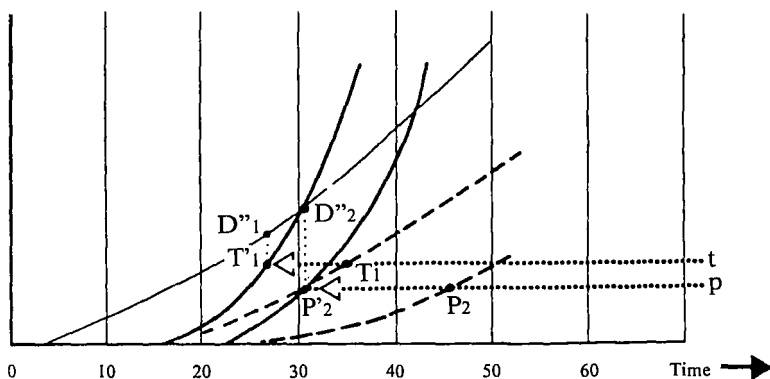
- *Retarding damage accumulation* (i.e., sliding the  $D_1 - D_2$  curve towards the right)
- *Accelerating technical knowledge* (i.e., sliding the  $T_1 - T_2$  curve towards the left and/or raising its slope)
- *Increasing public awareness* (i.e., sliding the  $P_1 - P_2$  curve towards the left and/or raising its slope).

*Specific options:*

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

All these various options make policy decisions possible at a stage when the level of environmental damage is still relatively low. One of these options is illustrated in *Figure 4*.

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



Source: Scimemi.



### 2.3 Environmental Impact Assessment as Part of Preventive Policy

Acceleration of knowledge and awareness can, of course, 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.

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 used for specific investment projects, it allows for the 'accelerating effort' to be targeted, and also permits generally 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, such as 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. The question of how *much knowledge/awareness is enough* normally falls upon the political decision-maker (the government, the environmental protection agency, the institution in charge of the problem), even if the scientific community (or part of it) is ready to say 'we know enough' and the public (or part of it) is demanding 'something must be done'. Therefore, stalemates in decision-making on environmental issues are quite frequent.

What is 'enough knowledge/awareness' for one country (government, institution) may not be enough for the other. The normal outcome of such a situation is a meagre 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<sub>2</sub> and NO<sub>x</sub> 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, the ozone layer may continue to be affected, 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 be dynamized to speed up industrial restructuring as quickly as possible.

As Scimemi rightly observed, this need to come to terms with the future is not unique to environmental policy. 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 *ecological modernization* is economic policy.

### 3. Ecology and Economic Policy

'Ecology in essence means the necessary and feasible harmony between man and nature, society and environment.' (C.F. von Weizsäcker). Economy, however, in general means disharmony with nature, or even war. 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 labour and capital, nature is the truly quiescent and exploited third production factor. How then can nature's position in the 'economy game' be strengthened?

#### 3.1 Conflicts between Economy and Ecology

The use of raw materials and the generation of emissions and wastes are, of course, old, not new issues. Scientific and technological development, however, has made it increasingly possible to exploit 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 for flora and fauna but for human beings as well.

Efforts to hide harmful emissions and toxic wastes - in land-fill sites, in transfer stations or permanent depositions, to spread them - through high smokestacks and incinerators, or to dump them - into the water bodies and abroad, have at best been temporarily successful because many emissions and wastes are 'mobile poisons' or reappear in different form. These

activities lead to what Johan Galtung 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 (actually or possibly) 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 specific challenge to the social sciences. The answer not only depends upon the respective individual and societal constellation of interests. It depends particularly upon the ability of and the willingness for social innovations, i.e., on (a) whether the potential of ecological self-regulation of the economy is used, and (b) how the option of ecological re-orientation of economic policy is implemented.

### 3.2 Ecological Self-Regulation of the Economy?

To 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 towards depleting resources and polluting nature. 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 cost components are relevant. Let us take, as an example, acid rain and the ensuing damage to the forests:

- 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 regionally.
- Third, this example shows the shifting of costs onto third parties (i.e., partial expropriation of the forests 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.

The economic system thus evidently makes incorrect calculations with respect to the 'ecosystem forest'. Both business accounting and national accounting do not provide adequate signals which may prevent pollution levels that are not tolerable for the ecological system. Conventional accounting shows favourable balance for the production of energy, for the automobile producers, and for the exporters of pollutants (just to remain 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, compensation does not take place nor is liability provided for.

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

To re-organize the economy towards a materially *integrated cycle* would, first of all, mean reducing systematically the use of depletable resources and the generation of polluting emissions and wastes - and this is in contradiction to the prevailing 'throughput economy'. In practice, recycling and clean technology are still at an incipient stage and not systematic economic undertakings. Especially, the step from simply disposing of wastes towards avoiding wastes ('low waste economy') has not been made.

Certainly, this is in part because many waste products cannot be recycled or only at high cost. But it is also true because adequate price and cost signals have not been set. Preventing waste generation and conserving depletable resources are still not sufficiently being promoted. This state of affairs, however, has also to do with the above mentioned structural deficits of the economic accounting procedures which do not adequately

measure the diminishing stocks. Therefore, two contradictory trends can be observed: *increasing monetary income - decreasing natural stock*.

Proposals for *ecological accounting* at the factory level and in the *national accounts*, however, are promising. With ecological accounting the amount of energy, materials, wastes, land use, etc. are being 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 will provide a public information instrument for promoting qualitative economic processes.

In industrial society another ecological principle is no longer adhered to, that of *sustainability of resource use*. Traditionally, forest owners for instance have followed the rule 'Do not cut down more wood than you re-grow'. This rule is being undermined: externally produced acid rain collides with internal resource conservation; and accumulated external debt lead to over-exploitation of national resources. Sustaining the yield of the forest capital stock is being replaced by indirect expropriation, or resource depletion.

Another basic principle to be re-established in the economy is that of *responsibility, or liability*. With respect to environmental problems, the legal system, and also economic behaviour, 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), the polluter is held liable for compensation. Instead, in some countries (for some cases) statistical probability is sufficient for obligating industry to compensate for damages (collective liability). Once this principle was established by the courts and through legislation, it quickly helped to improve environmental quality through ecological self-regulation of business activities.

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

### 3.3 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 . . . (seventeen years ago Kenneth Boulding called this the 'throughput economy'.) Instead, the 'ecological economy' 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.

Regarding *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. 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 re-adjusted. Economic growth is still being measured in terms of goods and income categories only (GNP - Gross National Product), while their effects 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 originally caused by the production process ('compensatory' or 'defensive expenditures').

Qualified goal indicators for economic policy can be defined in various ways: Computations of defensive expenditures, i.e., assessment of an environmentally related net product (ENP - Eco National Product); combined growth and distribution indices (RWG - Redistribution With Growth); an integrated system of economic and environmental indicators, or an attached 'Satellite System', etc.

Regarding *instruments*, conventional economic policy relies mainly on two instruments, i.e., 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. In a situation of structural unemployment and environmental pollution the introduction of *resource taxes* (as e.g., an energy tax) and *emission charges* (as e.g., charges on SO<sub>2</sub>, NO<sub>x</sub>, and CO<sub>2</sub> emissions), and a definite decrease of wage taxes are called for. Such a structural tax reform would change the existing incen-

tives in the economy towards promoting 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 is just a case in point. The actual and the pending environmental crisis requires structural institutional reforms by which economic institutions would have to incorporate the ecological perspective, environmental institutions would have to improve their competence, and environmental impact assessments (EIA) would be integrated into all major economic decision-making.

#### 4. Conclusions

According to the above deliberations, industrial restructuring for sustainable development, or '*ecological modernization*', is obviously a demanding concept, both methodologically and practically. Its implementation requires a far-reaching conversion of the economy, a re-orientation of environmental policy and a re-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 - or points of departure - 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 practical implementation of such a concept.





# **Environment and Bilateral Development Aid: The German Example**

The less money we have, the more we will talk politics.

*Jean Ping*

## **1. Introduction**

In a recent report on the general philosophy of the development aid agencies of six major donor countries it was stated that there is general consensus among those agencies as to the meaning of 'environment' in the context of their activities. This was supposed to be a major change from the more confused position of only a few years ago. The most important feature of this consensus was said to be that environment was no longer seen only as an additional topic to be added to the conventional development considerations, but rather as a new approach to development - an approach that recognizes the ecological costs of projects and focuses on the sustainability of development. However, the report said, this new development perspective had so far made only little impact on the actual design and implementation of the projects of the aid giving agencies studied. The report concluded with the following proposals:

- (1) There is a need to define more thoroughly environmental and natural resource objectives and concerns in the context of aid programmes as a whole.
- (2) Urgent attention should be given to helping developing countries build up their capacity to study and manage their own environmental problems. This effort should be closely related to donor efforts aimed at fostering greater environmental concern in the recipient countries.
- (3) There is a need to encourage and fund more conservation and rehabilitation projects in accordance with the rapidly increasing need of the recipient countries.

- (4) Policy documents which are produced in each agency to govern project design and implementation frequently lack adequate attention to environmental implications.
- (5) In only three of the agencies studied was there a clearly defined focal point for environmental responsibility. A framework for systematically checking on environmental implications is essential.
- (6) Procedures to ensure that projects are systematically screened for environmental impacts and subjected to environmental examination are also needed.
- (7) Improved cooperation of donor agencies regarding environmental protection in developing countries would be recommendable.

In taking these general findings and proposals as a point of departure, in this chapter the question is asked whether or not, and how far, environmental considerations are integrated in the development aid provided by the Federal Republic of Germany. To find an answer to this question, it seems necessary, first, to give a short overview of the history, the policy declarations, the principal features and the performance of West German development aid (in the following referred to as 'German' aid).

## 2. German Development Aid Policy - An Overview

With the change of government in Bonn in October 1982 from a social-liberal to a conservative administration, all fields of politics were subject to re-adjustments in their basic policy orientation. This was also true for the policies pursued regarding the assistance given to developing countries and the North-South issues. However, because of the long-term nature of many aid commitments and a fairly well established general consensus on basic aid issues among the major political parties of the country, there is a considerable element of continuity in German aid policy.

The aims of the development aid policy of the previous social-liberal government were most clearly and comprehensively expressed in the 'Outline of Development Policy' (1980), referring specifically to the recommendations of the Brandt Commission regarding '*interdependence*' and '*common interests*' between North and South. Besides the general emphasis laid on the promotion of rural development, one of the three major fields of programme activities of German aid was labelled 'Protection of Natural Resources'.

Regarding the *volume of aid*, the German federal governments, in principle, have always accepted the internationally set targets that were

adopted by the United Nations. They have, however, never committed themselves to any firm date by which these targets would be achieved. The absolute volume of German official development assistance (ODA) has been in third place among all the donor countries for a number of years, but relative to the target of 0.7 per cent of the Gross National Product (GNP) it has always been far below that standard. Total financial transfers to the developing countries, however, have consistently been higher than 1.0 per cent of the GNP, because private capital transfers were rather substantial.

Regarding the *principal features* of German aid, the relationship between bilateral and multilateral aid is of some importance to our subject. Both bilateral and multilateral aid have their distinct advantages and disadvantages from the point of view of the donors and the recipients. Both types of aid are thought to be complementary to each other, but firm quantitative rules have never been set for their relative weight. While in the early 1970s there was widespread agreement that an increasing share of the total aid volume should be channelled through multilateral institutions, this tendency has weakened in the 1980s, and bilateralism is gaining ground.

Regarding the *geographical distribution* of German aid, one can say that in a general sense it was extremely widespread. During the 1980s there was at least some kind of aid given to some 120 developing countries. In a specific sense, however, there was a high concentration of German aid on only a few countries, particularly India, Indonesia, Egypt and Pakistan. However, there are no explicit rules for the distribution of aid between regions and countries. The decision about the regional distribution of aid funds is made between the Federal Ministry for Economic Cooperation (BMZ) and the Development Aid Committee of the Parliament. Only in cases of a more political nature do policy considerations of the Ministry of Foreign Affairs enter the allocation process by way of discussion in the cabinet.

Regarding the *sectoral allocation* of German aid, intensive attempts have been made to specify rules for the composition of aid with respect to the type of programmes, projects and target groups. At various historical stages, the German government officially specified 'priority sectors'. But in reality, the sectoral spectrum of German aid activities is still fairly wide, depending to a larger extent on the available expertise and planning capacity in Germany than on the priority requirements of the recipient countries. Therefore, it is fairly difficult to specify to what extent development aid is geared to the recipient countries' interests, or how far its structure is determined by the perceptions and policy declarations of the donor country.

A specific feature of German aid is the 'request principle'. This means that in a formal sense all aid projects are based on the principle that the recipient country has to submit a request - although there are also indirect ways of initiating project ideas that are favoured by the donor side which can be eventually presented as official requests. Quite generally in development terms, and more specifically with regard to environmental considerations, there is a dilemma concerning this principle of acting only upon formal requests by the recipient government. How to ascertain that requests from the government of a developing country coincide with the 'priority sectors' specified in the donor's policy declaration? And, specifically, how to guarantee that these are requests for environmental conservation projects in the developing country? I would like to leave these questions open for the moment and come back to them at a later stage.

In concluding my remarks on the principal features of German development aid, a few more comments must be made:

There is, first, the question of the *conditions of aid*. In recent years attempts have been made to take better account of the differences between the developing countries and to tailor the aid instruments accordingly. This is particularly exemplified with respect to LLDCs on the one hand (soft terms), and the NICs on the other hand (hard terms). Since 1978, all German aid to the LLDCs has been given as grants, and in many cases debts resulting from former loans have been written off. In contrast, aid to the NICs has been gradually reduced or has been given only on hard terms. In practice, so far there is no special incentive being provided for environmental conservation projects by easing the respective conditions of aid; the instrument '*debt-for-nature swaps*', however, is increasingly being discussed.

Second, there is the question of *tying aid* to programmes or projects. A large portion of German aid is tied to individual projects, at least this is so with bilateral aid. Outright budget or balance-of-payments subventions are given but not normally provided out of the aid budget. This feature of (more or less) strict project orientation of German bilateral aid may provide a good chance for including environmental considerations in development aid activities, or even making environment projects predominant.

The German federal government is upholding the principle of not 'tying aid' to the procurement of German goods, except urgent famine relief. Formally, this promise was easy to keep since a high proportion of supply contracts quickly recycle back to German firms anyway. As a consequence of low economic growth and high unemployment in recent years, however, this principle faded away to some extent, and tying aid became more frequent. Here, again, the question arises as to what this could mean for including environmental considerations into development projects.

Third, the effectiveness of aid in general and the integration of environmental considerations into the aid projects is determined by the way *aid administration* is organized. The structure of the German aid administration is more complex than that of most other donor countries. The overall coordinator and policy-maker is the *Bundesministerium für Wirtschaftliche Zusammenarbeit* - BMZ. The project work itself, however, is carried out on behalf of the BMZ by various agencies, being administratively independent. The most important agencies are the *Kreditanstalt für Wiederaufbau* (KfW), a financial aid agency (government-owned development bank) which gives loans along the lines of the World Bank and does its field work largely through consultants, and the *Gesellschaft für Technische Zusammenarbeit* (GTZ), an agency which gives technical assistance and has a substantial number of people working in developing countries. This pattern of completely separate financial and technical aid agencies was established in the days of relatively simple single-focus financial and technical cooperation projects. In addition to these major agencies, there is a large spectrum of other public, semi-public, and private institutions that in one way or another are involved in implementing aid activities. No doubt, from the point of view of a recipient country it is quite difficult to grasp the division of labour between these various institutions of German development aid.

As for the institutional conditions which govern the BMZ's performance, administrative overhead in relation to project commitment compares favourably with that of the other aid agencies. However, this feature of low staffing in relation to delivered aid may not be advantageous from an environmental policy point of view. Fortunately, German aid draws, for additional staff for its bilateral aid, upon a wide variety of scientific and technological institutions and consultants.

The programmes of the BMZ and the two major agencies seem to be more closely watched by the Parliament than any of the other Western aid programmes, particularly with regard to environmental considerations. In fact, the KfW is guided by a non-mandatory cabinet resolution on 'Principles for Assessing the Environmental Impact of Federal Actions' and by a 'Catalogue of Environmental Project Assessment Criteria of the KfW'. These guidelines commit this agency to a rather thorough consideration of the environmental effects of its development projects.

Finally, one more principal feature of German aid should be mentioned. Over the years, policy instruments and incentives have been developed to supplement multilateral and bilateral official development assistance (ODA) by stimulating *private financial flows and private technology transfer* to the developing countries. It is disputable whether or not these flows should be regarded as an integral part of bilateral aid. For the estab-

lishment of an effective environmental policy in the developing countries this flow of resources and know-how can, of course, both be an asset or a liability. Certain conditions must be fulfilled to make sure that these flows are environmentally sound and be considered as a positive contribution to effective environmental protection in the developing countries.

In the next section, I would like to concentrate on the question of how effectively environmental considerations have been integrated into the German aid activity and what deficiencies still remain.

### **3. Integrating Environmental Considerations into Development Aid**

The impact of development aid upon the natural environment has recently become the focus of public attention. This is the outcome of a debate in which worldwide concern emerged over the depletion, misuse and overuse of resources. Environmental awareness has begun to influence theoretical thinking on and practical programmes of aid giving by national and international agencies such as the IMF and the World Bank. Actually, there is already a consensus on the need to integrate the concept of 'environment' into the thinking and the planning of development. For most (but certainly not all) of the officials of the aid agencies, it seems to be clear that a broad, 'holistic' interpretation of the concept is needed. This recognition is most certainly a step forward. Also, there seems to be growing willingness to recognize the interrelationship of all facets of development and of rejecting the notion that the 'environment' is just one more 'add-on' to the economic development process.

The wide recognition of the need to integrate environmental considerations into development planning is scarcely surprising. The rise, in the late 1960s, of the environmental issue had led to the 'United Nations Conference on the Human Environment' at Stockholm as early as 1972. The fact that this was truly a world conference (and not just a so-called 'World Summit', assembling the rich of the world) further encouraged many countries to begin to examine the interrelationships between development and environment more deeply. Countries began to focus on the question of long-term sustainability of their development efforts; the Brandt Commission ploughed the ground to a better understanding of the 'common interests' of North and South, and the Brundtland Commission made 'sustainable development' a major global issue.

These and other concerns came to be reflected on in the broad commitments to *environmentally sound development* and to *resource conserva-*

*tion projects* that can be found in the policy declarations of all the aid agencies. Theoretical commitments, however, may not be matched with effective action. There may be a discrepancy between programme formulation and programme implementation. What then has happened to German aid regarding the environmental issue, what is the record, what are the deficits?

A comprehensive evaluation of development aid would need input as well as output data. It would mean comparing the environmental situation in a developing country with and without an aid policy incorporating the environmental issue. We are far from being able to make such a comprehensive cost-benefit-analysis of development aid. Also, for German aid, such a comprehensive evaluation would not be possible. Therefore, in the following I shall concentrate on an input-oriented analysis only. The declarations on how to integrate environmental considerations into aid policy, the recent tendencies in project management, the judgement of projects by experts from aid agencies and the financial dimensions of environmental protection measures will be discussed.

### 3.1 Adjusting the Outline of Development Policy

After the Stockholm Conference of 1972, a discussion started in the Federal Republic of Germany on how to deal with the environmental problems in German development aid. First, an inter-ministerial working group studied the relationship between development and environment. In its report the working group suggested starting an environment research programme on developing countries, to promote environmentally sound projects, and to secure 'environmental conformity' of aid. Later on, the Minister for Economic Cooperation called for making environmental protection a central issue of development aid, since development and environment are the 'two sides of a coin'. Already in 1972, the KfW introduced a checklist on environmental aspects for the aid projects planned by that agency. In 1975, for the first time, environmental protection was given priority as a goal of official German development aid, alongside the promotion of agriculture, industry, education and research.

The worldwide discussion on the 'basic needs strategy' which fully started after 1976, and also the United Nations Conference on Desertification (1977) put environmental questions higher up in the German debate on development aid. Along with that conference, strategy papers were prepared suggesting measures for an environmentally sound and sustainable development of rural areas. A culmination point of the aid strat-

egy discussion in West Germany was reached in 1980, when the social-liberal government proceeding on the basis of the report of the North-South Commission (Brandt Report) thoroughly reformulated the framework of its development policy: In the 'Outline of Development Policy' the 'protection of natural resources' was given top priority - together with 'rural development' and 'improvement of energy supply'. One could conclude that this official set of priorities is still valid and that environmental considerations still rank high in German development aid policy.

### 3.2 Environment and Resource Protection Projects

Outlines of development policy indicate the aims, tasks or focal points for aid activities, not more, not less. A true indicator for the importance that is given to environmental considerations may be seen in the very structure and kind of the aid programmes and in the projects themselves.

In *Table 1* some data are presented on environmental oriented German aid projects. These data have been collected by a WZB research group and rely on the respective project descriptions. Projects were considered only insofar as the goal of the project was to make a contribution to the improvement of the environmental situation and/or the protection of the resource basis concerned. The data therefore show the direction of aid activities, not necessarily their effectiveness.

The table shows that a certain priority in German aid has been given to projects for 'Improvement in sanitation', and especially for supplying safe drinking water. Since the demand for safe drinking water in the developing countries is high, this part of German aid projects increased rapidly, both in number and financially. Whether these projects were successful, however, remains an open question.

The category 'Management of natural resources' comprises projects in forestry, fishery, plant protection and land use planning. The number of forestry projects increased early in the 1970s but decreased at the end of the 1970s, despite the growing awareness of the worldwide depletion of forest resources. The same must be said about fishery and plant protection projects, while the share for land use projects was increasing.

Regarding 'Ecology-oriented farming', not much has been undertaken, this being a reflection of the low priority ecology-oriented farming is given by official agricultural policy in Germany and in the European Community.



*Table 1: Expenditures for Environment and Resource Protection in German Bilateral Development Aid (1969-1978)*

(1) Management of natural resources	260 mio. DM	55 projects
(2) Ecology-oriented farming	20 mio. DM	4 projects
(3) Rural energy supply	40 mio. DM	28 projects
(4) Improvement in sanitation		
(a) Drinking water supply	625 mio. DM	88 projects
(b) Sewage and waste disposal	89 mio. DM	13 projects
(5) Urban industrial environmental protection	26 mio. DM	7 projects

Source: V. Hartje, *op. cit.*

A major contribution to an environmentally sound development in rural areas is to be expected by renewable energy projects. The stock of wood and forests can be preserved if biogas and solar energy projects can successfully be operated. Most of the projects reported in Table 1 belong to this category of alternative energy.

### 3.3 Mitigating Environmental Impacts of Aid

Environmental impact assessment (EIA) as a general planning method can also be seen as an instrument for assessing developing aid projects. EIA has been discussed in Germany since the early 1970s, but, in fact, attained importance only recently with the enactment of the respective European Directive. The acceptance of EIA was different in the German aid administration, where KfW and GTZ have been working for a long time according to specific environmental guidelines, and are requested to use 'checklists' and 'project manuals' for projects with potentially significant environmental impacts. The lists and manuals include typical environmental effects of irrigation farming, dams, sugar production, pulp and paper industry, chemical industry, etc. This procedure can clearly be regarded as an extension of technical feasibility studies and conventional economic appraisals. The respective project assessment in the agencies mentioned is undertaken by teams including country experts, technical, financial and also environmental experts, and thus may truly be called 'environmental impact assessment'.

Interviews with such evaluation teams and investigations of their reports have shown that in general there is a high sensitivity for the environmental problems connected with aid projects. And it is due to this interest that in project management improvements have been made towards mitigating negative environmental effects. However, the environmental effects monitored in the checking procedure and the proposals to tackle them show that, in general, a fairly technocratic understanding of environmental protection is prevailing. The technicians are well aware of the technical measures with which environmental effects are handled in Germany, and this knowledge is easily, and sometimes too quickly, transferred into project design and project implementation for the recipient developing country. The more environmental problems can be solved only through social innovation (e.g., erosion problems), the weaker the proposals are.

In *Table 2*, subjective judgements of KfW experts on capital aid projects are presented. The selection of the experts interviewed was made on basis of the list of projects undertaken by KfW between 1974 and 1978. The total number of projects was 383, from which some 206 were classified as projects with significant environmental effects. Out of these some 49 were taken on basis of a random sample and an ex post judgement was asked for from the experts interviewed.

*Table 2: 'Environmental Soundness' of Capital Aid Projects - Subjective Judgements*

Sector	Number of projects	Number of projects with environmental problems	Number of projects with incomplete information on environmental problems	Number of projects without environmental problems
Industry and mining	18	6	3	9
Agriculture	13	2	2	9
Power plants	4	-	1	3
Transportation infrastructure	8	1	-	7
Water supply and sewage disposal	7	-	1	6
Total	50 (100%)	9 (18.4%)	7 (14.3%)	34 (69.4%)

Source: V. Hartje, op. cit.

Regarding the counter-measures taken by KfW in the planning stage of the aid projects, it is interesting to learn that in industrial projects the main emphasis was laid on solving the problems of disposal with 'end-of-pipe technologies', while structural modifications of the production process ('low emission technologies') or in the location of the project were seldom undertaken. The choice of the disposal technique, again, was mostly tailored according to the standards prevailing in Germany. Regarding operation of the projects, countermeasures such as the training of additional employees were taken only in cases where serious problems had arisen.

At this point, I cannot investigate the assessment procedures used by the other German development aid agencies such as the churches and private foundations. However, it is possible to state that, in general, environmental impact assessment is very much dependent upon personal awareness and experience. Judging from the results of the research work quoted, negative environmental effects are understood and taken seriously the more the given aid project is of an investive type. This means that the potential environmental effects of other projects, such as institution building, etc. are recognized only as secondary or as being of low importance. These results again illustrate that there is a time lag between theoretical perception and practical development planning.

### 3.4 Environmental Project Planning

In concluding, one could say that environmental considerations rank high in German development aid. The general political outline and principles look especially favourable. Practical implementation of projects, however, still leaves much to be desired.

Implementing environmental considerations is fairly advanced regarding industrial and infrastructural projects, although solutions proposed and measures taken are often those typical for the donor country itself. Solutions adequately adjusted to the given economic and social conditions of the recipient country, instead, are still rare. Projects for safe water supply seem fairly well designed, while ecological farming is still in a pilot phase. It is very likely that not enough knowledge and expertise on environmentally oriented rural development is available in such highly technical agencies such as KfW and GTZ and the respective agencies in other donor countries.

A final remark: In several donor countries, including the Federal Republic of Germany, development aid agencies have agreed that enlarging the capacities of the developing countries to cope with their own environmental problems should be given higher priority. Clearly, environmental 'institution-building' is of utmost importance. At a time when environmental awareness is increasing all around the world, and when environmental problems seem to be growing everywhere, it is not only the development aid projects that should be environmentally sound, but the established economic structures and the development process in total have to be adjusted.

## Sustainable Development: A Selected Bibliography

There is something fundamentally wrong in treating the Earth as if it were a business in liquidation.

*Herman E. Daly*

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## Appendix I

### International Development Strategy for the 1990s\*

#### A. Development Challenges of the 1990s

1. In the 1980s, some countries, especially in Asia, grew rapidly; others in the developed and socialist world grew more slowly, while many developing countries, especially in Africa and Latin America, suffered severe losses in real per capita income. While it is not easy to generalize from this experience, it does appear that successful countries gave priority to human development, including the creation of a well-trained and educated labour force, maintained a high rate of investment, often through trade policies oriented towards greater openness, and financed that investment largely through domestic savings.

2. While performance records diverged in the 1980s, policy attitudes appeared to converge. There is a new political openness in the world community characterized by a reduction of ideological conflict and the prospect of reduced expenditure in armaments in both the industrialized countries and the third world. In many countries, a better understanding of the difficult economic realities has contributed to a new pragmatism in economic policy thinking and formulation.

3. These changes in circumstances and policy choices create a potentially unprecedented opportunity for accelerating growth to benefit the low-growth countries and reduce the disparities in performance. The Committee for Development Planning believes that this opportunity calls for an international development strategy for the 1990s which emphasizes accelerated economic growth through increased levels and efficiency of domestic investment with a special emphasis on human resource development and which encourages a more supportive international economic environment, both to preserve trading opportunities for small countries and to provide adequate debt relief for countries implementing policy reforms.

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\* Approved on 12th of May, 1989 by the Committee for Development Planning of the United Nations, of which the author of this book is a member.



## **B. A Supportive International Economic Environment**

4. World trade patterns underwent significant structural changes in the 1980s due both to technological factors and economic policies. Services trade increased; intra-industry trade reflecting the growing role of transnational corporations increased; developing countries exploited comparative advantages in many categories of manufacturing industries and diversified exports; and the importance of primary commodity trade declined, affecting African countries in particular. Policy shifts led to new regional trading developments in Europe and North America and the opening of China and the socialist world to world markets. These developments reflect both greater openness accelerating competition and increased protectionism in world markets that could marginalize some less developed countries.
5. There is even more reason therefore that the third world should be an active participant in further steps towards trade liberalization, particularly in the context of the Uruguay Round. Reduced restrictions on agricultural products, textiles and some service activities are of potentially great benefit to many third world countries. The industrialized countries have an inescapable responsibility to reduce these barriers and to manage the debt and macro-economic imbalances in the world economy to enhance growth and trade opportunities for developing countries.
6. Industrialized and developing countries share responsibility for both the origins of the debt crisis and its progressive resolution. To date, however, most of the costs of adjustment have been borne by the debtor countries and particularly by the lower-income groups in the debtor countries. Human resource development has been especially hard hit. Recent debt initiatives recognize that debt reduction needs to figure more prominently on the menu of options for negotiation between commercial banks and debtor countries. Debt reduction should aim, in particular, to release public sector resources for enhanced levels of public investment and policies to increase the efficiency of investment, including private sector entrepreneurship and capital formation. Particular priority should be given to human resource development.

### **C. Elements of a Development Strategy**

7. The key elements of an international development strategy for the 1990s are:

- (a) Accelerated economic growth;
- (b) greater concern for human development;
- (c) an absolute reduction in the number of people suffering from severe poverty and deprivation;
- (d) restraining the deterioration in the physical environment.

8. The need for faster growth is undeniable, not as an end in itself but as a means to increase the well-being of people throughout the world. A central policy objective must be to raise the rate of accumulation and efficiency of capital. In addition to a restructuring of output, this may require reforms of investment procedures within central government ministries, including improved criteria for investments in public sector enterprises, price reforms, making public sector enterprises more competitive by increasing their exposure to market forces, as well as the desirability of transferring such enterprises to the private sector. Reforming public finances through improved tax and expenditure policies and raising the efficiency of domestic capital markets are also necessary.

9. Developing countries must be free to choose their own policies to suit their own circumstances. In the 1970s and 1980s, however, many developing countries benefitted from export-oriented policies featuring in some cases import liberalization and, more importantly, export promotion. A predictable trade-oriented exchange rate regime is the most important single element in successful trade policy, but other key steps, in rough order of difficulty, include:

- (a) Removal of redundant trade barriers;
- (b) removal of administrative controls by relevant market-based policies;
- (c) achievement of greater uniformity in incentive structures;
- (d) uniform reductions in the levels of import duties and export subsidies.

10. People in the 1990s should be placed firmly in the centre of the development process. Investments in expanding the capabilities of people have the potential to yield a return to society at least as high as the return on physical investment. This requires policies to ensure that human resource capabilities are fully employed. Three areas of human resource development may be considered strategic:

- (a) Education and training;
- (b) health and nutrition;
- (c) housing.

The recommended approach during the next 10 years is to emphasize these areas of human development which are akin to capital formation and to give lower priority to the purely social welfare aspects of expenditure programmes.

11. Women represent more than half the world's population, yet in many countries lag behind men in school enrollment, nutrition and health, and life expectancy in age groups below 50 years. The young represent all the world's population for the future, yet 45 per cent of children under five years of age in developing countries (excluding China) are living in absolute poverty. These two groups deserve special attention in human resource development. Equality of opportunity for women is particularly necessary in all aspects of development.

12. Neither human resource development nor growth for its own sake is enough. The objective is to eliminate severe poverty and deprivation. Taking both rural and urban poverty into account, the number of people in the third world living in extreme poverty is estimated to have increased from 819 million in 1980 to 881 million in 1985. Most of this increase occurred in Africa.

13. To tackle poverty directly will require a fundamental change in attitude of policy makers, from regarding poverty alleviation as an act of charity to seeing it as an investment in the poor with a high rate of return. Such an attack is likely to include a combination of welfare services and entitlement programmes to place a safety net under the poor, policies giving priority to the production of goods consumed by low-income groups and to the construction of essential infrastructure to benefit the poor, public works to provide employment, and redistribution of income and assets in favour of the poor, notably land reform and credit programmes.

14. Although environmental deterioration is in general a consequence of affluence in industrialized countries and poverty in developing countries, there is broad agreement that attempts by people to improve their economic well-being have resulted occasionally in huge disasters and more frequently in gradual destruction of the resources on which material betterment depends. Some issues, such as the possible warming of the planet and the depletion of the ozone layer, threaten all countries. While environmental deterioration has not, in general, reached such a point that it will bring growth to a halt or even reduce growth markedly, if it continues, the danger is that it may be impossible to sustain the income of the poor.

15. Water resources offer an instructive illustration. Some 80 countries, with 40 per cent of the world population - many among the poorest countries in the world - already suffer from serious water shortages. Water quality is also degraded by expansion of irrigation, increased use of fertilizers, insecticides and pesticides, discharge of industrial wastes and untreated sewage, waste and toxic chemical dumps and atmospheric pollutants. Each year an estimated 12.4 million deaths occur from unsafe water and dirt-related diseases. Poor environmental sanitation is a critical link in the chain of diarrhoeal diseases that affect young children in developing countries and claim the majority of deaths in the under five years age group.

16. Three elements are essential in water resources policy;

- (a) Measures to increase usable supplies of water;
- (b) policies to manage water demand, preferably through pricing mechanisms;
- (c) measures to enhance the quality of existing water supplies and to prevent water pollution.

#### **D. Targets and Tasks for the Future**

17. The four elements of the strategy outlined in paragraph 7 above are not separate issues but strands of a coherent approach to development policy in the next decade. Faster growth is the foundation on which other policies to improve the well-being of mankind rest, but enlarging the capabilities of people and reducing the absolute number of people living in poverty, especially through human resource development, and breaking the cycle of poverty and environmental deterioration, is the ultimate objective.

18. Working together, the four elements of the strategy can aspire to high goals for the year 2000: Universal primary education, reduction of the infant mortality rate to no more than 50 per 1,000, or by 50 per cent in those countries where this rate has already been achieved, elimination of severe malnutrition in all countries, reduction of the absolute number of people living in poverty, reversal of the present trend, and establishment of priorities to restrain land degradation, deforestation and desertification, overcome water shortage and pollution, reduce deterioration of coastal areas, control atmospheric pollution and regulate hazardous wastes and toxic chemicals.

19. To meet these goals, international effort will be needed to reverse the net transfer of resources from poor to rich countries, to mobilize the support and co-ordination of the multiple United Nations organizations, and to establish more effective international accountability for national policies.

20. The next decade offers a rare opportunity to exploit a new political openness and economic pragmatism in the world community to accelerate growth with a focus on human resource development and environmental sustainability. All countries would gain, but the poor people of the third world would benefit the most.

## Appendix II

### Principles for Environmental Protection and Sustainable Development\*

Major changes (are) needed, both in attitudes and in the way our societies are organized.

*Gro Harlem Brundtland*

#### I. General Principles, Rights, and Responsibilities

##### *Fundamental Human Right*

1. All human beings have the fundamental right to an environment adequate for their health and well-being.

##### *Inter-Generational Equity*

2. States shall conserve and use the environment and natural resources for the benefit of present and future generations.

##### *Conservation and Sustainable Use*

3. States shall maintain ecosystems and ecological processes essential for the functioning of the biosphere, shall preserve biological diversity, and shall observe the principle of optimum sustainable yield in the use of living natural resources and ecosystems.

##### *Environmental Standards and Monitoring*

4. States shall establish adequate environmental protection standards and monitor changes in and publish relevant data on environmental quality and resource use.

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\* Adopted by the WCED Experts Group on Environmental Law. Published in: World Commission on Environment and Development: *Our Common Future*, Oxford, New York: Oxford University Press, 1987, pp. 348-351.

### *Prior Environmental Assessments*

5. States shall make or require prior environmental assessments of proposed activities which may significantly affect the environment or use of a natural resource.

### *Prior Notification, Access, and Due Process*

6. States shall inform in a timely manner all persons likely to be significantly affected by a planned activity and to grant them equal access and due process in administrative and judicial proceedings.

### *Sustainable Development and Assistance*

7. States shall ensure that conservation is treated as an integral part of the planning and implementation of development activities and provide assistance to other States, especially to developing countries, in support of environmental protection and sustainable development.

### *General Obligation to Co-operate*

8. States shall co-operate in good faith with other States in implementing the preceding rights and obligations.

## **II. Principles, Rights, and Obligations Concerning Transboundary Natural Resources and Environmental Interferences**

### *Reasonable and Equitable Use*

9. States shall use transboundary natural resources in a reasonable and equitable manner.

### *Prevention and Abatement*

10. States shall prevent or abate any transboundary environmental interference which could cause or causes significant harm (but subject to certain exceptions provided for in Art. 11 and Art. 12 below).

### *Strict Liability*

11. States shall take all reasonable precautionary measures to limit the risk when carrying out or permitting certain dangerous but beneficial activities and shall ensure that compensation is provided should substantial transboundary harm occur even when the activities were not known to be harmful at the time they were undertaken.

### *Prior Agreements When Prevention Costs Greatly Exceed Harm*

12. States shall enter into negotiations with the affected state on the equitable conditions under which the activity could be carried out when planning to carry out or permit activities causing transboundary harm which is substantial but far less than the cost of prevention. (If no agreement can be reached, see Art. 22.)

### *Non-Discrimination*

13. States shall apply as a minimum at least the same standards for environmental conduct and impacts regarding transboundary natural resources and environmental interferences as are applied domestically (i.e., do not do to others what you would not do to your own citizens).

### *General Obligation to Co-operate on Transboundary Environmental Problems*

14. States shall co-operate in good faith with other States to achieve optimal use of transboundary natural resources and effective prevention or abatement of transboundary environmental interferences.

### *Exchange of Information*

15. States of origin shall provide timely and relevant information to the other concerned States regarding transboundary natural resources or environmental interferences.

### *Prior Assessment and Notification*

16. States shall provide prior and timely notification and relevant information to the other concerned States and shall make or require an environmental assessment of planned activities which may have significant transboundary effects.

### *Prior Consultations*

17. States of origin shall consult at an early stage and in good faith with other concerned States regarding existing or potential transboundary interferences with their use of a natural resource or the environment.

### *Co-operative Arrangements for Environmental Assessment and Protection*

18. States shall co-operate with the concerned States in monitoring, scientific research and standard setting regarding transboundary natural resources and environmental interferences.

### *Emergency Situations*

19. States shall develop contingency plans regarding emergency situations likely to cause transboundary environmental interferences and shall promptly warn, provide relevant information to and co-operate with concerned States when emergencies occur.



### *Equal Access and Treatment*

20. States shall grant equal access, due process and equal treatment in administrative and judicial proceedings to all persons who are or may be affected by transboundary interferences with their use of a natural resource or the environment.

### **III. State Responsibility**

21. States shall cease activities which breach an international obligation regarding the environment and provide compensation for the harm caused.

### **IV. Peaceful Settlement of Disputes**

22. States shall settle environment disputes by peaceful means. If mutual agreement on a solution or on other dispute settlement arrangements is not reached within 18 months, the dispute shall be submitted to conciliation and, if unresolved, thereafter to arbitration or judicial settlement at the request of any of the concerned States.