

Simonis, Udo E.

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How to lead world society towards sustainable development?

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Research Professorship Environmental Policy
Prof. Udo E. Simonis

FS II 98-401

How to lead world society towards sustainable development?*

by Udo E. Simonis

*Lecture at the symposia on the emerging peace and environment states, organized by *Tokyo Shimbun* and *Chunichi Shimbun* at Tokyo and Nagoya, on October 22nd and 24th, 1997.

Wissenschaftszentrum Berlin für Sozialforschung gGmbH (WZB)
Science Center Berlin
Reichpietschufer 50, D-10785 Berlin

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gesichtet am: ...

1. Defining sustainable development

In political terms it all started with the World Commission on Environment and Development which in its 1987 report *Our Common Future* stated that "...humanity has the ability to make development sustainable - to ensure that it meets the needs of the *present* without compromising the ability of *future generations* to meet their own needs" (WCED, p. 8). The Commission defined sustainable development as "... a process of change in which the *exploitation of resources*, the *direction of investment*, the *orientation of technological development*, and *institutional change* are made consistent with *future* as well as *present needs*" (WCED, p. 9; italics added), Sustainable development thus deals with two fundamental issues, i.e. *inter-generational equity* and *comprehensive structural adjustment*.

Sustainable Development

"Humanity has the ability to make development sustainable - to ensure that it meets the needs of *the present* without compromising the ability of *future generations* to meet their own needs".

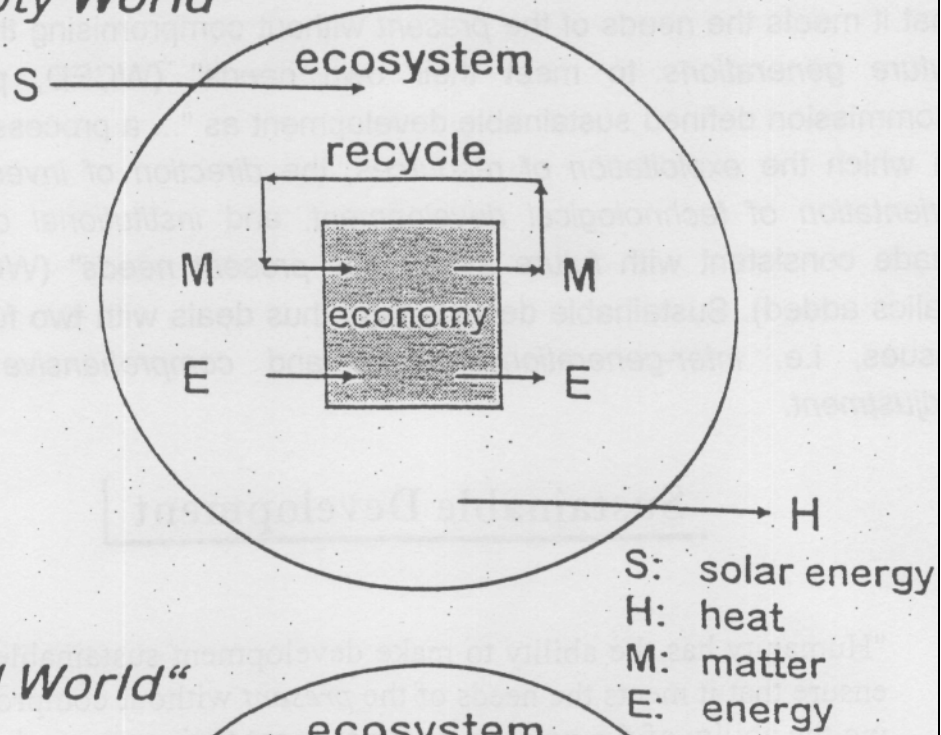
"... is a process of change in which the *exploitation of resources*, the *direction of investments*, the *orientation of technological development*, and *institutional change* are made consistent with *future* as well as *present needs*".

Source: World Commission on Environment and Development. 1987

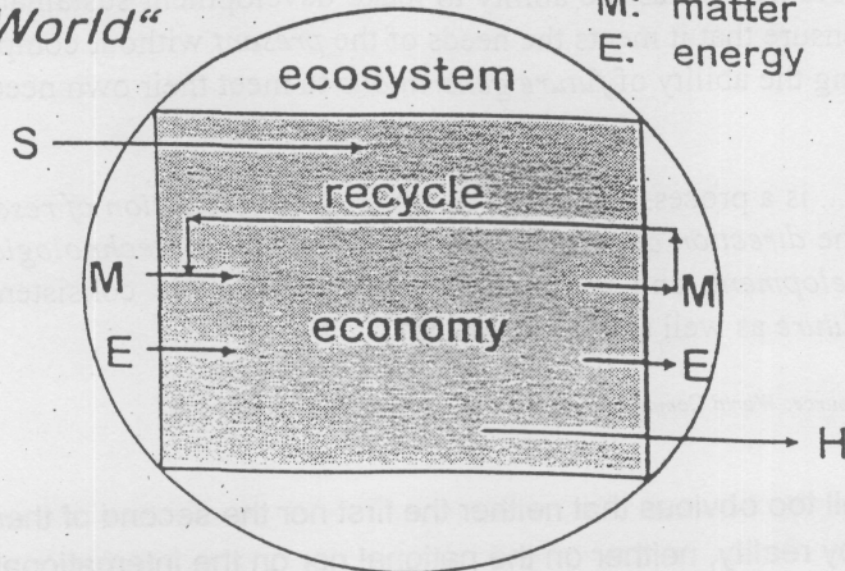
It is all too obvious that neither the first nor the second of these criteria are met by reality, neither on the national nor on the international level. "Many of the development paths of the industrialized nations are clearly unsustainable" (WCED, p. xii). And what would the world look like if some day 11 billion people - instead of today's 5.8 billion - would in average use the same amount of resources that we use today? The earth's ecology

The Economy as an open Subsystem of the Ecosystem

„Empty World“

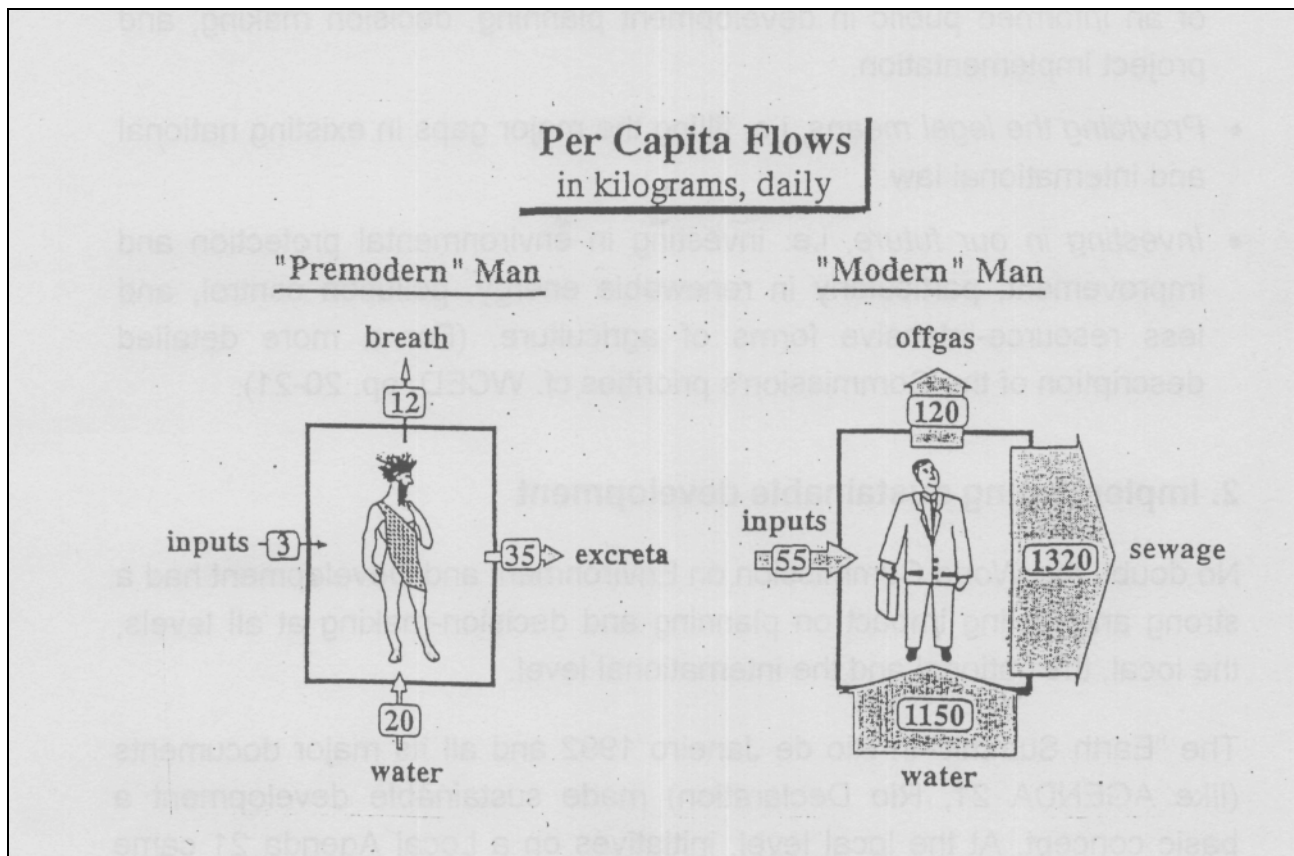


„Full World“



would be ruined. Particularly, there is no possibility that the life-style and the economic structure of the highly industrialized countries can be extended to the whole planet and to future generations; and so far there is also little probability that structural adjustment of the economy is quick and comprehensive enough to turn the trends round: from unsustainable to sustainable development.

The Commission in its wisdom came to the conclusion: "Sustainable global development requires that those who are more affluent adopt life-styles within the planet's ecological means" (WCED, p. 9). And it asked for international co-operation and responsibility: "We live in an era in the history of nations when there is greater need than ever for co-ordinated policy action and responsibility " (WCED, p. x). Particularly, there is "... need for effective international co-operation to manage ecological and economic interdependence"(WCED,p.9).



The respective main proposals of the Commission were embodied in six priority areas:

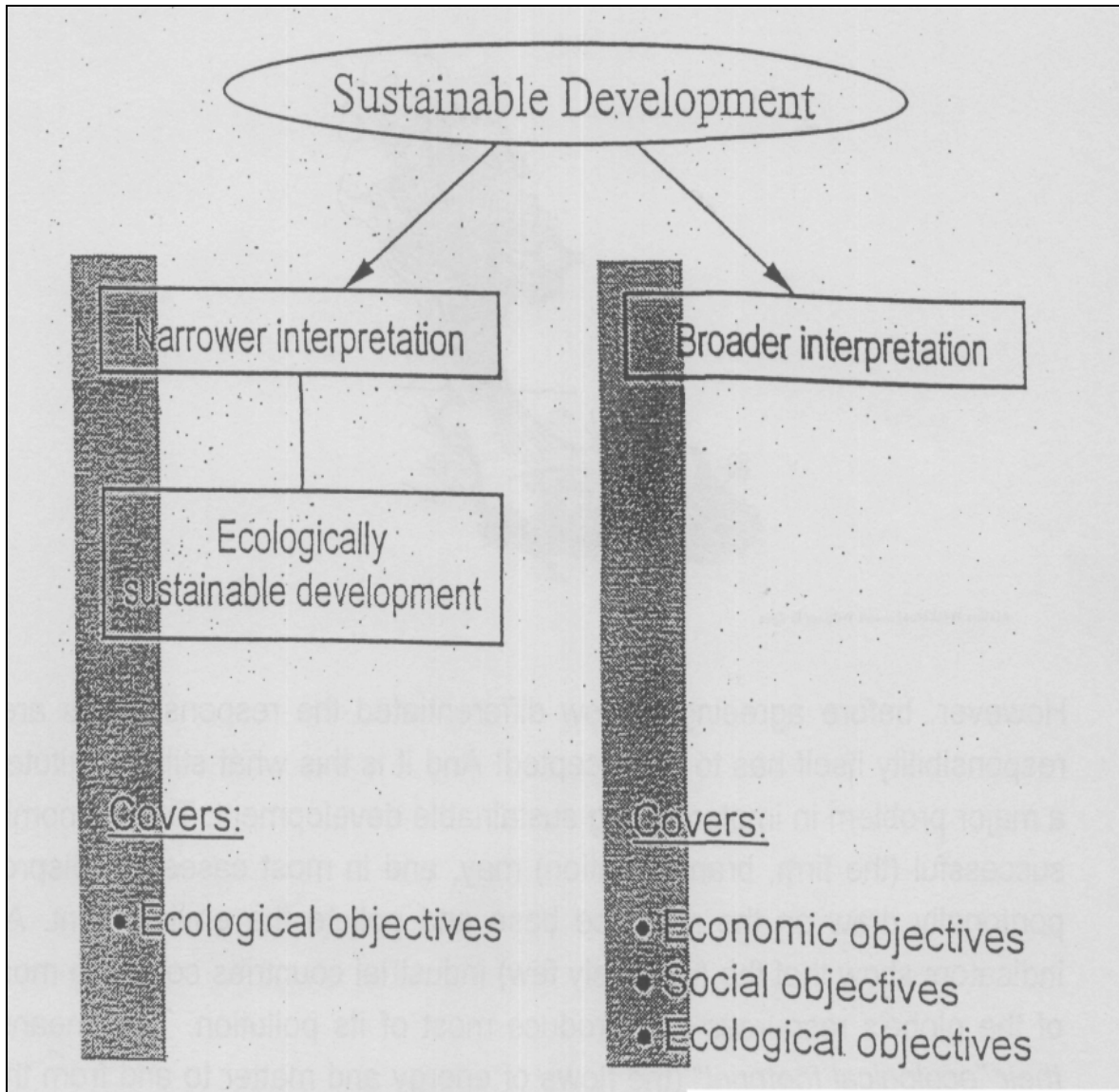
- *Getting at the sources*, i.e. making the national[^] regional and international agencies directly responsible and accountable for ensuring that their policies, programmes, and budgets support development that is ecologically sustainable.
- *Dealing with the effects*, i.e. reinforcing the roles and capacities of environmental protection and resource management agencies.
- *Assessing global risks*, i.e. identifying, assessing and reporting on risks of irreversible environmental damage.
- *Making informed choices*, i.e. expanding rights, roles, and participation of an informed public in development planning, decision making, and project implementation.
- *Providing the legal means*, i.e. filling the major gaps in existing national and international law.
- *Investing in our future*, i.e. investing in environmental protection and improvement, particularly in renewable energy, pollution control, and less resource-intensive forms of agriculture. (For a more detailed description of the Commission's priorities cf. WCED, pp. 20-21).

2. Implementing sustainable development

No doubt, the World Commission on Environment and Development had a strong and lasting impact on planning and decision-making at all levels, the local, the national and the international level.

The "Earth Summit" in Rio de Janeiro 1992 and all its major documents (like AGENDA 21, Rio Declaration) made sustainable development a basic concept. At the local level, initiatives on a Local Agenda 21 came into being and are widespread now. At the international level, in the ensuing treaties (like Climate, Biodiversity and Desertification Conventions) and institutions (like UN-Commission on Sustainable Development, Global Environment Facility, Business Council for Sustainable Development) equity and structural adjustment become major

Alternative Interpretation of Sustainable Development



issues of international policy. Particularly, the principle of "*common but differentiated responsibilities*" was established, committing industrial and developing countries to a new global partnership in which industrial countries should take the lead in making progress towards sustainable forms of production and consumption.

The Ecological Footprint is a measure of the "load" imposed by a given population on nature. It represents the land area necessary to sustain current levels of resource consumption and waste discharge by that population.



Mathis Wackernagel and William E. Rees

However, before agreeing to how differentiated the responsibilities are, responsibility itself has to be accepted! And it is this what still constitutes a major problem in implementing sustainable development. The economic successful (the firm, branch, nation) may, and in most cases do, disproportionately draw on the resource base and pollute the environment. All indicators show that the (relatively few) industrial countries consume most of the globe's resources and produce most of its pollution. That means, *their "ecological footprint"* (the flows of energy and matter to and from the economy, converted into the corresponding land required to support these flows) *is too large, and their "ecological rucksack"* (the material inputs, the emissions and wastes associated with production) *is too heavy*. Industrial society is activating enormous resource avalanches. To allow developing countries and future generations to fulfill their needs, the flows of material resources in the North cannot be maintained.

A first conclusion: *Making ecological footprints smaller and rucksacks lighter*, i.e. reducing resource and energy intensity, therefore, *should become the major perspective for the future of industrial society*.

There are numerous ways of translating such a message into practice. The priorities I have in mind at the national level and for the international level, and how Japan shows up or could find its place in the respective efforts, is what I shall focus on in the following sections.

3. National priorities

In the past, resource use and environmental pollution were rather strongly correlated with quantitative economic growth. Over a period of time, however, some kind of inverse U-shaped curve can be detected, i.e. a more or less pronounced decoupling of resource inputs and emission outputs from overall economic performance, the Gross Domestic Product (GDP). The Underlying reasons for such a development are twofold: First, with the growing scale of an economy the structure of that economy is changing, from primary (agriculture) and secondary activities (industry) to tertiary activities (services). Second, technological advance may improve the efficiency with which resources are being used and emissions and wastes being treated.

3.1. Structural change

In recent years, several studies have been published on the relationship between structural economic change and the environment. The results of these studies clearly dampen the often euphorically stated hypothesis that structural change is always correlated positively with beneficial environmental effects. The following general conclusions can be noted in this connection:

- As far as overall sectoral structural change (between agriculture, industry, and services) is concerned, the statistically detectable trend towards a "service society" in part only means that production-related services are being relocated; it does not indicate a significant change in the consumption of natural resources.

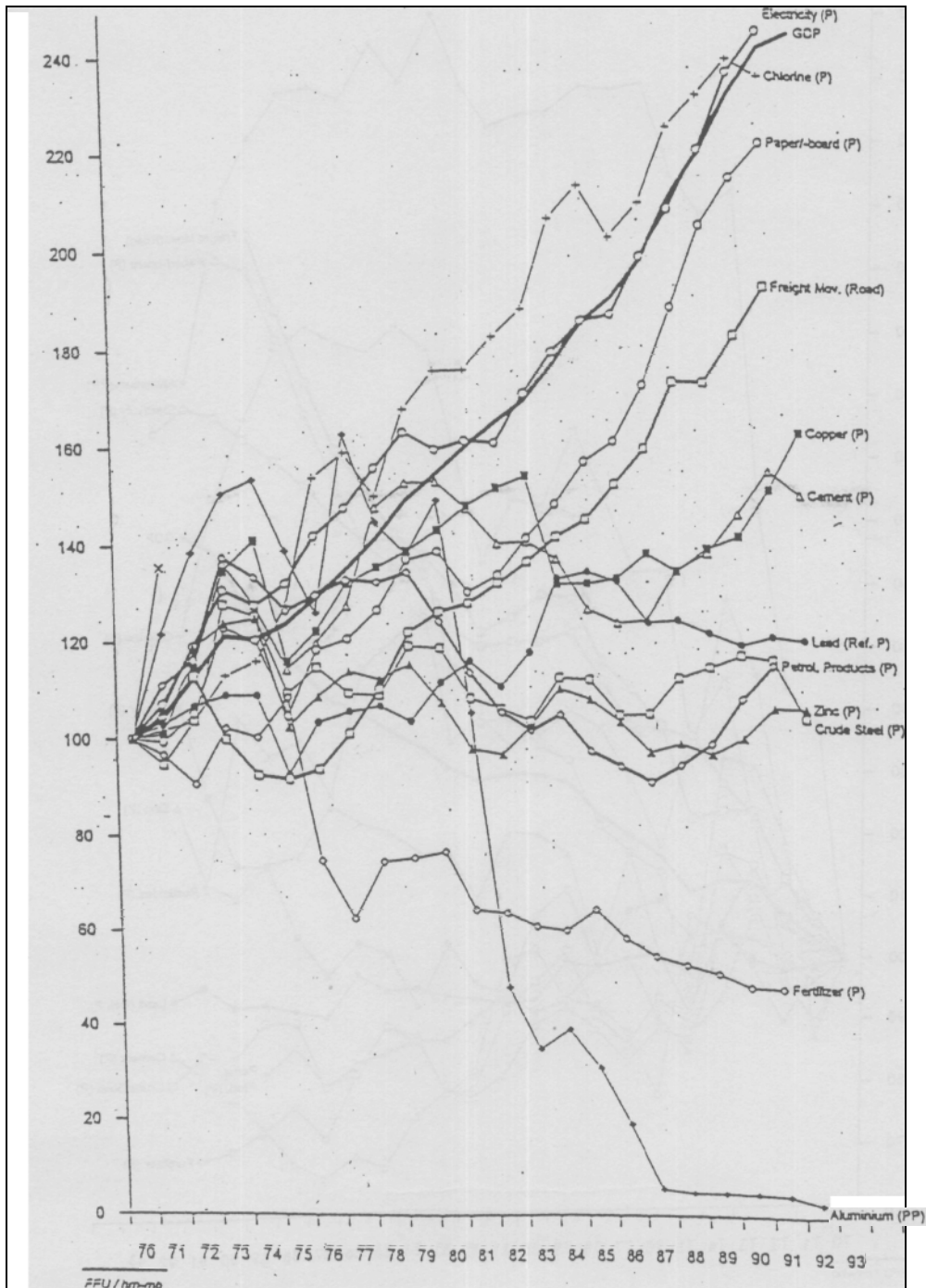
- The differences in the emission coefficients between the service sector and the industrial sector decline when account is taken of the emissions of pollutants caused by primary and intermediate inputs (the *ecological rucksack-effect*),
- The service sector is expanding with a growing utilization of living space, transportation, and tourism, services with high levels of energy consumption, noise pollution, and use of land.
- The decline of the share of agriculture in the GDP is associated with growing soil degradation due to chemical-physical inputs.

Against this background we may assume that as long as nature is underestimated in cultural terms and undervalued in economic terms, processes will materialize that favour environmentally harmful economic growth.

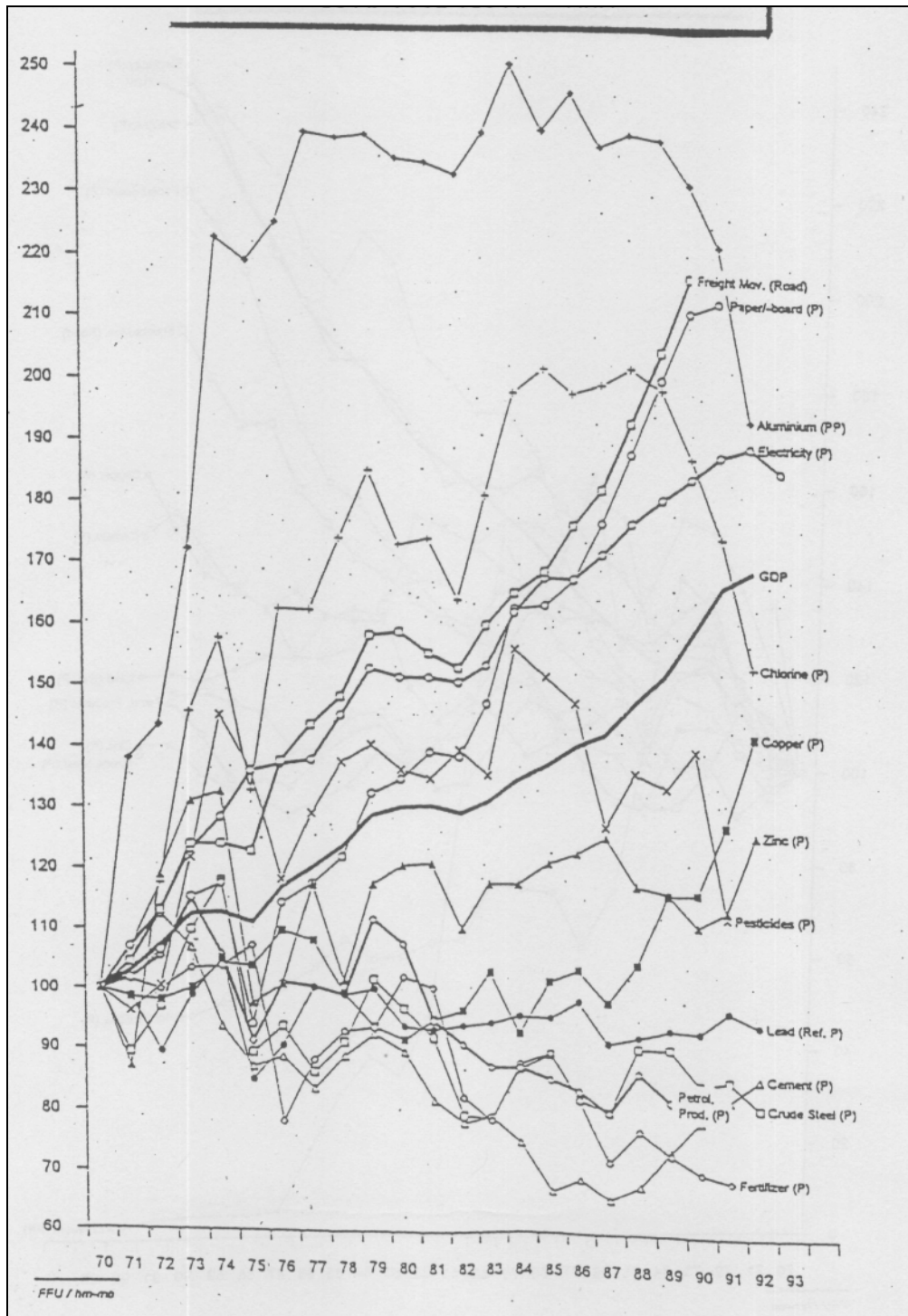
A cross-national comparison has shown that there are *pioneers*, *stragglers* and *dunces* among the 32 industrial countries as regards structural change and environmental relief: While for a few - among them Japan and Sweden - "some environmentally beneficial structural change" can be attested, there are many - among them Greece, Portugal, Slovakia, and Turkey - where "environmentally unfavourable structural change" took place. And there is a middle group - among them Germany and the United States - where some decoupling (of polluting activities from GDP) coincided with some additional burdening of the environment.

Even for the most successful cases, the *pioneers* - let alone the *stragglers* and the *dunces* - one must come to the conclusion: Autonomous structural change is a *necessary* but not a *sufficient* condition for sustainable development! What is needed, therefore, is a strong environmental policy that guarantees not only *relative* but also *absolute* reduction of resource use and environmental pollution. Put into a policy perspective: *The industrial countries must drastically improve their resource productivity to become ecologically sustainable.* To do so, a long-term vision seems needed - and such a vision has been proposed recently:

Economic Structural Change in Japan 1970-1993 (1970=100)



Economic Structural Change in Germany 1970-1993 (1970=100).



3.2. Factor 10

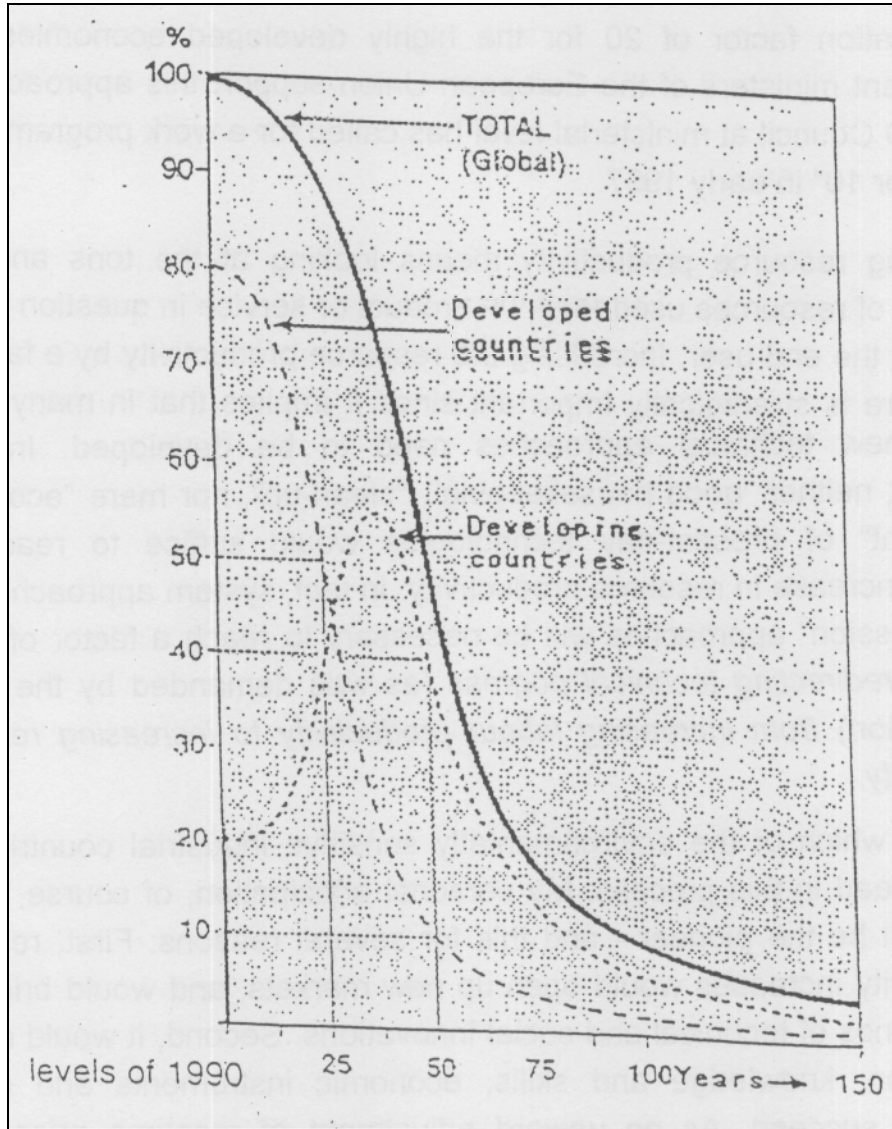
The *Factor 10* Club in its "Carnoules Declarations" of 1994, 1995 and 1997 suggested *that the resource productivity of Western style processes and products should be increased by an average factor of 10* (compared to present conditions) *on a cradle to grave basis*. The World Business Council for Sustainable Development and UNEP even proposed a de-materialization factor of 20 for the highly developed economies. The environment ministers of the European Union support this approach, and the OECD Council at ministerial level has called for a work programme on the "Factor 10" in early 1997.

Addressing resource productivity means looking at the tons and kilograms of resources used until the product or service in question makes its way to the end user. Increasing the resource productivity by a factor of 10 or more is strategically important since it implies that in many cases entirely new technical approaches need to be developed. In most instances, neither "good housekeeping", "clean-up", nor mere "ecological adjustment" of present-day technologies would suffice to reach the required increase in resource productivity. In fact, system approaches and "zero emission" approaches will be necessary to reach a factor of 10, in this way *redirecting technical progress* (as was demanded by the World Commission) *from increasing labour productivity to increasing resource productivity*.

I wonder which of the environmentally sensitive industrial countries will take the lead in this process. My personal anticipation, of course, is that Japan will be the pioneer - and this for several reasons: First, resource productivity increases would open up new markets, and would bring into play all kinds of technical and social innovations. Second, it would require information, knowledge and skills, economic instruments and market forces to succeed. As an upward adjustment of resource prices (e.g. *material added tax*) and a substantial shift or reduction of subsidies is unavoidable anyhow in the medium term, there would seem to be an excellent opportunity to reduce the non-market support of many sun-set activities. And third, only a country that is strongly future oriented, innovative, and ready for change will successfully overcome the barriers established by historic developments. Fourth, and not to forget: Japan in the 1970s very successfully implemented its "Income Doubling Plan".

Dematerialization

Foreseen for the Industrialized and Developing Countries



Doubling resource productivity in the next 10 years (and a tenfold increase in the next 50 years) therefore is not asking for *Utopia*, but could very much be a realistic vision.

"Ecological restructuring", "closing the materials cycle", "industrial ecology", "industrial metabolism", "solar economy", "ecological tax reform", these were the titles of recent academic works. It is these titles that bear the message national policies should pick up to make industrial society sustainable in the long run. If 50 years are envisaged for a respective restructuring towards sustainable development, the "Factor 10" vision is not Utopian but rather a realistic possibility, at least for the pioneers, maybe for the stragglers, certainly not for the dunces.

The Precautionary Principle |

In essence, the precautionary principle asserts that a cautious approach to human interventions in ecological systems is required that are

- (a) unusually short of scientific understanding, and
- (b) unusually susceptible to irreversible damage.

4. International priorities

In the arena of international policies for sustainable development, there are also pioneers, stragglers, and dunces. What is more, there is no clarity on the priorities themselves, let alone respective goals, instruments and institutions. It seems that this is due not so much to uncertainties about the physical facts of resource depletion and environmental damage (on which there cannot be much doubt), but to individual and social preceptions of manageability, on costs and benefits, on winners and losers (on which there can indeed be some doubt).

4.1 Ozone depletion

Uncertainties on necessary policy action can, hopefully, be decreased by communicating information on irreversibilities or threats of irreversible damages. This probably made the damage to the *stratospheric ozone layer* a topic issue of international politics, and also helped to make *loss of biodiversity* a field of international concern. Due to its slowly accumulating damage potential and its far-reaching effects on the economic and the ecological system, *climate change* also should be a topic of highest priority, though it doesn't seem to be so if judged by the arguments of the stragglers and the dunces. Fortunately, however, there exists a rather rigid procedure in form of the international conventions which forces the signatories to find some solution to the existing conflicts that result from differing preceptions and national interests.

The oldest of these conventions, the *Vienna Convention* with the *Montreal Protocol* on substances that deplete the ozone layer, is generally understood as a success story of international environmental policy. Besides the fact that substitutes to those substances were technically easier to find than expected, and that the number of players was rather small, two major conditions are identified in the literature that made the Montreal Protocol a success: the provision of a sanction mechanism (i.e. possible trade restrictions) and a finance mechanism (i.e. finance and technology transfer). Whereas the sanction mechanism was never really put into force, the finance mechanism was very important to stimulate substitution processes in the developing countries: All their "agreed upon incremental costs" are covered by the Multilateral Ozone Fund.

4.2 Climate change

So far, neither a sanction nor a finance mechanism has formally been installed to implement the *Climate* and the *Biodiversity Convention*, though the concept of "agreed upon incremental costs" appears in both these treaties.

It is not only this point that should be reconsidered by the parties to the conventions. Defining and agreeing on the goals is also urgent, and so is the marking of instruments.

Regarding climate change, the Third Conference of the Parties in Kyoto in December this year urgently has to find a consensus on a precautionary strategy, on the reduction of greenhouse gases in general and on carbon dioxide (CO₂) in particular. The Climate Convention demands a stabilization of the greenhouse gas concentrations in the atmosphere at a level that prevents a dangerous anthropogenic interference in the climate system. Climate experts say that the current level of global emissions must be reduced by at least 50% until the year 2050, that of the industrial countries by 80%.

At the moment, the conflict is on the size and the time of the targets to be set: While individual countries have officially announced a reduction goal of 25 per cent up to the year 2005 compared with the base year 1990, the European Commission has declared a 15 per cent cut to the year 2010 (or 7 per cent for 2005) to be technically possible and economically feasible. Japan so far has proposed a 5 per cent cut for the years 2008 to 2012, while the USA up to today abstains from any strict reduction target.

As the European Commission has put its proposal of a combined energy-/CO₂-charge on cold storage, there is no strong instrument available so far with which a cut of emissions really could be pursued.

Even if one cannot predict the final outcome of the Kyoto climate conference, one thing can be said with certainty: If no consensus on targets and time tables were to be found, the Kyoto conference would be a most costly conference, costly in the sense of taking no action despite overwhelming evidence, and costly in the sense of a further uncontrolled accumulation of potentially irreversible damages.

What is urgent, I think, is to get the process of target setting going whatever the concrete target(s) may be. As implementing an international convention is not a one-day-exercise but a dynamic process, it is important to get the process started - not only as regards the targets set but also with regard to the instruments chosen. Here, also, there are different possibilities and a few basic options.

United Nations Framework Convention on Climate Change (Climate Convention)

OBJECTIVE (ART. 2):

The ultimate objective ... is to achieve ... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. .

Such, a level **should** be achieved within a time frame sufficient

- to *allow ecosystems* to adapt naturally to climate change,
- to ensure that *food production* is not threatened and
- to enable *economic development* to proceed in a sustainable manner.

National CO₂ Emissions (1990) and Emission Goals of 15 EU-Countries

	in Mill. Tons	per capita	Goal (percentage change from 1990 level)	
Belgium	112	11.2	- 5%;	2000
Denmark	53	9.9	- 20%;	2005
Germany	1005	13.0	- 25%;	2005
Finland	55	11.0	± 0%;	2000
France	366	6.5	+ 13%;	2000
Greece	74	7.4	+ 25%;	2000
UK	579	10.2	± 0%;	2000
Ireland	31	8.8	+ 20%;	2000
Italy	402	6.9	± 0%;	2000
Luxembourg	13	35.0	± 0%;	2000
Netherlands	157	12.2	- 3%;	2000
Austria	59	7.5	- 20%;	2005
Portugal	40	4.1	+ 30-40%;	2000
Sweden	56	6.5	± 0%;	2000
Spain	211	5.4	+ 25%;	2000

Theoreticians of international relations (like economists and political scientists) favour either taxes (energy tax/CO₂-charge) or *emission certificates*. While the former instrument may be easy to communicate to the public but uncertain regarding its effects, emission certificates would hit the target strictly but are difficult to implement as there is not much evidence available on the functioning of such an instrument. The allocation of the certificates to the participating countries could be based either on historical emissions and equal reduction rates (weakest position), on per capita emissions (strongest position), or on a set of multiple criteria the weight of which changes over time (my personal preference).

The situation looks better with a third instrument: *Joint Implementation*. A pilot phase on implementing greenhouse gas reductions jointly between the various groups of parties to the Climate Convention (industrial countries, developing countries, and countries in transition) had been agreed upon at the First Conference in Berlin 1995. To conduct this pilot phase successfully is important for two major reasons: Joint Implementation can be understood as the introduction to, or the first stage of a system of internationally tradeable emission certificates, and it can, under certain conditions, activate huge amounts of private capital for a public good, stable climate.

Instruments of Climate Policy

1. Tradeable Emission Certificates (Entitlements)
2. Joint Implementation.
3. Eco Taxes (CO₂-Charge / Energy Tax)
4. Private Litigation
5. Direct Regulation (Standards / Licensing / Fines)

Idea: To establish incentives compatible to international cooperation

Here, all depends on how the instrument is forged: Projects have to be selected carefully, monitoring is important and so is the crediting of emissions reduced abroad on the balance sheet back home. In order to prevent a situation where all national emission reduction duties were fulfilled abroad (a theoretical possibility), international crediting should only be partial. The German Council on Global Change in its 1995 Annual Report suggested that only between 75 and 80 per cent of the national emission reductions should be credited for Joint Implementation abroad, the rest would have to be reduced in the industrial countries themselves.

In conclusion, a tax/charge and/or an emission certificates system should be made an essential part of a precautionary climate protection strategy. Joint Implementation can become the first phase of a tradeable certificates system, and is more capable of producing consensus in the short run. The more advanced industrial countries, including Japan, should foster the application of these instruments through participation in pilot projects and submission of workable models.

4.3. Loss of biodiversity

While international taxation, joint implementation, and tradeable emission certificates are the major, well discussed instruments of global *climate policy* that only wait to be implemented, *biodiversity policy* will have to rely on other instruments - particularly so, because we are witnessing a massive extinction of species, a devastating process of destruction of natural habitats with severe consequences for plants and animals. To conserve biodiversity, working out a National Strategy should have first priority. In most countries, nature conservation must be put on a much broader basis, and this would then produce incentives for international nature conservation. "Sustainable use of genetic resources", "safe handling of biotechnology", "fair and equitable sharing of benefits", "technology transfer and research co-operation", these seem to be the major fields of activities demanded by the Biodiversity Convention. And, finally, there is the question of appropriate funding.

United Nations Framework Convention on Biological Diversity (Convention on Biological Diversity)

OBJECTIVES

The objectives of this Convention ... are

- the conservation of biological diversity,
- the sustainable use of its components and
- the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including
 - *appropriate access to genetic resources*
 - *appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies*
 - *and appropriate funding.*

Unlike the established fund within the Montreal Protocol, and the envisaged tax solution in a future climate protocol, so far there is only little funding for biodiversity conservation through the *Global Environment Facility* (GEF) which spends its funds on four main purposes. It seems to be high time for countries like Germany or Japan, which are so dependent on a sustainable use of biological resources, to look for fresh ideas in this respect. Every day that passes by, means an irreversible loss to global biodiversity. While we are counting the profits of the global economic system, the global ecological system is only losing, day by day.

4.4 Loss of forests

Besides climate and biodiversity, I do see three more priorities for international environmental policy, i.e. forests, water and soils. First of all, an agreement against *deforestation* and for *reforestation* is needed. It's not only the recent disaster in Indonesia, it's the creeping loss of forests all over the world, that gives urgency to this issue. Unfortunately, the views of those concerned are split. While some favour, for practical reasons, a *Forest Protocol* within the existing Biodiversity Convention, others plead for an independent *Forest Convention*. No matter whether that conflict is real or only artificial, forest loss must be brought to a halt soon - particularly for two reasons: Economically, because one cannot survive when using up the stock of capital (the forests) instead of using its interests (the additional flows from the forest stock); ecologically, because not all forests are renewable, and some only at high costs,

Both Germany and Japan do have long lasting experience on sustainable forestry. It is this experience that should be activated for a global strategy of forest conservation and reforestation.

4.5 Water shortage and pollution

In large parts of the world, *water* is getting short and increasingly polluted. According to a recent study by Population Action International, in 1995 18 countries and 166 million people were suffering from freshwater scarcity, while 11 countries and 270 million people were in a situation of water

stress (scarcity being defined as availability of less than 1.000 cubic meters of renewable fresh water per person per year, and stress as 1.700 cubic meters). This means that of the 5.7 billion world population, in 1995 some 3 per cent fall into the category of water scarcity, and 5 per cent in the category of water stress. On basis of the 1996 *medium* population projection of the United Nations, in the year 2050 some 18 per cent (or 1.7 billion people) of the expected 9.4 billion world population may be confronted with water scarcity, and some 24 per cent (or 2.3 billion people) with water stress. In case the *high* population projection comes true, 4.6 billion of the then 11.2 billion world population may be hit by water stress. To provide a growing population with sufficient and safe water, it is not only necessary to increase water supply through investments in conventional and unconventional sources, it will also become necessary to invent sophisticated methods of demand side management.

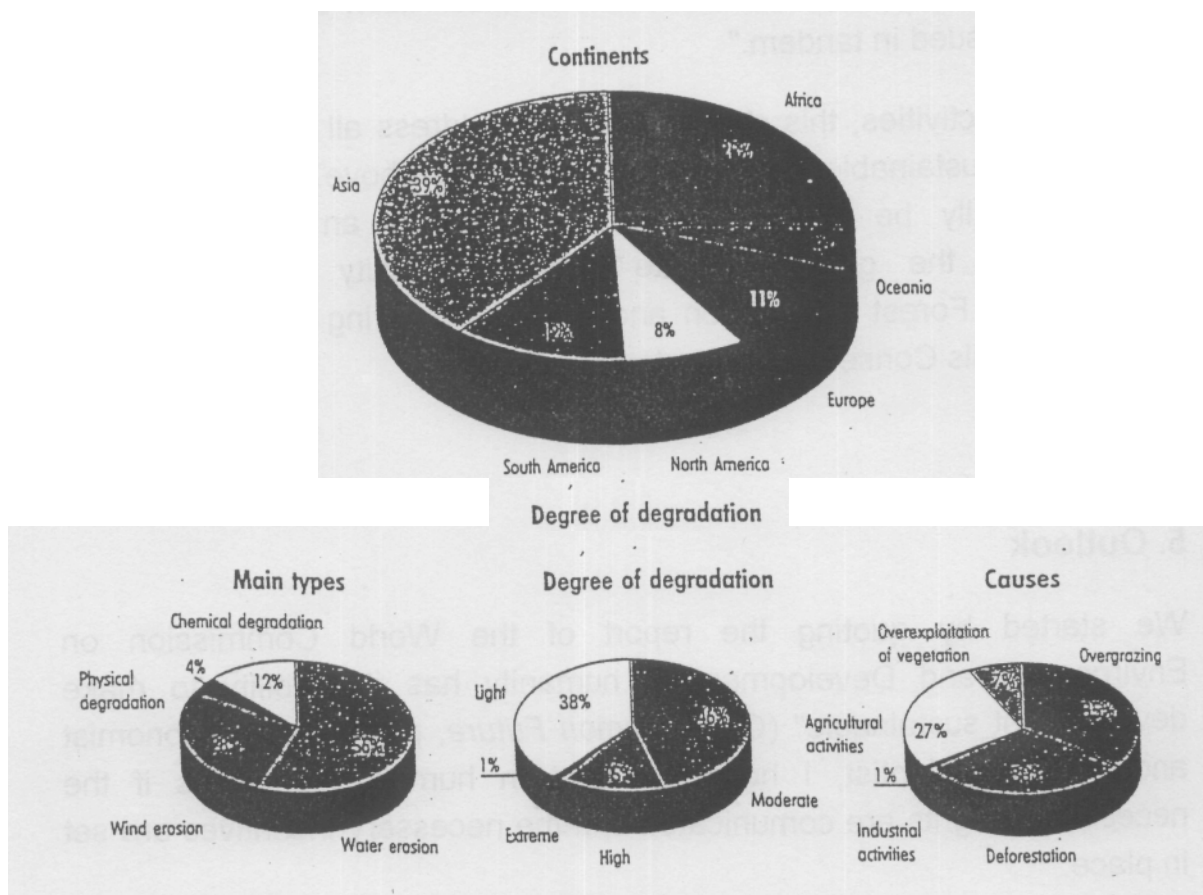
The efficiency of the water system in Japan is among the highest in the world, both in the industrial and the agricultural sector, and maybe also in the household sector. Therefore, a lot could be learned if water conservation would be made an international strategy. The need for an internationally coordinated effort, however, is not yet felt because many believe that water is not a global environmental problem *per se* but at best a universally spreading problem.

4.6 Soil degradation

Such a perception may also hold true for the fourth major environmental problem, the threat to our soils. Soils are complex physical, chemical and biological systems which are subject to continuous change through the influence of weathering, soil organisms and vegetation, but above all through the economic activity of human beings. *Soil degradation* as an important component of global change was not adequately dealt with in AGENDA 21 and at the UNCED conference, because neither the industrial nor the developing countries (who gladly exclude the topic because of the close linkages between soil degradation and population growth) had ever attached the requisite priority to this issue. Soil

degradation, however, is quite real, and it is threatening both food security and the carrying capacity for the population in general.

It is difficult to explain why the soils issue which is so serious and quantifiable, receives so much less attention in international policy on sustainable development than the climate issue which will be real and quantifiable only in the future. Probably, it is the same story as with the water issue: Soils like fresh water are perceived as being local, under local and national jurisdiction, while the effects of their degradation are increasingly becoming global in character. Be that as it may, soils and water are issues in which a country like Japan and Germany could take the lead in addressing them properly, both conceptually and practically.



World soil degradation. Nearly 2000 million ha of soil are degraded through human activities, equivalent to 15% of the land area of the Earth. . Source: Oldemon. 1992

4.7 Official Development Assistance

Since the beginning of the 1990s, Japan is "aid leader" in Official Development Assistance (ODA), i.e. in volume terms is by far the largest donor of development aid (although as percentage of GNP, Japans ODA is only 0,2 per cent, and so lags behind Germany and particularly the Scandinavian countries). In June 1992, the government ratified the Official Development Assistance Charter of Japan, which in paragraph 2 reads as follows: "Japan's ODA will be provided in accordance with the principles of the United Nations charter... as well as four principles." It is principle 1 that is important for our topic because it prescribes what sustainable development is all about: "Environmental conservation and development should be pursued in tandem."

As for ODA activities, this charter allows to address all the international priorities of sustainable development mentioned above. That means, it would basically be possible for Japan to play an active role in implementing the global Climate and Biodiversity Convention, in formulating a Forest Convention and also in preparing an International Water and Soils Conservation Strategy.

5. Outlook

We started by quoting the report of the World Commission on Environment and Development: "...humanity has the ability to make development sustainable" (*Our Common Future*, p. 8). As an economist and political scientist, I have full trust in human capabilities if the necessary insights are communicated and the necessary incentives are set in place.

One of the insights to be communicated is a fundamental one: The industrial system, as it exists today, is *ipso facto* unsustainable in the long term. Due to structural deficits and vested interests it conflicts with the international equity issue, and it may also conflict with the structural adjustment issue. In particular, however, it works in contradiction to three basic management rules, the "*golden rules of environmental management*".

5.1 Golden rules of environmental management

- (1) Non-renewable resources (like oil or gas) should be used only as far as equivalent renewable resources (like solar energy) are being developed.
- (2) Renewable resources (like forests or water) should be used only in line with their rate of regeneration.
- (3) The absorption capacity of nature for harmful emissions (like CO₂ emissions or toxic wastes) should not be overstrained, so that the ecosystems can remain intact.

To get these management rules enacted at the various levels of decision-making, technical, social and institutional innovations are needed and adequate incentives have to be set. To develop a vision like the "Factor 10" strategy is one thing, to make it effective requires preventive environmental policies, like zero emission or integrated technologies, and ecological economic policies, like resource taxes and emission charges, joint implementation and emissions trading.

Principles of Ecological Management I

- The rate of exploitation of renewable resources must not exceed the rate of natural regeneration.
- The level **of emissions** must not exceed the assimilative capacities of the ecosystems affected.
- When non-renewable resources are depleted, the reduction in stocks must be compensated for by an equivalent increase in the stocks of renewable resources.

But sustainable development also needs to be publicly supported to become a major project of the future. There is much to be left to the market, if the conditions under which the market works are changed. But there is, at the same time, a need for new institutional arrangements at the local level, like "Local Agenda 21", the national level, like a "Future Chamber", and at the international level, like a "World Environment Organization", equivalent to the World Trade Organization. Last but not least, there seems to be a strong need for an educational initiative at all levels in order to revive the 'Spirit of Rio' and make it really viable.

5.2 Eight Environmental Heavyweights

I would like to end with pointing at one possible institutional innovation which was first suggested in the 1997 report of the Worldwatch Institute (*State of the World*). In assessing the progress made since the "Earth Summit" in 1992, not all countries can be treated equally. The major environmental trends are dominated by just a few countries. There are "*Eight Environmental Heavyweights*" - four industrial and four developing countries - that together account for 56% of the world's population, 59% of its economic output, 58% of its carbon emissions, and 53% of its forests. These countries constitute what could be called the *E8* - eight countries that disproportionately shape global environmental trends.

The "Eight Environmental Heavyweights" E
8 Countries

Country	Share of World Population 1996	Share of Gross World Product 1994	Share of World Carbon Emissions 1995	Share of World Forest Area 1990	Share of World Flowering Plant Species 1990a
United States	5	26	23	6	8
Russia	3	2	7	21	9
Japan	2	17	5	0,7	2
Germany	1	8	4	0,3	1
China	21	2	13	4	12
India	17	1	4	2	6
Indonesia	4	0,7	1	3	8
Brazil	3	2	1	16	22
E 8 Total	56	59	58	53	-

Source: Worldwatch Report 1997. aBased on 250 000 known species. Total could not be calculated due to overlap in species among countries.

Even more than the Group of Seven (G7) - the industrial countries that dominate the world economy - the Group of Eight (*E8*) will shape the future of world ecology. The political systems of the *E8* are quite diverse, but in terms of environmental impact, these eight countries are in a league of their own.

The industrial countries in the *E8*, among them Japan, shape global trends in part because of their economic scale and their high level of materials and energy consumption, but also because of their social trend-setting and their dominance of technology development. The developing countries' influence in the *E8*, by contrast, is determined in part by their large populations and their rapid economic growth, but also because of their rich biological diversity.

As these eight nations - the *E8* - use such a large share of the world's resources, produce so much of its pollution, and possess huge amounts of biological resources, they truly have a high responsibility for crafting solutions to the global problems identified above.

Carbon Emissions from Burning of Fossil Fuels, *E8* Countries, 1995

Country	"Total Emissions (million tons)	Share of World Carbon Emissions (percent)	Emissions per Capita (tons)	Emissions Growth 1990-1995 (percent)
United States	1,394	22.9	5.3	6.2
Russia	437	7.2	2.9	-27.7
Japan	302	5.0	2.4	8.7
Germany	234	3.8	2.9	-10.2
China	807	13.3	0.7	27.5
India	229	3.8	0.3	27.7
Indonesia	56	0.9	.03	38.8
Brazil	62	1.0	0.4	19.8
<i>E 8 Total</i>	3,521	57.9	0.9	-

Source: Worldwatch Report 1997.

The *E8* nations, among them Japan, are major players at international economic and political fora, heavily influencing the policies of their neighbors and allies, and so should be well positioned to lead the world towards sustainable development. No such collection of countries can replace the important role played by the United Nations and its agencies. Yet, the *E8* countries, if they choose, could become an important catalyst for action - filling a vacuum that now seems to suck motivation and drive out of the sustainable development agenda.

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