05348

1994 Serie Research Memoranda
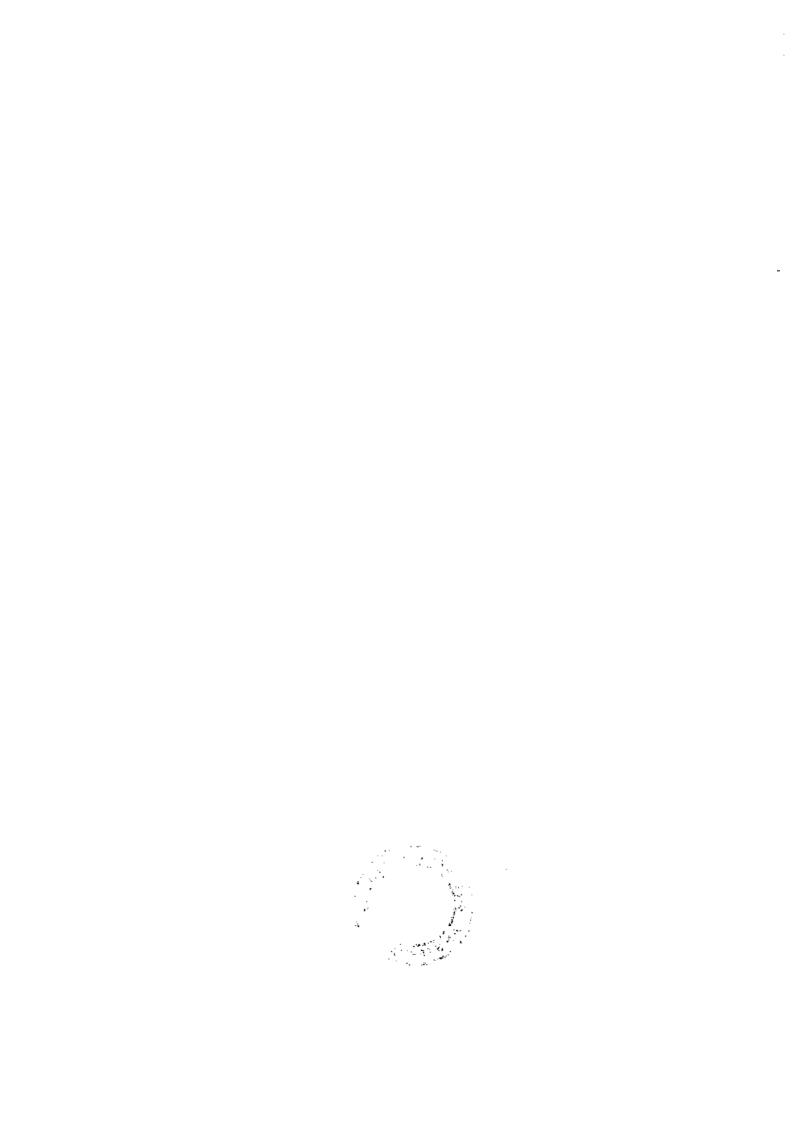42

1994 INSTITUTIONAL CHANGE AND DEVELOPMENT TOWARDS SUSTAINABILITY

J.B. Opschoor

vrije Universiteit   *amsterdam*

INSTITUTIONAL CHANGE AND DEVELOPMENT TOWARDS SUSTAINABILITY

J (Hans). B. Opschoor,
Professor of environmental economics
Free University Amsterdam

Free University Amsterdam
Faculty of Economics/Dep't of Spatial Economics/Ecological Economics Group
De Boelelaan 1105
1185 HV Amsterdam
fax: #31-20-4446005
email: jopschoor@econ.vu.nl

1. Introduction[1]

'Sustainable development' is defined by the WCED as: "... a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change ... enhance both current and future potential to meet human needs and aspirations"[2]. It thus is a concept that is related to the continuing existence of conditions favourable to life, human life in particular. It has to do with fairness or equity (especially, though not exclusively) in an intertemporal or intergenerational sense, and with the integrity of natural systems and processes (at least from an instrumental perspective and as perceived by *Homo sapiens.*

In the definition given, institutions have an explicit role to play and this paper takes its cue from there. The predominant institutions influencing decision making (i.e. market forces and market-based mechanisms) are geared towards efficiency almost at the exclusion of other values such as sustainability and equity. The importance of market-oriented institutions has even tended to increase over the past decades, especially since 1989. This is one of the realities people and nations are facing. At the international level, recent developments related to world trade illustrate this (the Uruguay Round, the setting up of the new World Trade Organisation).

In trying to give operational meaning to the notion of sustainability, several important issues must be addressed.
First, some agreement has to be reached on what the substance is of this notion: what are the 'dimensions' of sustainability and how can we capture this multidimensional concept? Somewhere between these two steps of identifying dimensions and finding measuring rods, there is a relatively value loaded intermediate step: that of setting thresholds or critical values: benchmarks on those measuring rods indicating, for each dimension, where the sustainable domain ends and the unsustainable domain begins.
Second, how can societies or economies move towards (more) sustainable states? Will individual decision makers be moving towards more sustainable ways of using natural resources automatically? Can the values and preferences underlying their decisions be influenced? Are changes necessary in incentive systems at the meso and macro level in order to effectively and adequately alter decisions? Are other, more fundamental institutional changes necessary? Is the global or international economic and institutional 'environment' conducive to, and sufficient for achieving sustainability?
A third set of questions relates to the costs and benefits of a business-as-usual type of development versus a sustainability-oriented scenario: what are the sacrifices in terms of income and consumption to whom, and when? What are the differences between these scenarios in terms of economic values of the various environmental states? And how are these distributed in time and space? What then are the tradeoffs decision makers are faced with when considering alternative development paths? What mechanisms for 'burden sharing' exist or should be developed so as to achieve and facilitate an optimal and adequate response to the threats of unsustainability?
Fourth, do our strategies address the main driving forces behind unsustainability? What are these driving forces? What 'undercurrents' and socio-economic structures enhance these driving forces? Can these be addressed?

Within the above 'agenda' for operationalising sustainability, this paper provides one attempt to further the debate about the institutional conditions that prevail and on how institutional change might foster sustainable development and development towards sustainability. That is, especially the second question and parts of the fourth question will be taken up. We cannot, however, proceed with a minimum amount of attention to the notion of sustainability itself.

2. Sustainability

The systems and processes that operate in the physical environments of society, enable the environment to provide to society a range of functions or services, including the self-regulation of these systems and processes, the production of materials, and carrier functions[3]. Looked at from an anthropocentric perspective, the environment could be regarded as a complex life support

system; the complexity arising, *inter alia*, from the inter-relationships between the various systems and processes sustaining the environment's capacity to perform these functions. Reduced to their most basic essentials, one could conceive of this life support system as made up of four elements: (i) a renewable resource that is harvested by society, (ii) its underlying regeneration process (say, a Lotka-Volterra stock growth function), (iii) environmental pressure and (iv) an absorption process. Effective regeneration (or the productivity of the regeneration system) can be assumed to depend on environmental quality which, in turn, is a function of environmental pressure and the scale and rate at which absorption processes in the environment buffer that pressure. Harvesting from the environment and putting waste into it (elements i and iii above) represent the ways in which society utilises the environment. Regeneration and absorption and other processes such as regulatory ones, together form the so-called 'life support' function of the environment; they can be referred to as the 'ecological infrastructure'[4].

If one analyses environmental utilisation in this simple framework, the result is literally a space, the boundaries of which represent environmental use patterns (in terms of combinations of resource stock levels, environmental quality and resource extraction rates) that can be maintained since the underlying ecological infrastructure remains in tact. If one assumes that lower levels of environmental quality are associated with reduced productivity of the regenerative process, then this space takes on the shape of a vault with a height and width that decrease as environmental pressure increases. This space has been called the *environmental utilisation space* (or EUS[5]): the range of different interactions between society and the environment that are all "ecologically sustainable" (in the sense that they preserve the ecological infrastructure). More precisely, the environmental space is defined as:

> the locus of all feasible combinations of environmental services that represent
> steady states in terms of levels of relevant environmental quality and stocks of
> renewable resources[6].

The notion of an environmental space of given magnitude still allows for the adoption by society of a wide range of more or less attractive, steady state positions, and it allows for economic growth. More attractive steady state positions can be reached at the cost of temporary sacrifices in terms of reductions in environmental utilisation. Moreover, social and technological change may expand (in real terms or virtually) the environmental space, and society can deliberately invest in that. And finally, even if further expansion of the environmental space would eventually become impossible, this would only pose a limit on environmental utilisation (or 'material throughput' or 'metabolism'[7]) and not necessarily on economic development or economic growth in welfare terms.

EUS and 'sustainable development' are related concepts. The EUS theoretically embraces an infinite number of patterns of environmental utilisation that are all -by definition- steady states. They may, however, differ greatly in their degree of desirability, especially in the light of considerations such as population growth, global inequality, etc. On the other hand, if one takes a long term perspective, desirable or socially acceptable patterns of environmental utilisation may not be ecologically feasible. Society therefore has to identify and move towards a feasible and acceptable level of environmental utilisation that it wishes to enjoy sustainably - if such a level that is both acceptable and sustainable exists[8].

'Weak' or 'strong' sustainability
It is conceivable that one natural resource replaces the other (e.g. sugar cane as a substitute for fossil energy). When resources can thus be replaced, the unsustained use of a particular resource may not pose a problem in terms of economic survival of the activities using that resource. As long as the natural resource base in total is preserved, there is no question as to the sustainability of using it.

Substitution options might also exist between natural resources and non-natural ones, such as produced capital, knowledge and know-how. And technological development or innovation may even lead to an expanded range of perceived options for substitution of one resource for another. It may thus appear to be more advantageous to sell or burn up a given fossil energy resource or cut a

forest, and invest the revenues in the development of alternative natural resources or even of artificial ones, than to preserve the resource. Economists, in addressing the notion of sustainability, often feel inclined to transform into one aggregate economic value (expressed in monetary terms) natural resource stocks as well as produced capital (in the form of equipment, road, etc.) and human capital (in the form of schools, research, etc) [9]. In this approach, degrading environmental features is then considered acceptable as long as: (i) this is 'compensated' by some form of increased produced capital, or enhanced intellectual capabilities, and (ii) the welfare potential of the overall capital base (of which environmental capital is but one component) remains intact. In this view, development can be regarded as sustainable while at the same time the environmental space is allowed to diminish. This is called 'weak sustainability' and one finds it reflected implicitly in the WCED-definition and in e.g., World Bank positions[10].

Opposed to this is the view that this faith in the substitutability of human made processes for natural ones may be unwarranted, and that the promise of technological innovation cannot balance environmental degradation. Both prudence considerations and preservation considerations based on the 'rights' to existence and development of non-human species and natural systems, may lead to a choice in favour of what has been called 'strong' sustainability. For renewable resources this 'strong' approach entails that: (i) the stock levels to be maintained must be high enough to safely ensure a sustainable offtake at at least the current level, and (ii) the quality of the regenerative systems instrumental in regrowth processes be maintained beyond safe minimum levels of environmental quality. Environmental pollution and waste would then be allowed only in so far prudently (i.e. in a risk-aversive way) assessed absorptive capacities are not surpassed and/or accumulation is checked or prevented. Non-renewable resources would be allowed to be exploited e.g. as long as proven reserves are sufficient to provide for consumption over a pre-determined minimum time span. Biological diversity would not be allowed to deteriorate and safe minimum habitats and populations should be preserved. Moreover, also from different normative positions (that will not be discussed here) vis-a-vis (i) biodiversity and (ii) risk and uncertainty, one may opt for a precautionary demarcation of the environmental space and the part of it that is judged to be accessible for economic utilisation -the other part being set aside for preserving biodiversity.

In other words, strong sustainability is compatible with at least preserving the ecological infrastructure and thus maintaining some amount of environmental space, or even with enlarging it, where weak sustainability would require only the total capital base (i.e., the economic value of the ecological infrastructure and human and produced capital) to at least remain equal over time. From a welfare maintenace perspective as is implied in the WCED-definition of sustainability, staying within the EUS is a sufficient, not perhaps a necessary condition for sustainability. Adding to sustainability the precautionary approach may imply that staying within the EUS becomes a necessary condition as well[11].

3. Institutions, Economics and Sustainability

Unsustainability can be related to a range of societal processes and elements. Traditionally, it has been linked to economic growth and population expansion, or to the combination of these. Other factors mentioned include short-sighted technological developments and poverty. Behind these forces, there are some more structural factors that economic expansion helps spreading over the globe. One such structural factor is Western cultural a prioris and world views (including views of humankind-nature relationships. Another one is that of institutional failure to accommodate to the emerging environmental realities. This Section looks at this type of failure in particular.

The notion of 'institutions' is used here in the scientific sense, originally due to Veblen, i.e.:
> consolidated patterns of human behaviour (formal and informal ones), as well as
> social conventions and organisations influencing human behaviour.

In this sense institutions include both the organizations that give force to social conventions and the less tangible social structures governing particular aspects of human behaviour. As the degradation of the environment is the product of the independent decisions of billions of individual users of

environmental resources, the underlying causes of environmental degradation accordingly lie in the determinants of those individual decisions, including institutional elements such as: preferences, property rights, cultural, religious and legal restrictions on individual behaviour that prescribe the range of admissible actions, and economic aspects such as relative prices.

Economics, as the late Jan Tinbergen used to describe it[12], deals with the 'economic process' (i.e., interactions between (groups of) individuals seeking satisfaction of wants) in relation to exogenously determined (changes in) the 'foundations' of the economic system (ie, its underlying political system, predominant norms and values, etc), the 'economic structure' (ie, the factor endowment, social structure and the derived production patterns; elasticities; market structures, etc) and the 'instruments' used by society to direct or influence the economic process. 'Policy' or 'policy interventions' then can be defined as changing the levels at which the instruments are operated, or the economic structure or its foundations. Tinbergen speaks of: (i) 'quantitative policies' when only the levels of instuments are changed, (ii) 'qualitative policies' when the economic structure is addressed, and (iii) 'reforms' when the foundations are addressed. Institutions as the phrase is used here, by definition play a role at the levels of the economic structures (e.g., elasticies and market structures) and foundations (eg, the predominant values and the politico-economic system).

We begin by making some observations and recommendations on value-related issues, i.e. on the level of foundations. In an institutional or evolutionary approach to assessing the performance of the economic process one refers not only to static values such as efficiency and equity, but also to very fundamental values such as: the "nonindividious recreation of the community", and the "continuity of human life". When extrapolated to shed light on environmental issues, these two values imply as a corollary: environmental compatibility or 'coevolutionary sustainability'[13]. This can be illustrated as follows. The system of society-biosphere interactions is one in which several subsystems or modules interact and reproduce themselves. Among these subsystems are: (i) human population (composition, size, dynamics), (ii) technology and economic potentials and demands, (iii) the organizational/administrative structure of society, (iv) culture/world view/ethics, and the environmental base. As soon as imcompatibilities between these modules arise, a process of structural adaptation will have to emerge within and between them. If this process is to be succesful in terms of survival, it will have to lead to changes in several of them and these adaptations must be mutually compatible. This in fact implies ecological sustainability, as otherwise the economy's material base will be insecure and cause future imcompatibility. Taking a system's point of view, compatibility or viability appears to be the overall concept. We do assume that these basic social values are accepted in themselves, an are taken to have precedence over short term interests or private interests. The continued existence of species and ecosystems may be in this category of societally relevant items where individual preferences or priorities for them remain low. This may, at the collective level, give rise to explicit a priori policies on nature conservation etc., on non-economic grounds. All these arguments support the position that the environment is a 'merit-good' not to be decided upon by aggregate individual economic values attached to it[14]. In terms of standard analysis, this means that we postulate a third and a fourth criterion in addition to efficiency and (intragenerational) equity, namely that of: coevolutionary sustainability (see above) and interspecies equity: a societally accepted element of care for the prospects of other species insofar as humankind can affect these prospects.

In this paper the emphasis is not on values but on institutions. We are concerned to identify both the institutional causes of environmentally unsustainable behaviour, and the scope for policies to modify that behaviour, through quantitative policies, structural change and institutional reform.

Typically in most economic analyses of environmental problems and the response to these, is to look at them form the perspective of 'market and government failures'[15]. This actually is an extension of the usual approach in welfare and public finance economics, where 'market imperfections' were identified as a potential cause for government or public intervention in markets. Such market imperfections had to do with deviations in reality from the theoretical preconditions for 'perfect competition' on markets (such as monopolistic tendencies, externalities and 'public goods' features, rigidities and immobilities) and with socially undesirable market process outcomes such as a too skewed distribution of income. These led to a 'mixed economy' with a market and a public

sector, with governments intervening in the market process through what Tinbergen would have called policy interventions and reforms (see above). In the more recent literature this approach has re-emerged as 'market failure' analysis of environmental degradation. Meanwhile, the effectiveness as well as efficiency of policy interventions had increasingly become subjects for analysis and discussion, and hence the notion of market failure was complemented by '(government) intervention failure'. Below, these notions shall first be introduced according to the way they are normally presented; subsequently I shall attempt to put them in a wider and deeper context.

Market Failures

In market economies the decisions of resource users are co-ordinated by market forces. Market failure can be defined as the inability of the market to lead the economic process towards a social optimum; one main aspect of this is failure to encapsule in costs and prices the external effects, or reductions in utility and profits that agents other than those directly involved in market transactions and the activities associated with these, have to undergo. In relation to environmental goods and services one may point at the externalities related to pollution, resource exploitation and ecosystems' intrusion. Externalities are the result of intended or unintended 'cost shifting' or 'displacement of costs[16]; that is, (part of the) adverse consequences of one actor's decision are passed on to others to bear (see below).

Intervention Failures

Button [15] defines intervention failures as: '...internal and external market failures which result from inappropriate actions (whether deliberate or not) of government'. He then divides these intervention failures into: (i) inadequacy in correcting market failure, and (ii) inappropriate policies elsewhere in the economy. In more practical terms, that is, looking at the operational mechanisms applied, intervention failures could be categorised into: 'economic intervention failures', 'regulation and control failure', and 'administrative failure'. Economic intervention failure has to do with qualitatively or quantitatively ineffective and inefficient policies; regulation and control failure are examples of ineffective and/or inefficient qualitative policies and reforms; administrative failure has to do with ineffective and/or inefficient organisation at the foundational level. Most studies on intervention failure deal with sectoral policy failure and administrative failure.

Past sectoral policies (e.g. in the field of energy, agriculture and transportation) have often been decided upon primarily with the sectoral interests in mind, at best with some consideration for tradeoffs vis-a-vis other sectors. Environmental concerns have not -or not yet- been appropriately internalised. Moreover, decision makers have limited time horizons and/or discount future consequences of present decisions. Thus, policy formation may suffer from biases towards stronger (in terms of economic and political power or significance) sectors and against interests that cannot manifest themselves on current markets and in today's political arena, such as future generations' interests. Sectoral policy failure often results in the subsidisation of sectoral activities. In resource related sectors such as agriculture, water, timber and energy, this leads to artificially low resource prices. In such cases, users of the products of these sectors are paying less than the social costs their use gives rise to; they thus are induced to consume more than would be the case were the price corrected for social costs. Prices thus may give the wrong signals and the sector may expand to levels beyond what is socially desirable.

The notion of administrative failure refers to a range of problems within the organization of government at the various levels, leading to inadequate policy implementation. Examples include: rigidities due to entrenched traditional divisions of labour within administrative organizations (very often along sectoral lines), insufficient integration between agencies and departments, etc.

4. Beyond market and intervention failure

The above perspectives and distinctions will now be put in a wider framework.

Transaction failure, Empowerment failure and Government failure

To begin with, I would argue that the range of environmentally relevant spontaneous social interactions is not fully captured by the market as an institution. Outside the market there are all kinds of multilateral and bilateral transactions with environmental and and economic significance. Beyond the market is social organisation itself, either non-governmental or governmental. I therefore propose that we incorporate into the analysis elements such as social mobilisation (failure) or (inadequate) countervailing power, and lack of public authority due to inadequate mandate given by society to its governments, as two main categories of "empowerment failure". Hence I suggest we replace the market-government distinction by a trichotomy: transactions-empowerment-policy (see table 1). Inadequacies at any of these three levels to achieve a social optimum (in our case taking sustainability into account) can be labeled "institutional failure". Market failure thus becomes one element of transaction failure, which in itself is one component of institutional failure.

We have at least three kinds of transaction failure: (i) market system failure which includes both inefficient markets (or market failure in the strict sense) and absence of markets, (ii) negotiation failure for all civil nonmarket transactions, covering both the situation where not all stakeholders are represented and that where they are, but suffering from bargaining power imbalances, and (iii) preference failures. Empowerment failure may occur at two levels: the non-governmental and the governmental. There may be a lack of social mobilisation to enable negotiation or demand-based market manipulation. Countervailing power at the non-governmental level is then inadequate. Secondly, there may be a lack of mandate at the government level to exert countervailing influence through policies, which should be addressed through political processes of authorisation leading to enhanced or more explicit mandates. Finally, government failure should include at least three categories: failures by government in formulating policies (either of intervention or of social mobilisation) to address unsustainability, failures in the intervention iself, and administrative failure. Some of these (sub-)categories may require elaboration.

Causes of market and preference failure

In order to understand the extent to which particular policies may be able to cope with market failures, their nature has to be looked at in more detail. The fundamental question is: what can be expected of markets? At their very best, markets co-ordinate in an efficiency-oriented way the decisions of billions of economic agents on how to allocate the resources they can decide over. They have as wide a horizon in time, space and scale, as these economic agents themselves have. They are therefore not inherently geared to overall systems' performance in terms of distributional aspects and sustainability. Inequity and scale issues may easily arise out of an economic process that is driven by market forces (e.g., economic growth under such circumstances will push the economy outside the environmental space[17]). This in itself is one reason for policies addressing the economic process, such as social and environmental policies. Put in another way, without such corrective or preventative policies, the market system gives rise to cost shifting. Let us look at that notion in some more detail[18].

The practice of cost shifting is facilitated by what could be labeled as: 'distance-related distortions'. There are three such distortions, related to different types of distance, ie distance in time, in space and in scale. The consequences or effects of environmental degradation in relation to economic activities manifest themselves at often large distances from the source or agent causing them. This may be a distance both in terms of *space* and *time* (e.g., DDT in polar ice caps, chemical time bombs and climate change). Effects of environmental degradation ar thereby shifted on to other people, to future people and even to other species. There is a third type of distance involved, namely that between the level of one's individual influence and the level at which a problem must be addressed for its solution. One could refer to this as: *distance in scale or in decision-level*. Single actors in a multi-actor context may face situations where their privately optimal behaviour may lead to socially or collectively undesirable overall outcomes (the 'prisoners' dilemma' in the case of very

Table 1: A Classification of Environmentally Relevant Types of Institutional Failure

Institutional Failure		
I: Transaction Failure	1: Market System Failure	Missing Markets
		Market Performance Failure
	2: Negotiation Failure	Missing Parties
		Asymmetries in Bargaining Power
	3: Preference Failure	Missing knowledge/information
		Incomplete preferences
		Time Preference Bias
II: Empowerment Failure	4: Social Mobilisation Failure	Missing/Inadequate Countervailing Power
	5: Authorisation Failure	Missing/Inadequate Remit/Mandate
III: Government Failure	6: Correction Failure	Missing Policies (environmental)
	7: Intervention Failure	Environmental Policy Failure: -Targeting Failure (inadequate objectives) -Instruments Failure (quantitative, qualitative) -Entitlement Failure
		Other Policy Failures (sectoral and macroeconomic)
	8: Administrative Failure	Integration Failure (horizontal)
		Intervention Level Failure
		Enforcement/Implementation Failure

Source: Adapted from Opschoor et al 1994: Managing the Environment. OECD, Paris

few actors, or the 'tragedy of the commons' in the case of many actors). Examples are: countries sharing a common resource, individual fishermen exploiting a shared fish population, etc. In many cases, the absence of control and intervention by national or international authorities, leads to an irrational exploitation of a shared or common property resource, to ongoing pollution, etc.

Distance-related distortion facilitates cost shifting. Where such distance factors prevail and the party on which the burden is shifted cannot counteract this distance by pressing his interest, government intervention may be needed - unless the costs of intervention exceed the benefits of intervention. This is quite obviously the case with a range of environmental problems. Reasons why these "external" interests are not adequately internalised, include:
a) absence of legally based 'property rights' or 'access rights' protecting the damaged party, or of liability/accountability regulations enforceable upon the causal agent;
b) absence of means to exert 'countervailing power' (Galbraith) through the political system (lack of voting power as in cases of transboundary cost shifting, or intertemporal cost shifting, or cost shifting onto other species), or through the market place (i.e. lack of purchasing power).
Reasons why this situation is not easily changed by installing more appropriate institutions or legislation, include the filtering process applied by any political system in responding to claims for systemic changes: the filters (again) of time preference (whereby future effects and future interests are discounted away), and of present purchasing or voting power, both heavily biased in favour of the predominant economic and political forces.

"Missing markets" relate to all situations where there is scarcity in a long-term perspective for a particular environmental component which, factually, is now dealt with as a free good; often, future demand for environmental goods is not reflected, property and access rights are not specified so as to lead to claims, etc. "Missing parties" include situations where allocational decisions are taken without all stakeholders being represented. Here again, future generations may be the most convincing example but in fact also other species could be regarded as stakeholders in many of the decisions now taken in the economic process.

Even if all parties with an interest can go to an appropriate market or negotiation table, they may be inadequately informed or suffer from "defective telescopic faculty" (Pigou) or "weaknesses in human imagination" (Ramsey) as manifested by our time preference; this is captured by the category of 'preference failure'. Preference failure leads to questions on the relevance of notions such as 'consumer sovereignty' as underlying Paretan welfare economics and the alleged superiority of market allocations even if otherwise market structures are perfect. Other causes of preference failure have been indicated earlier; see the comments on value hierarchies as made above.

Government failure

Failure to correct, ie, to intervene in the face of transaction failure or empowerment failure, is the first type of government failure. At the most fundamental level, government could 'go back' to society to renegotiate its own mandate, thus seeking correction of any kind of delegation failure that may have become manifest In Tinbergen's terminology, this is reform at the level of the foundations of the economic system. Given an adequate mandate, however, Governments may show correction failure in the sense that they fail to come up with -in this case- an environmental or sustainable development policy.

But if governments have environmental policies, these may fail in several respects. Here we shall go into the phenomenology of intervention failure; in a subsequent paragraph we shall look into the diagnostic and prescriptive aspects of it.

Intervention failures as defined above, can be divided into *policy failures* and *administrative failures*. The term *policy failure* refers to the range of regulatory instruments, fiscal, exchange rate, monetary, price, income and other policies (including environmental policy) which distort the private cost of environmental resource use as to make it privately rational to damage the social heritage. One may

speak of policy failure in two rather different cases.

1.   When prevalent policies (relating to sectors other than environmental and resource management) are based on decisions in which ecological or environmental considerations were given insufficient weight. This very often is the case with sectoral policies where sectoral interests and powers have predominated over, or excluded ecological considerations, or with policies dating back to periods of time when environmental problems were not yet perceived fully. Examples are: policies in the areas of agriculture, energy, transportation (see above).

2.   When environmental and resource policies inadequately address the social and ecological repercussions of economic activity, or are addressed at the wrong features. We restrict ourselves here to some more important cases: macro economic policies and price policies.

Economic growth may be beneficial for obvious reasons, having to do mostly with the welfare it enables. Economic growth may also be consistent with the maintenance of environmental quality, and is certainly feasible over some finite time horizon. However, given a finite resource base, and finite waste absorptive capacity, an overall and global growth maximisation strategy might not be sustainable in the long run. Current macroeconomic policies may suffer from potential policy failure in so far as long term environmental effects are ignored. The risk is that the global society will be confronted with environmental costs that are either irreversible (e.g. species extinction) or very costly to redress (e.g. the impact of pollution in Northern Bohemia or deforestation in tropical zones). From a long run perspective the levels of economic activities may have to be controlled and redirected to timely correct for this policy failure. This might be the case if changing the technologies or locations of our activities, would not provide sufficient responses to the ecological challenge.

Perhaps the most environmentally significant of the policy failures are those which drive a wedge between the true social cost of resource use, and the cost to the individual user -- the private cost of resource use. There exists a range of fiscal, exchange rate, price and income policies which have the effect of encouraging the over-utilisation of environmental resources.

At the level of objectives, governments may fail in adequately expressing e.g. equity or sustainability considerations; they may fail to safeguard the preservation of an adequate 'portfolio' of environmental assets (or ecological infrastructure) to future generations. An important next element is that of the (re)definition and allocation of property rights (both collective and private rights) and rights of access and use, in the face of environmental scarcities. This could mean establishing entitlements over environmental resources, liabilities for environmental damages, etc., with beneficiaries at alle relevant levels: individuals, communities and groups, regions, governments themselves, e.g. as custodians of ecological infrastructure for future generations, international agencies, etc. At the instruments level, governments may fail in selecting appropriate instruments (ie, they may have biases for or against economic instruments or command-and-control approaches, or for voluntary agreement and consensus-approaches, like in the Netherlands). Other policies' failure covers what is usually meant by government or intervention failure and will not be dealt with further. Finally, there is administrative failure. The most fundamental problem here is that of an approach at an inappropriate level of intervention: either too low (e.g., attempting to solve the greenhouse issue by one small country alone) or too high. In a way, intervention level failure may reflect empowerment failure, as is often the case with international, transboundary environmental problems where souvereignty and subsidiarity become relevant coniderations. But even if appropriate administrative levels exist, they may not be used correctly. A second type of administrative failure is that of lack of (horizontal) coordination or integration leading to spillovers in the form of externalities to other compartments or sectors. Finally, practical impediments to appropriate enforcement and implementation are included here.

Looking at table 1, it is easy to observe that a full scale approach to the causes of unsustainability in terms of institutional failure requires going far beyond market (performance) failure and policy failure as traditionally understood. This richer analysis may help in finding more appropriate answers to the question posed above: what are appropriate institutional settings from a sustainability perspective?

5. Intervention: the Standard Approach

If the economic process will not automatically move the economy towards a socially optimal allocation, then the question arises as to how to address this. Standard economic analysis has suggested two basic roads along which one might proceed: i) private negotiations and legal action, or ii) policy intervention directly aiming at an alteration of market prices (e.g. through charges), or redefining and altering the structure of property rights (e.g. by licencing, zoning, standards etc).

For road I): private actions, the point of departure normally taken, is Coase's theorem on bargaining. He has suggested that a bargaining approach might suffice in reaching a social optimum. Polluters and victims of environmental degradation are assumed to negotiate about the optimal level of environmental degradation or of economic activity giving rise to it, on the basis of their marginal damage costs and abatement costs. The mechanism assumed by Coase to operate, is the following. Left unregulated or in the absence of countervailing power from damaged parties, a polluter will try to operate at the level of activity where his profits are maximised. The social optimum is where the marginal profits are equal to the marginal damage due to the pollution. If the victim has legal rights to an unpolluted environment, then it could pay the polluter to compensate the victim . There allegedly is a 'natural' tendency to move towards the social optimum. This is also assumed to be true in the case where the rights are with the polluter and the victim pays the polluter for abstaining from his activities. The 'Coase Theorem' in fact claims that regardless of who holds the property rights, there is an automatic tendency to approach the social optimum via bargaining. If this mechanism could be trusted to operate adequately in real world situations, then government regulation of externalities would be redundant. Implicit in the analysis is, that intervention would be necessary only if the costs of reaching a bargain (the 'transaction costs') prove to be too high for an efficient solution to arise without it. These transaction costs include a range of elements difficult to measure such as: the cost of information on the nature and extent of environmental damage and treatment costs, costs of identifying, finding and addressing the relevant parties (both the polluters and the pollutees) or appropriate representatives of these, the cost of convincing them to reach a mutually acceptable agreement or the cost of litigation, etc. A number of criticisms of and complications with the Coasian approach have been identified and testify to the need for policy intervention. These include the lack of realism of various assumptions underlying the analysis such as the alleged market perfection, the level of transactions costs in actually achieving negotiation and bargaining on the level of pollution, and difficulties in identifying and mobilising the relevant polluters and sufferers. There are thus many reasons why bargains do not, and cannot easily, occur.

In the absence of bargains, there is a case for Government intervention (road ii). In fact, environmental policies by governments can be regarded as remedies for situations with high transaction costs and compliance/enforcement costs in the absence of such policies. Hence we proceed by looking into some theoretical possibilities for policy interventions: direct regulation via standards or zoning, taxes/charges, trading approaches, negotiation for agreements.

a) charges and standards
Pigou has advocated government intervention through the imposition of a tax on polluters based on the marginal (external) damage costs and the marginal abatement costs. The tax should induce polluters to automatically move to a socially optimal situation in terms of production and pollution abatement. However, in most cases it is impossible for an environmental agency to tax the pollution precisely at the appropriate level due to lack of adequate information on damage. The Pigovian solution has thus proven to be an impracticable one. "Proxy solutions" to this problem have been proposed, such as emissions charges aimed at realising some specified level of reduction of emissions[19], or a "standard". Charges then would at least equalise the level of marginal pollution abatement costs among firms, and thus provide an incentive for the most cost-effective total investment in pollution clean-up. One could regard the Baumol-Oates charge as a second-best alternative to the Pigovian charge, with Government allegedly making some assessment as to where the socially optimum emissions reduction objective might be located, based on an implicit social valuation of (marginal) environmental damages.
Charges tend to be a lower-cost method of achieving a given standard or emission level, than a

uniform standards policy if marginal abatement costs differ between sources. Moreover, they will provide a stronger incentive to firms to identify and even develop clean technologies with lower marginal abatement costs, as the financial reward of that exceeds the benefits of a standards based approach (at least in cases of rising marginal abatement costs).

b) Tradeable rights or quota
Marketable permits for emissions offer the same promise of efficiency as Baumol-Oates charges. By giving the polluters a chance to trade their pollution emission/discharge permits, the total cost of pollution abatement down to some predetermined acceptable level, is minimised. As long as polluters have different costs of abatement there is an automatic market - low-cost polluters selling permits and high-cost polluters buying them. The same reasoning applies to quota for exploiting a natural resource within some pre-established (sustainable) total yield. Trading ensures a cost-effective total abatement result. For emission permit markets to function well, they have to meet a number of conditions; we list the more important ones. First, like in the case of charges, there have to be significant differences in marginal pollution abatement costs and technological options for cleaner production must not have been exhausted. Second, the market must be characterised by sufficiently large numbers of buyers and sellers. Third, the importance of the location of both sources and receptors must be of relatively minor importance. Fourth, the rules governing the permits market must be simple and transparent. Tradeable permits could be seen as more compatible with standard economic practice (e.g. by industry) than charges. Permit markets could, however, be complex in administrative terms, and the conditions determining there functioning may not all be met in reality (eg. in terms of the number of market parties and hence their relative market power, or in terms of their proximity).

c) (Voluntary) Agreements
One other form of intervention is that of negotiation between government or the environmental agency within government on the one hand, and (representatives of) polluters on the other. This may take the form of so-called "voluntary agreements" negotiated between the environmental agency and sectors of society, e.g. industries, consumer organisations, etc.; the agreement will be on short and medium term changes in patterns of investment, technological change, consumption, waste treatment, etc. These voluntary agreements may at first sight resemble negotiation and bargaining as described earlier, but there are important differences. First, this type of negotiation does not normally involve the exchange of environmental quality against financial transfers. Second, the damaged or potentially damaged parties do not participate in the negotiations. One could regard the role of governments in these voluntary agreements as taking place on behalf of society at large including the sufferers from environmental degradation; as in the case of the Baumol-Oates charge, government might be assumed to seek for approximate a social optimum on the basis of some estimate of the marginal external damage costs. Also because these negotiations tend to be at the macro-meso level and tend not to be detailed enough to take into account locational aspects (of sources as well as receptors), this voluntary agreement is a second-best proxy only, but still one that could be better, from a point of view of effectiveness as well as efficiency, than that of no intervention.

The above arguments have focused on allocative efficiency in the full sense of that phrase, or on cost-efficient approaches to predetermined environmental objectives or constraints set by environmental policy. In a dynamic setting, environmental policy instruments have an impact on both the degree of technological innovation and the process of diffusion (or penetration) of new technology. Charges (as well as trading in emissions permits) in theory carry a dynamic incentive effect: they are assumed to augment the process of technological change almost by definition, as charges will always stimulate an interest in technologies that reduce pollution and the obligation to pay charges at a cost that is lower than the otherwise paid charge. Moreover, charges may not only induce an interest in end-of-pipe provisions that firms can operate at a cost lower than the charge, but they will wish to develop or buy inherently cleaner technologies that in practice very often prove to reduce normal production costs as well. Standards or non-tradable permits would lack this facility, often referred to as "X-efficiency" or "dynamic efficiency".

6. Intervention Reconsidered

The standard approach to intervention as reviewed above, appears to arrive at a coherent set of operational recommendations on how to intervene in the economic process: by putting in place some combination of economic instruments such that prices reflect the true costs of production and consumption, and the polluters/users of the environment pay for their pollution/use.

From a theoretical perspective one could say that an intervention strategy based on economic instruments, once being put in place, would imply a rather restricted and quantitative, economic process oriented approach, rather than a broad one one addressing the economic structure or its foundations. And this might be rather shallow compared with the at least structural (if not foundational) causes of unsustainability as analysed above.

First, it is a rather restricted approach even when it comes to quantitative interventions. Some empirically based observations[20] underline this:
1) ·   Economic analyses do not always convincingly reflect economic realities. Real markets do not always work as theory assumes. The efficiency and effectiveness arguments associated with economic instruments are not always applicable, as a review of the history of environmental policy instruments discloses[21].
2)   Non-economic instruments may produce equally well or even better than economic incentive; combinations of legal and economic approaches may turn out to be more promising[22].
3)   Economic analyses and recommendations often ignore or play down realities typical of the political "arena" (Majone) in which (environmental) policy is shaped in reality. One aspect of this is the issue of the distributional implications of environmental policy and instruments choice.

Secondly, there can be no single generally valid optimal intervention strategy, due to two sets of institutional or 'contextual' aspects: (i) differences in the structures (environmental, economic) in which the intervention is to operate (the 'application context'), and (ii) socio-political and cultural structures (the 'policy context').
Situation-specific characteristics relevant to the choice of instruments include source-related aspects such as: the availability of substitutes, elasticity, the potential for technological innovation, differentiation in abatement costs, competitiveness, market structure related features; they also include impact-related issues such as the seriousness of environmental damage, local and temporal variation in linkages between emissions and impact, etc. In Tinbergen's terminology, these are structural aspects that may require a more structural (rather than purely quantitative) intervention approach[23].
Moreover, governments' choices of policy instruments have a strong political basis and may be governed by a variety of considerations, some more rational than others. Acceptability is an important one, next to the economically more obvious effectiveness and efficiency considerations. Acceptability is defined here as the extent to which the instrument can be properly implemented and enforced without running into problems of non-concordance with existing regulations, principles and policies, or of resistance by target groups or indirectly affected agents, on the basis of allegedly unfair or unproportional burden-sharing implications (equity considerations)[24]. These arguments (on application context and on policy context) show that political, institutional and even cultural developments may influence the process of articulation of environmental policy objectives and strategies, and of instruments selection.

Thirdly, given the deep-rooted causes of unsustainability (see above) I doubt whether altering the stringency with which existing quantitative instruments are applied, or even whether adding to that set of quantitative instruments, are sufficient interventions in terms of achieving sustainability. One has to realise more profound changes. We are talking of using instruments in such as way that the economic structures are changing. We are even talking of altering the very foundations on a large set of issues related to the economic process. Basically, what is implied in the analysis so far, amounts to an argument in favour of alterations at the level of rights, responsibilities and power relationships[25], such that environmental quality claims and existence rights (of species), etc. are recognised, coupled with compensations to be made by those inflicting upon those rights.

7. Institutional Improvements towards Sustainable Economic Development

Some main lessons since the early '60s are that there will be a need for (i) redirecting growth, and perhaps for (ii) curbing growth (at least where it has become ecologically inviable), and (iii) that these objectives require new institutions and instruments capable of achieving the necessary entitlements and powers. Below we will present a general introduction to institutional changes that these lessons give rise to; in the subsequent Section we pay special attention to conceivable international institutional implications.

Redirecting economic growth

From a structural perspective, society needs to *prevent or reduce cost shifting* tendencies so that prices reflect (marginal) social costs and thereby provide appropriate and correct signals to decision makers in the economic and political process. This requires an institutional reduction of the impact of distances between cause and effect in *space, time* and *decision level* (see Section 4).

- Proper pricing policies may make far away environmental repercussions of economic behaviour count in decision making here and now; examples include direct price-oriented interventions such as charges and (the removal of) subsidies.

- The use of safe minimum standards will be an essential part of any environmental policy supporting sustainable development and will indirectly result in prices reflecting environmental costs, if the standards are implemented and maintained.

- But there will be many cases where it will be necessary to introduce new or extended legal arrangements for liability and accountability by changing the structure of property rights in environmental resources and environmental effects. This may be particularly appropriate where the problem is one of local degradation as a consequence of unidirectional externality. In cases of internationally shared environments or environmental resources in common property, new legal and administrative institutions may be needed to facilitate the negotiation of acceptable outcomes (see the next Section).

- Distance in *time* needs to be overcome by lifting the veil of time preference and by altering the preoccupation in the public sector with matters of immediate urgency. One form this could take is the adoption of some type of 'legacy principle', whereby countries agree to pass on to the next generation an environmental quality and environmental resource stock at least as large as the one they found. Institutionally, this would have to be complemented by installing some authority or body to represent and defend future generations' (and possibly outher species') interests, e.g. an Ombudsman-type organization for this specific purpose.

- The problems created by the distance in scale, or between *decision levels* can be overcome by creating platforms or authorities at levels high enough to cope with the problem at hand; that is at least to negotiate, and preferably to have some authority over the joint resource or environment and their uses. Many of these problems are manifest at the international level (see next Section).

- There is a need to review taxation policies and their foundations. In so far as scarcity is one justification for choosing tax bases, most current systems turn labour into an over-expensive factor of production and this reinforces tendencies towards unemployment. Ecotaxes are based on differences in environmental pressure or resource claims, and may be a very useful addition to the set of fiscal instruments, to replace other types of taxes (as on labour or value added) so that more labour intensive and less environmental resource intensive production processes are favoured in a fiscally neutral way.

Managing (curbing) economic growth

This may be needed when even with the interventions and institutions discussed under 'redirection', economic growth would still lead to an overall environmental pressure beyond the EUS. Economic activities likely to bring societies near or beyond their EUS would have to be scrutinised for their environmental impacts. If these are unacceptable, and if there is no scope for reducing them by further technological innovation, then it may be necessary to restrict the level of economic activity in that particular sector ("volume-oriented" or "scale oriented" policies), e.g. by allowing that activity to expand only in sofar as critical loads or safe mission standards are not exceeded[26]. This may ultimately result in changes of the overall patterns of production. Thus, there will be cases (especially

in the more intensively industrialised countries) where direct regulation of economic behaviour will be warranted or even preferable, e.g. from an efficiency or effectiveness point of view. Environmental policy thus inevitably requires extensions of the powers of the state into areas (e.g. economic planning, pricing policy, sectoral ("volume-oriented") policies etc.) from where it is, in fact, currently seen to withdraw.

Policies of curbing economic growth described so far, do not affect the basic forces underlying growth; they merely mitigate or curb the effects of these forces. Depending on how effective these growth-curbing policies are, more basic strategies might be needed. As we saw, growth tendencies are triggered by structural elements such as poverty or inequality; insecurity in a competitive and dynamic context; wrongly oriented technological innovation.

Firstly then, society can stimulate technological innovation oriented towards: (i) reducing the environmental burden of economic activities (dematerialisation, decoupling), (ii) enhancing the environment's capacity to generate economic inputs (environmental productivity) and (iii) improving the ecological infrastructure.

In the second place, poverty alleviation at the global level would both directly and indirectly reduce long term environmental pressure (see next Section).

Thirdly, the most profound policy to prevent growth would be that of reducing market insecurity and competition. As this comes close to the very essence of our economic system, one cannot but hope that the environmental crisis can be resolved without having to consider changes as fundamental as these (see also the next Section).

Basically what has been recommended above, amounts to an alteration of rights such that environmental pressure is recognized as a new type of claim on livelihood, existence rights (of species), etc. to be compensated for by those laying that claim, to those on whom the claim is being laid. Compensation will have to follow new regulations on rights of property of (and/or access to) environmental resources, accountability and liability. This could be in the form of an extension of the Polluter Pays Principle to not only the measures prescribed by environmental policy, but to damage costs (including ecological damage) in general. It might also entail developing a User Pays Principle, and a practically operational Precautionary Principle. Each of these principles would have to be worked into the mandates and regulations of the major national and international institutions and new institutions would have to be created to ensure the interests of those stakeholders that have hitherto been neglected:
-those groups (in the present generation) with little purchasing power and political clout ;
-future generations
-other species.
Another extension might be that non-compliance with agreed or prescribed practices be punishable much more heavily than is currently done, or that some *ex ante* 'performance bond' be made possible to be returned upon behaviour according to agreement.

Such fundamental reversals in legal status of polluters *vis-a-vis* pollutees, will not easily come about and may need political mobilization and coalition formation between various ngo's and interest groups ("countervailing power").

7.   INTERNATIONAL INSTITUTIONS AND SUSTAINABILITY

A special set of problems has to do with the regulation of access to resources in which there is no clear central authority. These are frequently referred to as the problems of the global commons. Access to every public good involves a political process, in the course of which users cede rights to some decision making regulatory authority. This is most difficult in the case of ecological services that extend across a number of juridical boundaries: such as a number of biogeochemical cycles, the upper atmosphere or biodiversity. The biosphere only allows a limited "amount" of effective metabolism on the environment-economy interface, even if this limit can be extended through scientific and technological advance. 'Metabolism' here is the sum of resources (matter and energy) mobilized by society and its wastes and pollution released into the environment. Prevailing

inequalities and persistent tendencies of production growth in all societies, lead to an accelerated and insaturable growth push bringing the global economy beyond the levels of effective metabolism that the biosphere can sustain. Thus, globally and in a long term perspective, the situation is one of *inherent insecurity and unsustainability*.

Necessary (perhaps not even sufficient) steps to alter this include the establishment of:

a)   effective global redistributive mechanisms and institutions
      Sustainable global development implies international institutions capable to change
      prevailing distributions of incomes and current distributions of access to sources of
      income and wealth, including environmental resources and world markets. This,
      therefore, is a question not just of aid, but also of trade and technology. Here we
      confine the expose to some comments on institutional aspects.

      In the area of the establishment of fair shares in future carbon emissions, distributi-
      onal issues prove to be tremendous stumbling blocks. Most work on strategic
      behaviour of parties to international negotiations over common property resources
      indicates the importance of transfers as instruments of international environmental
      policy. This raises a number of practical issues concerning, for example, the precise
      role of international institutions, such as the World Bank, and UNEP, in the process.
      It also raises the issue of conditionality. Certain forms of transfer are already linked
      to the adoption of environmental reforms -e.g. 'debt-for-nature'-swaps. One of the
      most promising suggestions is that relief be offered on debt servicing obligations in
      exchange for a range of reforms, the principal being written off only as specific
      targets are fulfilled. Other forms of 'green conditionality' are now commonly attached
      to development assistance, and the World Bank has used its leverage in a number of
      countries to promote the development of Environmental Action Plans.

      Apart from redistribution of financial resources and environmental quota, there are
      other issues such as the one of the redistribution of knowledge and intellectual
      property.

b)   effective resource management and enforcement facilities
      In cases of internationally shared environments or commonly used environmental
      resources, legal and administrative institutions may be needed for more appropriate
      management, and for resolving disagreements about actual use. This often means
      establishing new types of jurisdiction at high administrative levels. The International
      Rhine Committee is an example of such a new institution (but one without enough
      authority), and so are the North Sea Conferences. This point leads to questions
      related to souvereignty and jurisdiction. Transfers of sovereignty to international
      institutions in the area of natural resources and environmental management, will be
      necessary both in view of global problems and with regard to regional and sub-
      regional components of the biosphere. They will also take the form of engagements
      in agreements and conventions on the use of global resources and ecosystems, on
      biological diversity, on the rights of future generations and on the rights of other
      species; etc.
      There should also be an international environmental authority (within the UN-system)
      with a mandate, the competence and the instruments to effectively implement a
      global sustainability oriented policy. This authority (wherever it is vested: in UNEP, in
      a special Security Organisation, in ECOSOC, or elsewhere) is to:
      -coordinate multilateral work in the areas of environmental quality, natural resources
      and biological diversity;
      -set international standards and have the power to monitor and even enforce
      adherence;
      -settle disputes between nations on transboundary environmental and resource
      problems;

-etc.

c)   reforming multilateral development structures
      Firstly, sustainability-oriented mechanisms are needed for price setting on world
      markets. In cases where environmental effects are redistributed via the world market
      mechanism (international trade and investment), these effects have to become
      known and visible, and (where needed) to be transferred into changing regulations
      on international trade (e.g. GATT/WTO-rules, international price regulation, etc). This
      will especially be the case when North-South trade results in unsustainable patterns
      of production in developing countries, or where developing countries are (e.g. as a
      consequence of international debt servicing obligations) are forces to sell out natural
      resources on the world market. The Polluter Pays Principle (extended to: User Pays)
      should be a central principle in the new WTO-charter, and so should the notion of
      minimum sustainability standards, to be translated into adequate process standards
      to be set by governments in order to avoid the risk of being suspected of 'green
      dumping'.
      Secondly, the World Bank and IMF-mandates and structures may require revision in
      the light of sustainable development. The World Bank has moved far along this road
      in theory, but this needs to be entrenched in the realities of Bank-sponsored
      operations. IMF is beginning to give environmental matters some thought, but this is
      far from adequate. Accepting the necesstity of development but underlining that
      development is to be sustainable, one must question the Bank's and Fund's strategy
      of fostering unrestricted trade liberalisation and export-led growth that is implicit in
      WB and IMF interventions. Strengthening economies by developing domestic and
      regional markets might even be precautious from a sustainability point of view.

d)   institutions and mechanisms for changing global patterns of production and con-
      sumption
      Poverty alleviation at the global level will come about only via economic develop-
      ment and growth, implying additional environmental burdens in the short run.
      Poverty alleviation without changing the quality of economic growth, is a cul-de-sac.
      Given the present distribution of per capita environmental claims as well as welfare
      levels, it is obvious that there are to be substantial quantitative changes as well, and
      that these have to come in the West first: qualitative changes in East and South will
      only come about in sofar as the consumption patterns in the West will manifestly
      reflect new environmental values and if there is an explicit willingness on the side of
      the richer countries to assist the poorer countries in accomplishing reorientations in
      their production patterns whilst guaranteeing them rising material per capita welfare
      levels. This requires a drastic reorientation (sometimes reduction) of consumption
      and production in the North: new lifestyles and ecologized production patterns.
      There is no institutional structure in place to ensure that effective and equitable
      reconsideration and change of patterns of production and consumption will take
      place; it is here that I see the major shortcoming in the multilateral institutional
      structure.

8.   Conclusions

Sustainability can be defined in several ways but in this analysis it refers to the maintenance of the
ecological infrastructure as defined in Section 2. This gives scope for society using the environment:
the 'environmental utilisation space' (EUS). Societies have to identify and embark upon a feasible
and acceptable level of environmental utilisation that they wish to enjoy sustainably - if such a level
that is both acceptable and sustainable exists. From a welfare maintenace perspective as is implied
in the WCED-definition of sustainability, staying within the EUS is a sufficient, not perhaps a
necessary condition for sustainability. Adding to sustainability the precautionary approach may imply

that staying within the EUS becomes a necessary condition as well. The main question addressed in this paper is: what institutional conditions and changes might foster sustainable development and development towards sustainability?

As environmental degradation is intimately linked with economic activities, we are interested in the institutions that shape and/or affect the 'economic process': the 'foundations' of the economic system (ie, its underlying political system, predominant norms and values, etc), the 'economic structure' (ie, the factor endowment, social structure and the derived production patterns; elasticities; market structures, etc) and the 'instruments' used by society to direct or influence the economic process. Normally in economic policy, attention is focused on issues of efficiency, and -to a lesser degree- of equity. Environmental or ecological economics cannot be satisfied with that, if the EUS is to be respected as presenting an ecological constraint on long-term economic development. A third and even a fourth criterion are needed: *coevolutionary sustainability* and *interspecies equity*: a societally accepted element of care for the prospects of other species, insofar as humankind can effect these prospects.

Typically, economic analyses of environmental problems and the response to these, look at them form the perspective of 'market and government failures'. In this paper the conceptual framework is broadened to: Transaction failure, Empowerment failure and Government failure. Outside the market structure there are all kinds of multilateral and bilateral transactions. Beyond that, and even underlying the level of transactions, is social organisation itself, either non-governmental or governmental. I propose we incorporate into the analysis elements such as social mobilisation (failure) or (inadequate) countervailing power, and lack of public authority due to inadequate mandate given by society to its governments, as two main categories of "empowerment failure".

Inequity and scale issues may easily arise out of an economic process that is driven by market forces (e.g., economic growth under such circumstances will push the economy outside the environmental space. Without corrective or preventative policies, the market system gives rise to cost shifting. This is facilitated by 'distance-related distortions', related to different types of distance, ie distance in time, in space and in scale.

The standard approach to these is to put in place some combination of economic instruments such that prices reflect the true costs of production and consumption, and the polluters/users of the environment pay for their pollution/use. However, this is a rather restricted approach even when it comes to quantitative interventions. Moreover, there can be no single generally valid optimal intervention strategy, as policies have to operate in different 'contexts': (i) differences in the structures (environmental, economic) in which the intervention is to operate (the 'application context'), and (ii) socio-political and cultural structures (the 'policy context').
Thirdly, given the deep-rooted causes of unsustainability (see above) I doubt whether altering the stringency with which existing quantitative instruments are applied, or even whether adding to that set of quantitative instruments, are sufficient interventions in terms of achieving sustainability. One has to realise more structural changes and systems' reforms: rights, responsibilities and power relationships, such that environmental quality claims and existence rights (of species), etc. are recognised, coupled with compensations to be made by those inflicting upon those rights.

There is a need for institutional change and reforms in the areas of: (i) redirecting growth, and perhaps for (ii) curbing growth (at least where it has become ecologically inviable).
1) Institutions are required that are capable of safeguarding that the economic process stays within the environmental utilisation space: safe standards, zoning etc. will have to be applied and enforced. Environmental agencies will have to be empowered to take structural or volume-oriented measures wherever this is needed.
2) Ombudsman-type institutions may be required to represent and defend future generations' interests, and perhaps other species' interests.
3) Proper pricing in a framework of appropriate entitlements, liabilities and responsibilities will have to back this up and enhance society's efficient use of its environmental space. Tax reform and financial accountability (Polluter and User Must Pay) can achieve that.

4) Institutional reform must ensure that basic driving forces of unsustainability are adrressed (e.g. effective reductions in poverty and insecurity) or neutralised (e.g. appropriate technological innovation). This has repercussions for existing international institutions (GATT/WTO, World Bank, IMF, etc), but a number of areas have been identified in which institutions or mechanisms appear to be lacking, e.g.: (i) redistribution of wealth and access to EUS; (ii) regional and global resource management; (iii) changing patterns of production and consumption.

1. This paper has been presented as an invited plenary address at the 3rd Conference of the International Society for Ecological Economics, San Jose, Costa Rica, 24-28 October 1994. The author is endebted to many more colleagues than have been referred to in the endnotes.

2. World Commission for Sustainable Development (1987): _Our Common Future_. Oxford Universtity Press, Oxford, p. 46.

3. See eg, R.S. de Groot (1992): _Functions of Nature_, Groningen: Wolters-Noordhoff.

4. IUCN et al (1991) _Caring for the Earth: a Staregy for Sustainable Living_. Gland, Switzerland, p.200; Opschoor J.B. and Ch. Perrings (1994) "The Loss of Biological Diversity: Some Policy Implications". _Env. & Res. Econ's_ 4 No 1: 1-13.

5. H. Siebert (1982), "Nature as a Life Support System: Renewable Resources and Environmental Disruption". _Journal of Economics_ Vol. 42 No 2:133-142. J.B. Opschoor (1987): _Duurzaamheid en Verandering: over de Ecologische Inpasbaarheid van Economische Ontwikkelingen_ (Sustainability and Change: on the ecological viability of economic development). VU-Boekhandel, Amsterdam; with G.A.J. Klaassen (1991): "Economics of Sustainability or the Sustainability of Economics: different paradigms", _Ecological Economics_ 4 (1991): 93-115; Hans Opschoor (1992):"Sustainable Development, the Economic Process and Economic Analysis", in J.B. Opschoor (ed): _Environment, Economy and Sustainable Development_, Wolters-Noordhoff, Groningen 1992.

6. The latter implies the preservation of the relevant ecological infrastructure or the underlying ecological processen and systems. One can in principle generalise this to include nonrenewable resources by requiring decreases in stock levels of these resources to be compensated by equivalent increases in renewable ones. The term 'relevant' is used in the definition to acknowledge the element of judgement that inevitably plays a role in any assessment of the size of the environmental space (see below).

7. These terms refer to the environmentally relevant material aspects of economic activity: pollution and waste generated, and materials and energy used. See eg, H. E. Daly (1972) _Steady State Economics_. W.H. Freeman and Cie, San Francisco; Weterings and Opschoor (4); J.B. Opschoor (1994): "The Environmental Space and Sustainable Resource Use" in: F.J. Duijnhouwer, G.J. van der Meer, H. Verbruggen (eds) _Sustainable Resource Management and Resource Use: Policy Questions and Research Needs_. Raad voor het Milieu en Natuuronderzoek, Publicatie Nr. 97, Rijswijk.

8. The Netherlands' environmental policy, for instance, aims at achieving sustainability of its environmental claims "in one generation" (i.e. by the year 2010), and it has made this operational in terms of a large number of (mostly) substantial reductions of emissions and energy use to be achieved by that time. Ministry of Public Housing, Planning and the Environment: _National Environmental Policy Plan_ No 1 (1989), No 1+ (1990), No 2 (1993). SDU-Uitgeverij, Den Haag.

9. Eg, Nobel-laureate R. Solow (1992): _An Almost Practical Step Toward Sustainability_. Resources for the Future, Wash. DC., October 1992.

10. "Societies may choose to accumulate human capital... or man-made physical capital in exchange, for example, for running down their mineral reserves or coinverting one form of land use to another. What matters is that the overall productivity of the accumulated capital ... more than compensates for any loss from depletion of natural capital" (World Bank 1992:8).

11. Between the extremes of strong and weak sustainability various other positions could be taken. For instance, Dutch Development Cooperation policy has adopted a "strong, unless.."-position: if it can be demonstrated that running down a natural resource can indeed be compensated by human or produced capital without risk to overall sustainability and biodiversity, then such a development can be supported.

12. J. Tinbergen (1956). _Economic Policy: Principles and Design_. North Holland, Amsterdam.

13. These concepts directly or indirectly derive from Tool as quoted by Swaney J.A. (1987): 'Elements of a Neoinstitutional Environmental Economics' _Journ of Econ. Issues_ XXI-4:1739-1781, or from Swaney himself (op.cit.).

14. J.B. Opschoor (1974) _Economic Valuation of Environmental Degradation_ (in Dutch), Van Gorcum Assen; see also R. Hueting (1980) _New Scarcity and Economic Growth_, Elseviers, Amsterdam.

15. OECD (1992), _Market and Government Failures in Environmental Management: the Case of Transport_, Paris.

16. Kapp W. (1969), 'On the Nature and Significance of Social Cost', _Kyklos_ 22-2:334-347; Pearce D. and K. Turner (1990) _The Economics of Natural Resources and the Environment_, Harvester Wheatsheaf, New York/London; Opschoor 1987 op. cit.

17. Herman Daly speaks of "scale"-problems is such cases; H.E. Daly: "Allocation, Distribution and Scale: Towards an Economy that is Efficient, Just and Sustainable". _Ecol.Econ._ Vol. 6(1992) No 3:185-194.

18. See also Klaassen G. and J.B. Opschoor, _Ecological Economics_ 1991 and Opschoor J.B. and J. Van der Straaten: "Sustainable Development: an Institutional Approach". _Ecol. Econ._ Vol. 7(1993) No 3: 203-222.

19. Baumol W.J. and W.E. Oates (1988). _The Theory of Environmental Policy_, Cambridge University Press, Cambridge.

20. Opschoor J.B., A.F. de Savornin Lohman, H.B. Vos (1994), _Managing the Environment: the Role of Economic Instruments_, OECD, Paris.

21. Very often economic instruments are used merely as adjoints to regulatory approaches, in "mixes" the performance of which in terms of efficiency and effectiveness are preferred (if not actually better) than those of "pure' instruments, especially the purely economic ones. A shift from a regulary approach towards one based on economic incentives only is unlikely to occur, nor would it be desirable. Combinations of instruments are preferable and within such "cocktails" economic incentives will have a

crucial role to play.

22. For recent attempts in this direction, see (i) Zweifel P and J.-R. Tyran: "Environmental Impairment Liability as an Instrument of Environmental Policy". Ecological Economics 11(1994)No.1:43-56; and (ii) J.F. Shogren, J.A. Herriges and R. Govindasami: "Limits to Environmental Bonds" Ecological Economics Vol 8 (1993) No 2:109-134.

23. One important aspect often ignored in the traditional approach to economic instruments is the fact that in economic life interventions based on specific types and levels of environmental degradation often imply interventions in complex product life cycles and materials chains. Moreover, in product chains environmental degradation in fact "accumulates" from the environmental impacts in the mining stage in which the inputs are extracted, via the impacts in the various stages of secundary to final production, to the environmental impacts of consuming these products and entering them into the waste segments of the product life cycle. For environmental policies to truly attempt to be efficient, an integrated "chain approach" should ideally be applied to products and associated processes, and it is in such a context that instruments choice should be placed.

24. The actual development of environmental policy instruments has followed different courses in different parts of the OECD region, due to the diversity of policy contexts prevailing in OECD member countries. There may be differences in: general political outlooks, e.g. on market intervention; political environments in which individual countries operate (e.g. EC, EFTA/Nordic Council, NAFTA); political structures (federalism etc.); basic tenets of environmental policy (e.g. quality oriented or source oriented); distribution of responsibilities for economic sectors (and environmental compartments) over ministries, policy levels and agencies; etc (Opschoor and Vos 1989: Economic Instruments for Environmental Protection, OECD, Paris).

25. This has implications for economic valuation aimed at underpinning optimal levels of resource exploitation and pollution as well; some recent proofs of this can be found in (i) M.Faber and J.L.R. Proops: "Natural Resource Rents, Economic Dynamics and Structural Change: a Capital Theoretic Approach". Ecological Economics Vol 8(1993) No 1: 17-44; and (ii) C.L. Lant: "The Role of Property Rights in Economic Research on US Wetlands Policy". Ecol.Econ. Vol 11 (1994) No 1: 27-34.

26. Given (a) the very considerable and fundamental uncertainty associated with the future environmental effects of current activities, (b) the potential for 'overshooting' ecological thresholds where optimal levels of private resource use are determined on the basis of (current) market prices, and (c) the irreversibility of environmental effects such as species extinction, the best means of ensuring the ecological sustainability of economic activity is likely to lie in the application of safe minimum standards of environmental access. In systems that are neither controllable nor observable through the price mechanism, and where many environmental assets are in the nature of public goods, safe minimum standards will be an essential part of a strategy of sustainable development.