The Intrinsic Political Aspects of Environmental Problems

Henk C. van Latesteijn
Netherlands Scientific Council for Government Policy
PO Box 20004, 2500 EA The Hague, The Netherlands

Abstract The tension between societal and environmental goals is culminating in the debate on sustainable development. All efforts to model this complex relationship start with some type of limited carrying capacity of the environment that must be obeyed. These concepts presuppose unequivocal scientific information that can reveal the distinction between the sustainable and the unsustainable. However, one can argue that sustainable development points to a subjective trade-off between environmental and societal issues. In a study by the Netherlands Scientific Council for Government Policy, it is demonstrated that different paradigms for sustainable development emerge from the perceptions of risk that stem from uncertainties in scientific facts and subjective objectives. We cannot exclude these perceptions and value judgements from the political process by introducing fictitious objective measures that define sustainability. Rather, the discussion on value judgements should constitute the heart of the political debate. This does not imply that it is impossible to conclude that society should stay within certain limits of energy use or acidification. However, we should acknowledge that such a political agreement is always provisional, i.e. dependent on then available knowledge and valuation of all the factors involved. This consensus may easily disappear as new scientific information and societal circumstances emerge.

1. INTRODUCTION

Environmental policies show a distinct evolution over the last two decades. The seventies were dominated by policies for solving acute problems. In the eighties environmental policies were designed that show a more structural approach. The purpose of this shift is to avoid future environmental problems by imposing standards that are deduced from the earlier identification of pollution problems.

This line is continued in the nineties, but now the call for more general preventive policies becomes apparent. However, preventive policies need some type of reference. Numerous governments have embraced the concept of sustainable development as this reference value.

The Brundtland Commission defined sustainable development as a concept 'that meets the needs of the present without compromising the ability of future generations to meet their own needs' [WCED, 1987]. The question of what needs the present generation should safeguard for itself and the next generations cannot be based on objective measurable ecological data alone. Subjective choices are also at issue. In this paper, a somewhat diverging effort to implement the concept of sustainable development by the Netherlands Scientific Council for Government Policy [1995] is described. Differing perceptions of societal and environmental risks are the starting point of the approach. This requires discussion on how sustainable development is related to perceptions of risk.

2. THE DIFFICULT CONCEPT OF SUSTAINABLE DEVELOPMENT

The concept of sustainable development arose in reaction to a general and diffuse sense that the environment was being increasingly harmed by human activity. However, human endeavours do not only have negative implications for the environment but primarily have brought prosperity and quality to our lives. It is easily forgotten that modern agriculture is capable of feeding an increasing world population, that life expectancy has increased substantially, that human health has improved significantly and that the standard of living has increased on a world-wide scale. At the same time, recognition of the benefits should not deny that these achievements are also associated with the possible exhaustion of resources and potential or acute damage to the natural environment. So, if one tries to assess the value of developments, both aspects of human activities should be fully appreciated.

The Brundtland Report put the concept of sustainable development firmly on the political agenda. The report gives a clear indication towards a two-sided appraisal of human activities, both fulfilling needs and endangering the environment. The report states that:

'In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and fu-

ture potential to meet human needs and aspirations.'

This indicates that sustainable development is concerned with at least two dimensions: the continued existence and well being of humankind and that of the environment. Harmony must be established between all the activities required to meet human needs. However, the Brundtland Report does not elaborate what is meant by the harmonious treatment of the environment or when human activities will result in unacceptable damage to the environment. In society, different opinions are present on what are legitimate human needs or what are essential environmental values. This has led to a wealth of different operational definitions of the original concept of sustainable development.

2.1 Ecological and economic sustainability

The differences in definition make it clear that sustainable development is not an objective feature of a process. Rather, it involves assigning the label of sustainable or non-sustainable to human activities. This implies an appraisal of both the well-being of mankind and society and that of the environment. Social well-being can be measured in terms of the extent to which needs are satisfied, not only the needs of the present, but also of future generations. However, by defining sustainable development this way, the present generation assesses the needs on behalf of future generations. The well-being of the environment can be measured in terms of the extent to which environmental functions and assets are left unharmed. Consequently, whether human activities deserve to be labelled 'sustainable' must be based on both societal and environmental well-being.
Figure 1 shows the "circles" that can be observed.

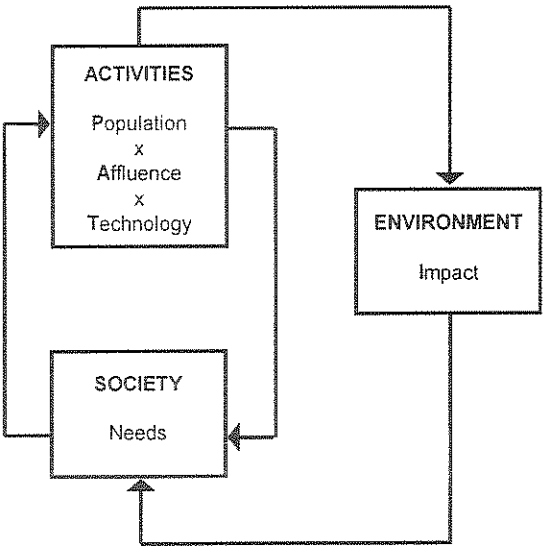

Figure 1: Interrelationship between activities, needs and environment in the economic and ecological system.

All activities find their origin in the economic domain, but sometimes the activity will have a negative impact on the environment. The magnitude of the impact is related to the number of people involved in the activity, the level of affluence of society and the technologies used.
In many interpretations of sustainable development, just one of the two circles is taken into consideration. If ecology prevails, a standard is assigned to elements of the environment that may not be exceeded. If economy prevails, the satisfaction of societal needs is of paramount importance.

2.2 Ecology prevails

As illustrated by Hueting [1990] the emphasis on the ecological system may manifest itself in proposals to adjust the estimate of national income with ecological damage. Others, like Daly [1990] propose to give greater priority to 'environmental criteria' than to human needs. In this approach, 'ecological constraints' are determined in absolute values. The advocates of this position propose that the natural resource base should be kept intact, no matter the consequences for society. Therefore, limits are defined within which human activity must take place if it is to be sustainable [Daly, 1995]. The notion that the environmental risks are exceptionally great justifies this position. This ignores the fact that others may have an - in their eyes - equally justified, though totally different perception of the environmental risks involved.

2.3 Economy prevails

Alternatively, confidence in the robustness of the ecological system may lead to an evaluation of human activities entirely based on social needs and the risks of undermining these needs are regarded as excessive. Any consequence for the environment is justified with the express desire of meeting those needs.
This approach does not explicitly examine more 'environment-friendly' behaviour. Environmental interests will only come into focus if the environment can no longer facilitate given needs. This 'learning by doing' approach presupposes that there are sufficient feedback mechanisms in society and that there is enough reaction time.

2.4 Balancing subjective preferences

By simplifying the discussion on sustainable development to proponents and opponents, a number of highly divergent and sometimes conflicting perceptions of sustainability are lost. Each of these perceptions leads to a specific interpretation of the ecological and the socio-economic values that must be respected.

Therefore, it is essential that both socio-economic and ecological dimensions be incorporated in an operational approach to sustainable development. Choices in favour of certain environmental values or certain human needs need to be based on the consequences of those choices for the other dimension. This 'double goal' is not always clear in present policies.

3. SUSTAINABLE DEVELOPMENT AS A POLICY TOOL

The scientific concept of ecological carrying capacity is used to define sustainable development. By determining the carrying capacity of the environment, constraints can be defined for the various activities that impose a burden on the environment. In turn, these constraints can be used to determine the necessary changes in behaviour for sustainable development. This concept is attractive for government administration: hard, scientific constraints and parameters can render political debates superfluous. However, this type of decision support tool presupposes scientific information that is capable of distinguishing between the sustainable and the unsustainable in a way that is convincing enough to overcome political differences of opinion.

3.1 Political robustness and scientific uncertainty

The notion of indisputable scientific constraints is, to begin with, at variance with the observation that sustainable development is about the quality of both the environment and society. If the 'demands' of the environment do not cut across social desiderata, there is of course no problem. In practice, we accordingly find that the greatest progress is made in 'win-win' situations.

Problems arise where ecological and social desiderata come into conflict. If an abstract consensus has been reached about the need to strive for sustainable development, this can suddenly prove paper-thin once the consequences become visible and tangible. Instead of providing clarity, the application of the concept then simply leads to escapist behaviour.

Moreover, the notion of decisive scientific information denies the dynamic nature of science. Constantly new knowledge is generated that qualifies or tightens previously formulated 'demands' on society. Knowledge previously regarded as incontrovertible then proves to have been no more than provisional insight.

The main scientific problem in discerning the sustainable from the unsustainable is the lack of the requisite information for a complete and coherent analysis. In many cases, the knowledge concerning environmental developments and the impact of human activities on those trends is no more than fragmentary. In particular two problems arise: *inherent ignorance* and *uncertainty*.

3.2 Inherent ignorance

The assessment of constraints that stem from the concept of ecological carrying capacity implies the understanding of a very complex system. The environment does not exist as a unit or entity but needs to be defined as a system of differing ecosystems supplemented by abiotic elements. Because ecology deals with the analysis of ecosystems, this discipline could provide the building blocks for setting environmental quality standards. To date, however, it has proved impossible to determine unambiguously which elements are vital for the functioning of an ecosystem. Ecology is not ready to deal with questions of this type, and will probably never come up with definitive answers.

This may be clarified by drawing a distinction between repeatable and unique systems. Systems analysis is based on the concept of repeatable systems. The time-scale of the system is known and the number of elements of the system is limited. The majority of natural ecosystems, however, are unique systems, characterised by a large number of unknown positive and negative feedbacks and an infinite time-scale. Therefore, knowledge of the resilience, robustness and persistence of complex natural ecosystems is limited. At best, science is able to provide a partial and conditional insight into positive and negative feedbacks of natural ecosystems.

3.3 Uncertainty

The debate on sustainable development is also hampered by statistical and fundamental uncertainty. Statistical uncertainty stems from the lack of knowledge concerning human intervention and its effects on the environment, while fundamental uncertainty stems from partial knowledge of complex relationships that may lead to differences in insight concerning that relationship.

Sometimes the effects for the quality of the environment can be described with a dose-effect function. However, a widely used metaphor in this line of research is the black box. Since the properties of the system are unknown, the effects of an impact are only examined on the outside of that. The relationship between the dose and the effect can only be portrayed in the guise of a scatter diagram, indicating that different effects have been observed for a particular dose. The relationship between the intervention and the effect is evidently disturbed by background interference that cannot be screened out.

In the case of many dose-effect relationships, it is not even possible to provide an indication of the

size of the background interference and there is total uncertainty about the precise position of the points. The reason for this is that much scientific research into these relationships does not only reveal statistical uncertainties, but also fundamental uncertainties that prove unbridgeable. The ongoing debate about the potential effects of climate change is illustrative.

However, even if the relationship between (for example) the use of fossil fuels and the rise in sea levels is unknown, choices have to be made for policy purposes. In these circumstances, risk becomes the determining factor in the choice. Risks related to statistical uncertainty can be estimated, but risks related to fundamental uncertainties are necessarily based on subjective estimates. Therefore, the conclusion is that in matters of sustainability we have to deal with *perceptions of risks*.

3.4 Perceptions of risks and sustainable development

One way of dealing with the problem that sustainability is a subjective notion, is simply to accept the fact that plural interpretations of sustainable development are possible. This calls for an analysis of current and future situations that are believed to be essential to sustainable development. Haavelmo and Hansen [1992] note that policies aimed at attaining sustainability first need a good knowledge of the consequences of alternate directions of human activities both in production and in consumption. This can be achieved by introducing different paradigms of sustainability: sets of assumptions that together define the perception of risk with respect to society and the environment.

4. EXPLORING SUSTAINABLE DEVELOPMENTS

The starting point for this type of analysis is an identification of the different positions. One specific definition of 'sustainable developments' may be based on the notion that the environment is very vulnerable and that society should be able and willing to accept rather drastic changes. This will differ considerably from the view in which the environment is considered as highly flexible and society as very reluctant to accept changes. In a next step, these different positions can be used to sketch possible future developments in a number of scenarios that point to the consequences of current policy decisions for future generations.

4.1 Four action perspectives

Four paradigms are selected that can be considered as defining the corners of the playing field of most of the discussions on sustainability. The paradigms are denoted as *Utilising*, *Saving*, *Managing* and *Preserving*.

In the *Utilising* paradigm the environment is thought to return to its original position after a disturbance has taken place. Risks for the environment are relatively small and timely adjustments in technology can prevent major problems. Technology is thought to be self-regulating.

In the *Saving* paradigm the environment is thought to have a limited absorbing capacity. However, technology is very difficult to steer and forced shifts in economic production will cause massive societal obstruction. Therefore, the solution must be found in redressing the levels of consumption.

In the *Managing* paradigm adapting technologies must protect the vulnerable environment There are no major limitations to transforming the technology, but changing the level of consumption would lead to unacceptable societal risks.

In the *Preserving* paradigm any human activity poses a threat to the fragile environment. So, all adaptations of society that we can think of should be put into effect. The risks for society related to these drastic changes are acceptable. Society is very flexible and with the proper measures and efforts changes can be initiated before major damage to the environment becomes apparent. The summary of the four paradigms and their contents is given in Table 1.

UTILISING	SAVING
'environment can be exploited'	'consumption must come down'
self regulating technology	environment is vulnerable
predominantly trial-and-error	technology cannot be adapted
MANAGING	**PRESERVING**
'production must be adapted'	'all hands on deck'
environment is vulnerable	environment is fragile
technical solutions are feasible	trial-without-error

Table 1: The characteristics of the four paradigms of sustainable development

	'DEMAND-SIDE'	'SUPPLY-SIDE'
World food production	diet (luxury vs. moderate)	orientation (global vs. local)
Energy supply	energy intensity	structural change
Conservation of nature	aim (features vs. unspoiled area)	space (minimal vs. maximal)
Use of raw materials	raw material intensity	means of extraction
Regional water supply	consumption	water quality standards

Table 2: 'Risk-variables' with respect to demand and supply side changes in society for the five environmental themes

4.2 Sustainable scenarios for environmental themes

The paradigms *Utilising*, *Saving*, *Managing* and *Preserving* all aim at sustainability, however different their assumptions may be. These assumptions can be considered as input or motivation for behaviour. Whether this behaviour will result in a sustainable situation cannot be assessed a priori, but should be judged by the effects of this behaviour in the long term. Thus, the impact on future generations becomes visible and subject to feedback. To that end, the four paradigms are translated into action perspectives by considering specific environmental themes.

Five different environmental themes are selected to illustrate the diverging outcomes of sustainable development if the assumptions are taken to their logical conclusion. They are:

1. world food supply
2. energy supply
3. conservation of nature
4. use of raw materials
5. regional water supply

A uniform method is applied to all these themes that consists of defining the action perspectives based on the four paradigms, translation of the action perspectives into scenarios and evaluation of the results.

4.2.1 Action perspectives

Roughly speaking, the four paradigms lead to action perspectives that reveal distinct risk perceptions related to the demand-side and the supply-side of society. With respect to the demand side, *Utilising* and *Managing* do not have much faith in the flexibility of consumer society, so all given demands should be fulfilled. *Saving* and *Preserving*, on the other hand, reflect a perception that society is able to assimilate the risk of (drastic) changes in consumption. From the supply-side, a different distinction is apparent. *Utilising* and *Saving* show no great confidence in the possibilities of technological adaptations. The risks for society involved are too high a price to pay. *Managing* and *Preserving* show the opposite belief. Society is capable of adopting technological changes at the necessary pace to alleviate environmental problems. The five environmental themes of course are all different in the operational outcome of these divisions. The variables with respect to the perceived risks on the 'demand-side' and the 'supply-side' for all environmental themes are given in Table 2.

4.2.2 Scenarios

The action perspectives for the five environmental themes have been elaborated into scenarios of possible developments up to the year 2040. These scenarios illustrate the incompleteness of the information and the scientific uncertainty and demonstrate how different attitudes need to be adopted in various areas if sustainability is to be a 'realistic' concept (Table 3). The results are obtained by taking the action perspectives to their logical conclusions.

For example: World food production in the *Utilising* perspective implies that a relatively luxury diet is made available to all consumers. A globally oriented production system produces this demand, which implies imports and exports of both inputs (fertilisers) and outputs (grain, fodder, beef, etc.). If all available productive land is used, some 25 billion people can be fed with this production system. In the *Saving* perspective the same globally oriented production system is used, but on the demand side consumers have to accept a relatively moderate diet with less animal proteins. As a result, this perspective leads to a world food production that can feed a maximum of 44 billion people.

The potentials of the various perspectives with respect to energy supply, nature conservation, use of raw materials and regional water supply have been calculated in a similar fashion. In all these cases different 'carrying capacities' can be derived from the four action perspectives.

	unit	UTILISING	SAVING	MANAGING	PRESERVING
world food production	people	25×10^9	44×10^9	11×10^9	17×10^9
energy supply	EJ use	1183	625	1032	433
	Gton CO_2 emission	22.1	9.1	13.9	5.6
nature conservation	nature area	5%	10%	10%	60%
use of raw materials (copper)	tonnes extraction	22.6×10^6	15.3×10^6	15.9×10^6	6.3×10^6
	tonnes consumption	825×10^6	875×10^6	675×10^6	500×10^6
Regional water supply	m^3 groundwater	900×10^6	3200×10^6	900×10^6	3200×10^6
	m^3 freshwater	4500×10^6	1400×10^6	4500×10^6	1400×10^6

Table 3: Some results of the scenarios (Source: Netherlands Scientific Council for Government Policy, 1995)

4.2.3 Evaluation of the results

It can be concluded from Table 3 that a variety of possibilities emerge if different perceptions of risk are taken seriously in the debate on sustainable development. Maximum population sizes that can be fed in a sustainable fashion ranges from 11 to 44 billion people. Emissions that may give rise to an enhanced greenhouse effect range from 5 to more that 20 gigatonnes of CO_2. The area reserved for nature conservation purposes ranges from 5% to 60% of the total landmass. These examples illustrate that sustainable development by itself does not give a strict formulation of the target that society should aim for. Instead, the concept of sustainable development clearly shows a need to incorporate perceptions of risk in the policy making process.

Another striking outcome is the incompatibility of the scenario results. An example may clarify this. If one opts for the *Preserving* action perspective with respect to world food supply, this implies an extensive use of landmass for agricultural production. However, the *Preserving* paradigm with respect to nature conservation leads to the reservation of 60% of total landmass for nature conservation purposes. These two goals cannot be combined. The Earth simply is not big enough to accommodate these two requirements. Together with the diverging results per environmental theme, this indicates the need for a more informed political debate on the real goals of sustainable development.

5. CONCLUSION

The scenario results illustrate that attempts to specify the abstract concept of sustainable development result in wildly differing and far reaching outcomes. World food production can be carried out in different ways, that all can be labelled 'sustainable' from different points of view. The same holds true for global nature conservation. The analysis of different possibilities to sustainable development shows clearly that there is not one best solution. This creates room for governments to manoeuvre to arrive at a commonly agreed agenda. The challenge for the next generations of policy makers is to find the vocabulary and mechanisms to bring this situation to reality.

There are numerous doomsday predictions with respect to sustainable development. The analysis given by the Netherlands Scientific Council for Government Policy is an effort to go beyond the point of surrender to inevitable developments. The examples show that the concept of sustainable development - in one way or another - can lead to the identification of intervention points for policy. They also show that these policy tasks are tremendous and most of them are not even within sight. The results of the different scenarios illustrate that a careful scrutiny of the objectives of sustainable development can lead to the formulation of a research agenda. As a first step towards more comprehensive policies that may rightly carry the label 'sustainable development' this may prove of utmost importance.

6. REFERENCES

Daly, H.E., Towards some operational principles of sustainable development, *Ecological Economics*, (2) 1-6, 1990.

Daly, H.E., On Wilfred Beckerman's Critique of Sustainable Development, *Environmental Values*, (4) 49-55, 1995.

Haavelmo, T and S. Hansen, On the strategy of trying to reduce economic inequality, In: R. Goodland, H. Daly, S. El Sarafy and B. von Droste (eds.), *Environmentally sustainable economic development: building on Brundtland*, Unesco, Paris, 1992.

Hueting, R., Correcting national income for environmental losses: a practical solution for a theoretical dilemma, In: R. Constanza (ed.) *Ecological economics. The science of management of sustainability*, Colombia University Press, New York, 1990.

Netherlands Scientific Council for Government Policy, *Sustained risks, a lasting phenomenon*, Reports to the Government no.44, Sdu Publishers, The Hague, 1995.

World Commission on Environment and Development, *Our Common Future*; Oxford, Oxford University Press, 1987.