The Notion of "Sustainable Development"

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1. Introduction

The notion of 'sustainable development' was introduced on the political agenda by the World Commission on Environment and Development through its report (WCED, 1987), also called the Brundtland Report. Since the publication of the Brundtland Report the notion of sustainability has been used (and abused) a rich variety of ways. The present purpose is to give a clarifying interpretation of this notion. We will consider sustainability to be a requirement for a just distribution of quality of life between generations. The question of intergenerational justice has become a question of increasing importance in the latter years, since it is now in the capacity of the current generation to ruin the natural and environmental resource base of our descendants.

2. Definition

The Brundtland Report does not give a precise definition of the notion of a 'sustainable development'. The quotation that is usually taken as a point of departure is the following: "Sustainable development is a development that meets the needs of the present without comprimising the ability of future generations to meet their own needs" (WCED, 1987, p. 43). The Brundtland Report looks at sustainability both as requirement for intragenerational justice and as a requirement for intergenerational justice. If we here choose to limit the discussion by considering sustainability to be a requirement for intergenerational justice, sustainabilty requires from our generation not to use more than our fair share of the resource base. More precisely, sustainabilty is defined as a requirement to our generation not to use the resource base to ensure ourselves an average quality of life which cannot be shared by all future generations.

By considering sustainability as a requirement for intergenerational justice, it becomes a global requirement. It sets up limits for the way our generation can manage the global resource base. Hence, the notion of 'sustainability' can in our view be used at a national or a community level only in reference to a global sustainable development.

Our discussion presupposes an independence between intra- and intergenerational distribution. We leave the responsibilty of intragenerational distribution to the generation in question, and assume that its decisions with respect to redistribution among its own members do not affect the possibility for redistribution between generations. The validity of this assumption is easy to question. In particular, does the unequal distribution of wealth within our own generation prevent us from taking proper care of the resource base? Still, we choose to abstract from these problems.

In the notion of 'quality of life', we include everything that influences the situation in which people live. Hence, the notion includes much more than material consumption. It is intended to capture the importance of health, culture, and nature. One limitation is of importance, though: The 'quality of life' does not include the welfare that people derive from their children's consumption. Likewise, only the instrumental value in nature (i.e. recognized value to humans) is included in the 'quality of life', not the intrinsic value in nature (i.e. value in its own right regardless of human experience). The distinction between 'instrumental value' and 'intrinsic value' is elaborated on in Pearce and Turner (1990, pp. 12-15). The rationale behind these limitations is that we want to separete the definition of sustainability from the forces that can motivate our generation to act in accordance with sustainability.

It is possible that our generation is about to use the resource base so as to ensure ourselves a quality of life that cannot be shared by all future generations. In such a case sustainability requires that we today reduces the exploitation of the resource base. Given the unequal distri-

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bution within our generation, ethical considerations would seem to imply that such a reduction should occur in the rich part of the world.

Above we have defined sustainability without taking account of risk and uncertainty. This is somewhat unsatisfactory since the long term consequences of human activity is not deterministic and since risk and uncertainty is of importance in the mangagement of natural and environmental resources. Our definition may, however, be extended to a situation with risk. Let us first rewrite our definition of sustainability in (what can be shown under given condtions to be) an equivalent form:

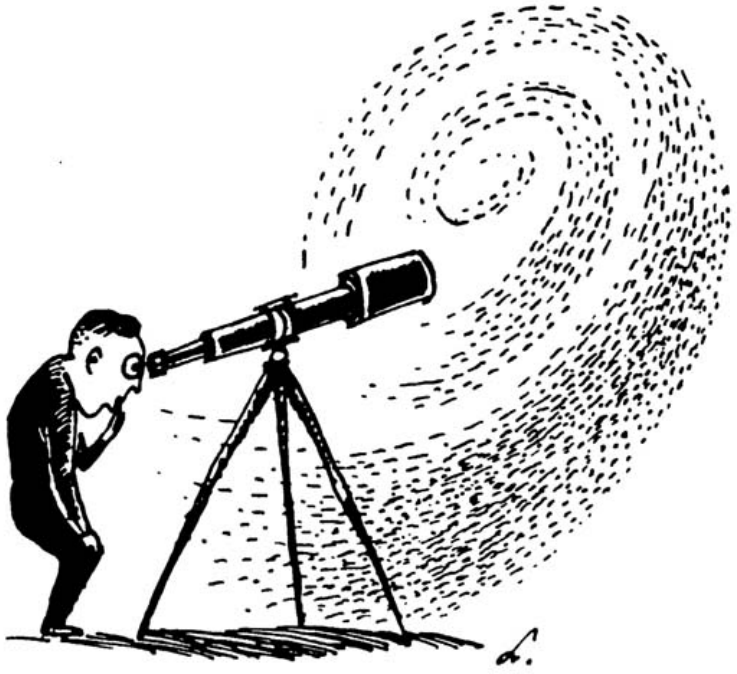
> *Sustainability is a requirement to each generation to use the resource base in such a way that its average quality of life can be shared by the next generation even when the latter abide by the requirement of sustainability.*

If the consequences of our actions are not deterministic, the following definition can be adopted:

> *Sustainability is a requirement to each generation to use the resource base in such a way that its average quality of life can be shared by the next generation in an expected utility sense even when the latter abide by the requirement of sustainability.*

By 'an expected utility sense' it is meant that negative or catastrophic event are given a relatively greater weight when calculating the weighted expected average quality of life of the next generation. Our generation is thereby induced to take actions that reduce the probability of such events.

Sustainability in the above sense is a natural requirement of intergenerational justice because it can be shown under given conditions that if a development is not sustainable there exists another development that increases the total quality of life and leads to a more even distribution of the quality of life between the generations (Asheim, 1991a).



By some writers (Mähler, 1990, p. 240; Pearce and Turner, 1990, p. 44) sustainability is defined as a requirement for nondecreasing resource stocks. We believe that from a conceptional point of view it is better to tie the definition of sustainability to the intergenerational distribution of quality of life, not to the development of resource stocks. However, as we will see in the next section, from an operational point of view this argument may well be reversed.

3. Rules for a sustainable resource management

If the notion of a sustainable development is to be of practical importance, it is essential that the notion be operational. The notion becomes operational if we can answer the following question: What kind of rules must we follow in order to manage the resource base in such a way that we do not use more than our fair share.

If the sum of natural and man-made capital could be considered as one capital good, it is not a problem to formulate such a rule in an economy with a constant population and a constant technology. The rule would be:

> *Transfer to the next generation a stock of capital which is at least as large as the one the present generation inherited.*

In the real world - where there are many types of natural and man-made capital - it is tempting to generalize this rule in the following way:

> *Transfer to the next generation a stock of each of the capital goods which is at least as large as the one the present generation inherited.*

However, this is not a useful rule because it implies that non-renewable resources will not be exploited by any generation. In order to be able to exploit non-renewable resources at all, generations must be allowed to deplete such stocks and compensate for this by accumulating stocks of other kinds of natural and man-made capital.

The problem is to decide how much alternative investment that is required to compensate for depleted stocks of non-renewable resources. This problem can only be resolved through an analysis of the long-term global production possibilities. Only through such an analysis is it possible to establish whether our resource management is compatible with a wish to sustain the resource base for future generations. An analysis of this kind can, however, hardly be undertaken when population growth and technological progress are taken into account. A positive population growth implies that sustainability is a harder requirement for our generation since the resource base that is bequested to future generations is to give the same average quality of life as we enjoyed even though the population will be greater. A positive technological progress, on the other hand, fascilitates sustainability since cet.par.. our descendants thereby inherit greater production possibilities. The problem is that we have insufficient knowledge of the rate of population growth and the rate and composition of the technological progress. Moreover, we have insufficient knowledge of the long-term consequences of human economic activity on the natural environment (e.g. the green house effect). Finally, the notion of 'quality of life', as used in our definition of sustainability, is hard to quantify.

A more fundamental question, which is also hard to answer, is whether a sustainable development is feasible at all i.e. whether the resource base and the technological progress allow us to sustain an average quality of life that lies above the level of subsistence. The answer to this question depends on

- how well reproducible capital substitutes for natural capital
- to what extent the population growth is brought under control
- to what extent a high rate and a desirable composition is achieved for the technological progress.

The composition of the technological progress is important since our generation's economic activity reduces the availability of some natural and environmental resources. The requirement of sustainability implies that our generation must compensate for the reduced

avaiability of these resources by accumulating man-made capital. It is desirable that such a compensation does not in itself create future natural and environmental degradation. Therefore, it is of great importance that we are able to invest in man-made capital that do not lead to future exploitation of natural resources and to long-term negative environmental effects.

On this background it may seem futile to operationalize what a sustainable development means for our generation. This does not mean, however, that we cannot point to actions that will bring our management of natural and environmental resources more in line with the goal of sustainability.

4. Actions for a sustainable development

A first step towards a sustainable development is to confront consumers and producers with the full private costs of their activities. Much environmental degradation today is in fact encouraged through subsidies from the authorities (e.g. destruction of rain forests in South America, production of coal in Europe).

A second step towards a sustainable development is to confront consumers and producers with the full social costs of their activities. Today, this is far from the rule: The natural environment is too heavily polluted since the polluters are not required to pay for the damages caused by their emissions. Fish stocks are being depleted too heavily since each fisherman is not confronted with the consequences of his own fishing on the size of the stock. The athmosphere receives too much CO_2 since each country is only to a small extent confronted with the negative effects that its CO_2 emissions have on the global climate. In such cases, policy actions may include environmental taxes and tradable pollution permits.

These two steps bring the real world economy more in line with the theoretical benchmark of a perfect market economy and enables the economy to achieve an efficient resource allocation. However, it is important to realize that even if the real economy functions as a perfect market economy, this does not necessarily ensure a just intergenerational distribution. Our descendants will have 'income' only to the extent that we leave them a resource base and it is clearly in the capacity of our generation to seriously reduce this income. This may come about by not properly addressing the problems of making consumers and producers pay the full social costs of their activities. However, it can also be caused by our insufficient interest for the well-being of our descendants, combined with our own gain from exploiting natural resources and destroying the natural environment. In the latter case, a management of the natural capital that leaves a reduced and even totally destroyed resource base to our descendants is not necessarily in conflict with an efficient resource allocation and can therefore in principle be implemented by a perfect market equilibrium. In such a case, the real problem of attaining a sustainable development is that we do not have sufficient altruism for future generations. This is to say that even if economic agents pay the full social costs of their resource use and of their environmental damage, such activities are not necessarily morally right when taking the interests of future generations into account.

In a situation where the interests of the future generations are not taken care of by the two steps mentioned above, sustainability can only be achieved if we individually and collectively enhance our concern for future generations through

- limiting the population growth
- better preserving renewable natural and environmental resources in a productive condition (examples include (1) ensuring an athmosphere with an ozon layer and without a too high content of CO_2, (2) ensuring the continued productivity of the soil and of marine resource, and (3) ensuring ecological diversity in general)
- changing the technological progress by developing technologies that to a lesser extent is dependent on the exploitation of the resource base and which therefore can be used to compensate for the unavoidable degradation of natural and environmental resources.

Such changes in population growth, resource management, and technological development can either be individually motivated or collectively guided. How these changes can come about in the real world is hard to say. It is possible that one efficient way to motivate a

greater concern for future generations is to place an intrinsic value in nature, i.e., a value in nature in its own right independent of human experience. This implies that the position of the so-called 'deep ecology' can contribute to a policy of the current generation that is more in line with the requirements of sustainability.

5. Concluding remarks

It might be of interest to speculate what would characterize a world economy that manages its resource base in a way that is consistent with the requirements of sustanability. Clearly, we are not in a position to give a complete characterization. We therefore confine ourselves to focus on three aspects that will probably be important features of a sustainable economy.

The implicit discount rate

Under the assumption that our generation today enjoys an average quality of life that cannot be sustained for future generations, the implicit rate of discount in a sustainable economy would be lower and decreasing as compared to the present situation. It would be lower because each generation would have more concern for future generations and therefore invest more by accumulating man-made capital and avoid degradation of natural capital. It would be decreasing since with the accumulation of man-made capital and with the decreasing availability of natural capital, the productivity of man-made capital would decrease. The latter observation could, however, be reversed by technological progress.

Prices on natural capital

The prices or implicit values of natural and environmental resources in such an economy would be high. This is consistent with a low and decreasing rate of discount which put a high discounted value on future use of the resources. The higher accumulation of man-made capital and the lower degradation of natural capital would also make future generations better off and increase their willingness-to-pay for natural and environmental resources.

International agreements, regulations, and environmental taxes

Under the assumption that not all individuals will act in accordance with sustainability, a sustainable economy will be characterized by extensive international agreements relating to the abatement of atmospheric pollution, coupled with institutions for supervision and control which rely on credible sanction systems for non compliance. Furthermore, one might envisage an introduction of new systems for pollution abatement such as tradable emission permits, where the total number of permits are regulated according to Nature's assimilative capacity. At the national level one should expect to see an extensive use of environmental taxes internalizing negative external effects of waste production and pollution.

Notes:

[1]This paper builds on Amundsen et al. (1991) and Asheim (1991b)

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