ENVIRONMENTAL ACCOUNTING FOR SUSTAINABLE DEVELOPMENT: SYSTEM FOR INTEGRATED AND ECONOMIC ACCOUNTING (SEEA) CONCEPTUAL AND THEORETICAL ISSUES[1]

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A long-term successful development of society necessitates integrated economic, social and environmental policies. Potential environmental and social drawbacks should be considered in economic planning. An integrated environmental and economic system could be such a strategy. There has already been a long debate on how national accounting should be extended to environmental accounting. The revision of the United Nations'System of National Accounts (SNA 1993) afforded a unique opportunity to examine how the various concepts, definitions, classifications and tabulations of environmental and natural resources accounting can be linked to the SNA. Such linkage was originally proposed in a framework for a SNA satellite system of integrated environmental and economic accounting. The 1993 SNA devotes a separate section (Chapter XXI, section D) to integrated environmental-economic satellite accounts. This paper describes the possible steps for extending SNA to environmental accounting and presents different valuation concepts and their consequences for deriving different types of eco (green) domestic products. Implementation problems are briefly addressed in the final part of the paper. All parts of this paper are based on the SEEA described in the handbook of national accounting published by the United Nations in 1993.

1. INTRODUCTION

There has already been a long and partly hot debate on how national accounting should be extended towards environmental accounting (see e.g., Ahmad, El Serafy, Lutz, 1989; Costanza 1991, Part II: Accounting, Modelling and Analysis; Lutz, 1993; Franz, Stahmer, 1993).

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The *revision* of the *System* of *National Accounts* (SNA, United Nations, 1994) afforded a unique opportunity to examine how the various concepts, definitions, classifications and tabulations of environmental and natural resource accounting can be linked to the SNA. Such linkage was originally proposed in a framework for an SNA satellite system of integrated environmental and economic accounting (Bartelmus, Stahmer, van Tongeren, 1991). Considering the knowledge currently available on environmental accounting and the divergent views on a number of conceptual and practical issues, it was not possible to reach an international consensus at that time for a fundamental change in the SNA. Nevertheless, there was agreement that the SNA should address the issue of its *links* to *environmental concerns*. Therefore, the 1993 SNA devotes a separate section (Chapter XXI, section D) to integrated environmental-economic satellite accounts and introduces refinements into the cost, capital and valuation concepts of the central framework that deal with natural assets. This will also facilitate using the SNA at a point of departure in the development of environmental accounts.

The satellite approach to environmental accounting expands the analytical capacity of national accounts without overburdening the central framework of the SNA. The Statistical Commission, as indicated in its report on its twenty-sixth session (United Nations, 1991), endorsed the *satellite approach* and requested that the concepts and methods of integrated economic and environmental accounting be developed by means of satellite accounts. This approach was confirmed by the United Nations Conference on Environment and Development, which recommended in Agenda 21 that systems of integrated environmental accounting, to be established in all member states at the earliest date, should be seen as a complement to, rather than a substitute for, traditional national accounting practices for the foreseeable future (United Nations Conference, 1992, resolution 1, annex II, para. 8.42).

As a conceptual basis for implementing an SNA (satellite) system for integrated environmental and economic accounting (SEEA), a *handbook* of national accounting was published by the United Nations (United Nations, 1993).

It is not the aim of this handbook to present just another approach to environmental accounting; rather, it reflects as far as possible the different concepts and methodologies that have been discussed and applied in the past few years. The main task of the handbook is to effect a synthesis of the approaches of the different schools of thought in the fields of natural resource and

environmental accounting. A thorough analysis of those approaches indicates that they are often complementary rather than mutually exclusive. The absence of a general approach seems to be due more to missing linkages among the different approaches than to the existence of contradictory concepts. The handbook therefore does not intend to replace existing data systems like the natural resource account or the System of National Accounts (SNA), but rather to incorporate their elements as far as possible in order to establish a comprehensive data system.

In the present situation, *countries in transition* to market economies have urgent economic problems which seem to relegate environmental questions to the background. On the other hand, a long-term successful development of the society necessitates integrated economic, social and environmental policies. Environmental (and social) drawbacks should be considered in planning economic activities. An integrated environmental and economic accounting system could support such a strategy.

In the following second part of this paper, possible steps for extending SNA towards environmental accounting are described. In the third part, different valuation concepts and their consequences for deriving differing types of eco (green) domestic products are presented. In the final part, implementation problems are briefly addressed.

All parts of the paper are based on the SEEA described in the handbook (United Nations, 1993).

2. BUILDING BLOCKS FOR EXTENDING NATIONAL ACCOUNTS

An SNA satellite system describing environment-related extensions of the traditional framework should have a high degree of *flexibility*. The needs of individual countries differ to such an extent that each country should be enabled to develop a data system suitable to analyse its own specific problems. In any case, three different *types* of *data sets* could be distinguished which might allow a comprehensive analysis of the environmental-economic interrelationships:

- Starting with the conventional SNA framework in monetary terms, environment-related stocks and flows could be identified by disaggregation. Such a procedure could aim at describing environmental

protection activities that prevent and mitigate environmental deterioration or restore the damage (reflected in health expenditures, material corrosion) caused by the deteriorated environment. Such an analysis of *environment-related defensive activities* could reveal the increasing importance of expenditures which do not aim at raising the level of welfare of the population but merely try to diminish negative impacts of a growing economy (Leipert, 1991). In this context, environmental protection activities of the *government* are especially important.

In the revised version of the SNA, accounts for produced assets as well as for *non-produced natural assets* are included as far as they could be estimated at market values. Such accounts could be established without extending the scope of conventional national accounting and its asset boundaries.

- Whereas the monetary building blocks described above are derived from the conventional SNA framework just by disaggregating monetary flows and stocks of the SNA, *linked physical* and *monetary accounting* implies extensions of the conventional national accounting system by adding physical data. Such linkages do not necessarily imply changes of the traditional SNA concepts. The additional information in physical terms could be linked with the traditional SNA framework in monetary terms without any conceptual modifications.

  Physical accounting could incorporate the relevant concepts and methods of natural resource accounting, material/energy balances, and input-output tabulations. Special attention could be paid to the flows of *raw materials* as inputs of the economic system, to changes of the economic *use* of *land***,** and to the flows of *residuals* of economic activities discharged back into nature. As far as possible, inputs of raw materials and outputs of residuals should be linked by showing different stages of the economic transformation of raw materials which sooner or later leads to residuals which are not used anymore within the economic sphere.

  From my point of view, this part might *not* be the most *exciting* one of an SNA satellite system describing environmental problems. Attempts at valuing the economic use of nature seem to be much more attractive for international discussions. Nevertheless, this part of the data system to be developed seems to be the *most important* one. This opinion is based on

two observations: The natural environment can adequately and comprehensively be described only in physical terms, and all attempts at valuing the economic use of nature need an adequate data basis in physical units and could only provide a limited view on environmental problems.

- A third type of environment-related extensions of national accounting imply an *imputed valuation* of the economic uses of the natural environment. These approaches imply corrections of the net domestic product towards an eco domestic product. As proposed in the SEEA, different types of valuation could be applied depending on the aims of analysis. This paper deals in particular with that task of valuing the economic use of nature. Nevertheless, we should not forget the data basis in physical terms which is urgently needed for such exercises. All attempts at correcting the net domestic product will be controversially discussed. A well-elaborated data system in physical units could establish a solid basis which would facilitate judgements on different valuation concepts.

These three types of data sets are described in the chapters II, III and IV of the handbook (United Nations, 1993). In chapter V, further extensions of the production boundary towards a complete description of household activities are discussed.

3. TOWARDS AN ECO DOMESTIC PRODUCT

3.1. Imputed Environmental Costs of Economic Activities

In the seventies, Nordhaus/Tobin (1973) and the Japanese NNW Measurement Committee (1973) were convinced that the gross (or net) domestic product could be modified in such a way as to make measuring possible of the *welfare* connected with economic performance. They intended to purify the national product by subtracting "regrettable" parts (like national defence expenses) and added further values of non-market production (like household work or leisure activities) which were classified as welfare-increasing.

The optimistic belief that economic production reflects--with slight modifications-- economic welfare has been given up. The increasing deterioration of the natural environment has questioned the very principles of the conventional measurement of economic activities. Economic output has to comprise not only

produced *goods* and services but also *"bads"* such as by-products of economic activities like the depletion of natural resources and the degradation of land, air and water by the residuals of economic performance.

In a similar way, inputs of economic production have to contain not only the costs of using produced assets but also the costs of using non-produced natural assets. More important than identifying products which are still welfare-relevant seems to be the aim to achieve more complete *cost accounting* of economic activities. In this context, it is not intended to estimate environment-related economic welfare but to show the remaining part of the national product after deducting the costs of using the natural environment for economic purposes.

Following these arguments, an *eco domestic product* could be derived as follows:

	gross domestic product (GDP)
-	depreciation of produced fixed assets caused by economic activities
=	net domestic product (NDP)
-	depreciation of non-produced natural assets caused by economic activities
=	eco domestic product (EDP).

A comparison of the net domestic product with an eco domestic product could demonstrate to what degree the results of our production activities are achieved only by destroying the natural environment. If economic activities did not cause depletion or degradation of the natural environment, the net domestic product and the eco domestic product would be identical.

This approach aims at completing the economic cost accounts merely by estimating *additional imputed costs* of economic uses of the natural environment. The *actual costs* which also contain environment-related defensive expenditures (like environmental protection expenditures) are not used for deductions from NDP. Such modifications would require concepts of economic welfare which do not seem to be applicable in national accounting anymore. Of course, the proposed concept does not necessarily exclude the identification of the economic costs of defensive activities. It seems to be increasingly important to identify such defensive costs and to estimate actual defensive costs in relation to GDP or NDP (Leipert, 1991). This work could be done without further modifying macro-economic aggregates (see also Chapter II of the Handbook, United Nations, 1993).

3.2. Principles of Valuing Environmental Costs

In *Figure 1*, different ways of valuing the environmental costs of economic activities are shown. There are *two approaches* which differ fundamentally:

1) Should the analysis focus on the state of the environment and its effects on the population in a specific country and a specific time-period irrespective of the question [of] which economic activities have caused environmental deterioration and when (left side of *Figure 1*);

2) Should the analysis focus on the immediate environmental impacts of the economic activities of a specific country in a specific time-period irrespective of the question [of] at what time and in which country those impacts will cause environmental deterioration (right side of *Figure 1*).

In the first case, the imputed environmental *costs borne* by enterprises, the government and households are estimated and deducted from the net value added of the economic units *affected* by environmental deterioration. In the second case, the imputed environmental *costs caused* by economic activities are deducted from the net value added of the economic units *responsible*.

In the first case, only the deterioration of the *domestic* natural environment is taken into account. In the second case, the impacts on nature *abroad* are also recorded as far as they are caused by domestic economic activities. Thus, valuation refers only to domestic *welfare* in the first case, whereas, in the second case, the leading valuation principle is oriented towards *responsibility* for all countries.

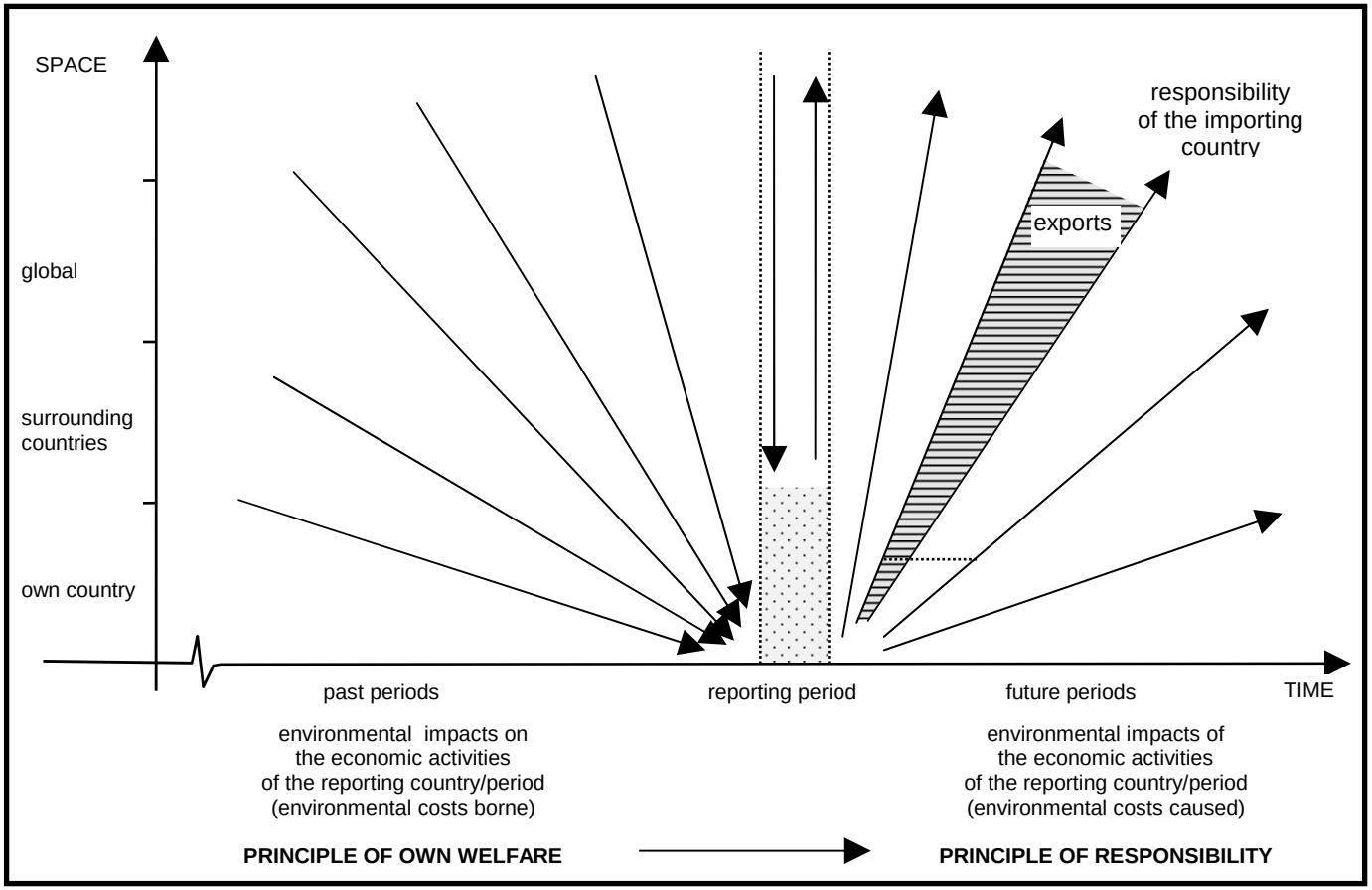
It seems to be more and more difficult to *link* the two types of environmental costs. Only if economic activities cause environmental deterioration in the same country as well as in the same time-period are such linkages possible at all. It is typical of most of the environmental impacts of economic activities that they cause long-term and international problems. The traditional *cost-benefit analysis* which refers to such linkages is nowadays increasingly restricted to specific regional environmental problems (e.g., noise, changes of land use). In the SEEA, no attempt is made to link the approaches of environmental costs borne and environmental costs caused. The optimistic attempt to compare benefits and costs of economic activities in a specific country and specific time-period seems to

have been abandoned after observing the long-term and global problems of environmental deterioration caused by economic activities.

In *Figure 1*, it is indicated that the importing country has to bear responsibility for the environmental deterioration caused by the production of the imported goods in the delivering (exporting) country. A rich country could "export" its environmental problems by importing all goods whose production causes environmental problems. In a similar way, a rich country could export its dangerous wastes in order to store them in poorer countries. It seems to be very important that the environmental impacts of *international trade* are taken into account in calculating the eco domestic products of the importing and exporting countries.

In the following section, different ways of valuing environmental costs borne and caused are described. It should be stressed that these valuation methods are *complementary* and *not mutually exclusive*. It seems to be impossible to identify one true value of the natural environment and the changes it is subjected to. Valuation could only be oriented towards specific aims and has to differ if the analysis focuses on different aspects of environmental-economic interrelationships. The struggle between different schools of valuation seems to have only the result of wasting time and should be reduced as far as possible. It has been mentioned already that it is one of the tasks of the United Nations Handbook (United Nations, 1993) to support concepts which are based on a synthesis of different types of valuation. The problems of environmental deterioration are so urgent that a close co-operation of all scientists working on the analysis of these problems is strongly desired.

Figure 1: Valuation principles of the economic use of the natural environment



3.3. Environmental Costs Borne

In the revised SNA (United Nations, 1994), not only flow but also asset accounts are integral parts of the overall system. These asset accounts contain produced assets whose increase is measured as gross capital formation (increase of GDP) and whose decrease is taken into account as consumption of fixed capital (decrease of NDP). The asset accounts of the revised SNA also include non-produced natural assets (like subsoil assets, water, wild animals and plants, land) as far as these assets can be assessed at *market values*. Such market values could be derived by using observable market prices, by estimating the discounted value of expected net proceeds or--in the case of depletable natural resources--calculating the net rent of resources (actual market price minus actual exploitation costs including a normal rate of return of the invested produced capital).

The volume changes of non-produced natural assets are shown in the SNA in separate asset accounts and do not affect the flow accounts relevant for calculating NDP. A first approach at calculating an eco domestic product could be to identify the volume changes (due to economic causes) of non-produced natural assets in the SNA asset accounts and to introduce them as *additional costs* (depreciation of non-produced natural assets) in the flow accounts. Such shifts lead to the following concept of an eco domestic product:

	net domestic product (NDP)
-	depreciation of non-produced natural assets at market values
=	eco domestic product (EDP I).

The value of the depreciation of non-produced natural assets could comprise the depletion of subsoil assets, water and non-produced biota or the degradation of land by soil erosion. Of course, such a type of valuation only covers ecological problems as far as they are reflected by changes in economic values. Only if economic units like enterprises or the society as a whole recognise decreased market values of their assets will an eco domestic product differ from the net domestic product. The *limits* of this approach, which has been supported and applied especially by the World Resources Institute (see e.g. Repetto 1989), are evident: Market values can only reveal pressures on natural assets and cannot reflect the whole range of economic uses of the natural environment. On the other hand, such a type of valuation could be relatively easily derived from observable statistics and does not necessitate additional imputations in national

accounting. The values are already recorded in the asset accounts. Furthermore, changes of market values might be the type of valuation which facilitates a discussion with politicians on the depletion and degradation of natural assets: If they understand that their country is gradually losing its natural wealth even from a narrow economic point of view, they might be willing to take into account also environmental problems. The same holds true for enterprises which have to bear decreases of the market values of their non-produced natural assets (like owned land or subsoil assets they have the right to exploit).

The presented concept of environmental costs borne at market values is restricted to marketed parts of the natural environment. Such an approach is especially useful for identifying environmental costs borne by *enterprises* because these economic units normally take into account only environmental changes reflected by the market. To a certain extent, *households* also suffer from changes in market values due to environmental effects, e.g., changes in the value of dwellings due to increasing traffic noise or air pollution. Nevertheless, the major part of environmental effects on human well-being (e.g., air and water pollution, noise, destruction of landscape used for touristic purposes, etc.), are not adequately reflected by changes in market values. In these cases, indirect methods for measuring the changes in these environmental services have to be developed. Such estimates could be added to the calculations at market values to achieve a more comprehensive concept of environmental costs borne.

The most prominent valuation method for estimating the non-market costs borne are the different types of *contingent valuation*, especially the so-called willingness-to-pay approach (OECD, 1989). The contingent valuation method is not without controversy. In particular, it has been argued that the amount of money that people are willing to pay to improve the natural environment does not necessarily correspond to the amount that they would actually pay (free-rider problem). Furthermore, a fully developed knowledge of the quality of the natural environment and of the possible impacts, inter alia, on health does generally not exist. It is therefore difficult to translate environmental effects into monetary expenses. Willingness to pay will also depend on the income situation of the individuals questioned.

Nevertheless, it seems important in a democratic and participatory approach to take the opinions of the people into account, even if their knowledge of the natural environment is incomplete. The SEEA (United Nations, 1993, par. 320-331) proposes to ask people to what degree they are willing to *reduce* their

consumption level or change their consumption pattern. In this case, the difference between the expenditures connected with existing consumption activities and those connected with the offered change in such activities could be used to represent the value of the environmental quality lost.

The willingness to forgo consumption involves at least *actual repercussion costs* of households (for example, environment-related health expenditures, additional commuting and housing costs). If such a deterioration could be avoided, households would of course be willing to reduce their respective defensive expenditures. Studies on the willingness to reduce household consumption levels could therefore identify actual repercussion costs as part of the total amount of voluntary reductions and, in a second step, focus the questions on the willingness to pay for additional reductions.

When concepts of contingent valuation are applied, more comprehensive estimates of environmental costs borne lead to a second type of eco-domestic product:

	net domestic product (NDP)
-	depreciation of non-produced natural assets at market values
-	depreciation of non-produced natural assets at contingent values
=	eco-domestic product (EDP II)

Of course, the estimates at contingent values have to refer only to environmental changes which have not yet been recorded at market values.

3.4. Environmental Costs Caused

The concept of environmental costs caused is based on the principle of *responsibility* for the long-term development of our earth. This attitude recognises the same rights for all living beings irrespective of whether they live in our country or abroad, and is based on the ethical postulate that we should act in a way that does not adversely affect other living beings now and in the future. This principle represents a *strong sustainability concept*: Our economic activities should be limited to those which will not entail a decrease in the natural capital. This concept allows the substitution of a type of natural capital for another but no replacing of natural by man-made capital.

The suitable valuation concept for such an attitude is the avoidance (prevention) cost approach (see especially Hueting, 1980, 1993). We measure the decrease in the level of economic activities by the additional costs necessary for achieving sustainable development and interpret this decrease as the value of the depreciation of the natural environment which reduces the net domestic product:

	net domestic product (NDP)
-	depreciation of non-produced natural assets at avoidance (prevention) costs
=	eco domestic product (EDP III)

It should be stressed that the necessary prevention costs are only calculated for the impacts of *domestic* economic activities of the *reporting period.* Thus, prevention costs comprise the costs of activities which prevent at least further negative impacts of present activities (in the own country or abroad). It could happen that the environmental quality would decrease even if no additional negative effects of present activities were added. In this case, the negative development of the natural environment in the reporting period was already recorded in the past by calculating prevention costs for the economic activities of previous periods.

On the other hand, the effects of present economic activities comprise not only impacts in the same period but also in the future. This concept is shown on the right-hand side of *Figure 1*.

In *Figure 2*, alternative *developments* of the *environmental quality* in the reporting period t are shown. The actual development (2) indicates a diminished decrease in comparison to a (hypothetical) situation of no actual environmental protection activities in t (1). If the economic activities in t had no negative impacts on the natural environment, the development would be indicated by the (hypothetical) line (3). To achieve a constant level of environmental quality in t, restoration activities in t would be necessary (4) which do not only balance the negative impacts of the economic activities in t (3) but also undo negative impacts of the past. It may happen that the natural environment is already destroyed to such an extent that an improvement of the environmental quality (5) is urgently needed. In this case, further restoration activities will be necessary. Of course, the scenarios (4) and (5) will only be feasible if the deterioration of the natural environment is reversible. This assumption seems to be unrealistic to an increasing extent.

The calculation of avoidance (prevention) costs is only possible on the basis of *modelling*. In the process of thinking about alternative and more sustainable ways of economic performance, the comparison between the actual and the desirable development can only be a hypothetical one. The necessary modelling work can be more micro- or more macro-oriented. In the first case, each economic activity is studied with regard to its environmental impacts. In a second step, alternatives are developed which avoid possible negative environmental effects of the actual activities. The difference between the net value added of the two types of activities is treated as (imputed) environmental costs. By adding the differences of all economic activities studied we obtain the total of environmental costs which is subtracted from the net domestic product. The main problem of this approach consists in the dependencies between the economic activities and their impacts on the natural environment which allow only a restricted additivity of the environmental costs calculated at the micro-level. An alternative way of calculating avoidance costs is to introduce limits (standards) of environmental effects of economic activities first and to calculate in a macro-economic model a sustainable level of economic activities (especially of final consumption of products). The difference between the actual net domestic product and the hypothetical net domestic product could be interpreted as the necessary environmental costs. In this case, the eco domestic product would be the net domestic product of the hypothetical economy without negative impacts on the natural environment.

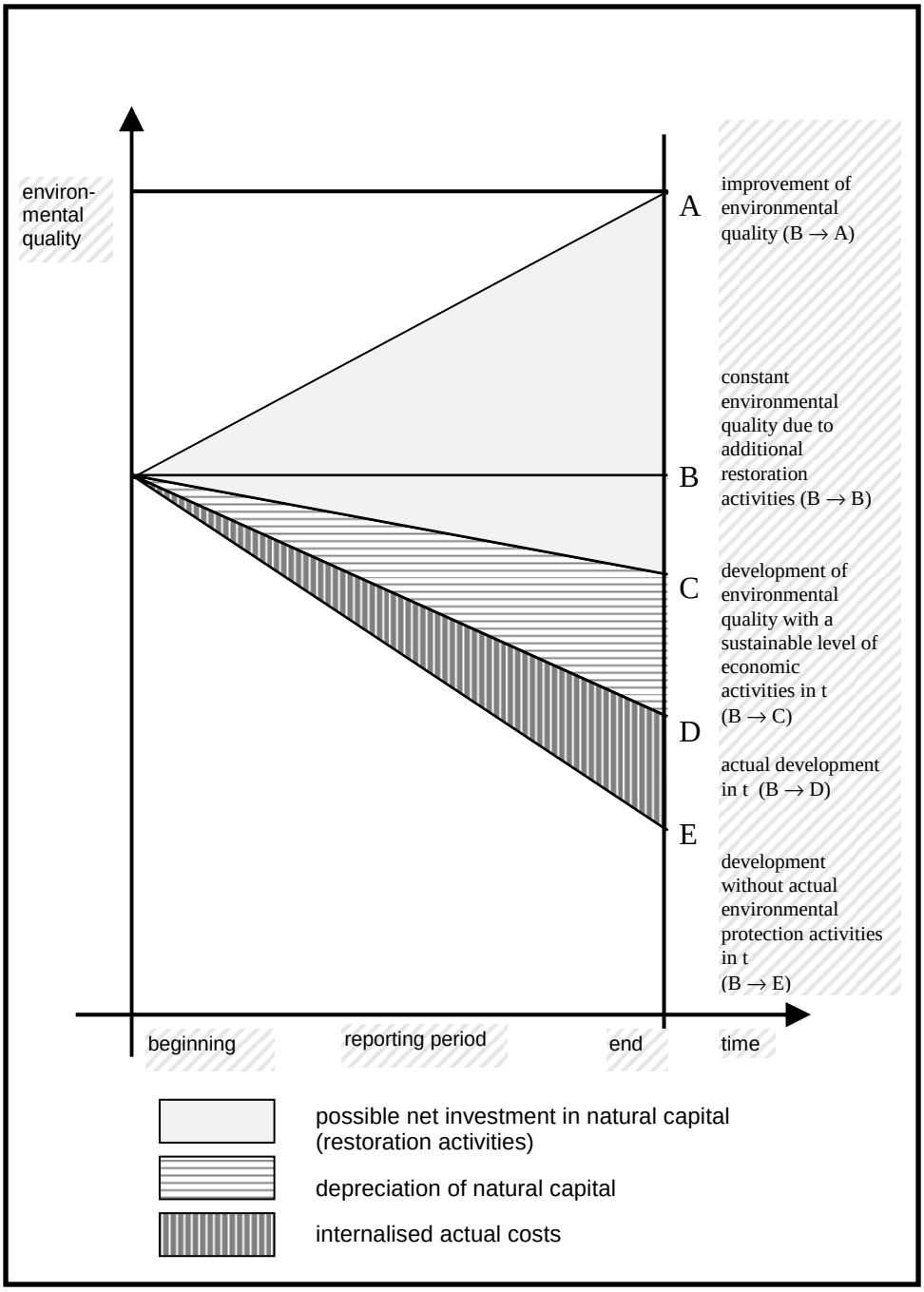
A crucial point of all estimates of avoidance (prevention) costs is the determination of the level of economic activities whose effects on the natural environment could be assimilated by nature without long-term negative impacts. This determination is especially difficult because we have to take into account effects which could be both long-term and widespread. If knowledge about these effects is limited, a risk-averse attitude should be applied. Furthermore, setting *sustainability standards* also means solving distribution problems. If, for example, global limits for producing carbon dioxide have been set, it will have to be decided which proportion of the globally allowed pollution of carbon dioxide is accepted for the individual countries. Theoretically, the principle that pollution per head should be equal world-wide, seems to be acceptable. If especially developing countries accept a lower level of pollution they should receive a compensation from the (normally richer) countries whose pollution per head exceeds the average.

The strategies to avoid negative environmental impacts of economic activities differ with regard to the *types* of *economic use* of the *natural environment*:

In the case of *depleting non-renewable* natural resources (like subsoil assets), the quantitative decrease in these resources could be diminished by developing more efficient ways of using raw materials. Nevertheless, a decrease in these assets will normally be unavoidable. In this case, replacement by other types of natural capital would be necessary to achieve at least a constant level of natural capital as a whole (Daly, 1991). The substitution costs could be used as estimates of the environmental costs.

In the case of depleting *renewable cyclical* natural assets, natural growth (biota) or natural inflow (groundwater) should be balanced against the quantities depleted. If

Figure 2: Development of environmental quality in period t



depletion exceeds natural increase, the necessary reduction in net value added of the depleting industries can be used as an estimate of environmental costs.

- In the case of *land use*, sustainability implies a constant qualitative and quantitative level of landscapes and their eco systems. If an increase in economic activities results in a decrease in this level, the necessary reduction in economic activities and in their net value added involved will have to be calculated.

- With regard to *discharging residuals* into nature, numerous possible prevention activities have to be analysed which comprise the replacement of products (by increasingly more environmentally friendly goods and services), technological changes to produce technologies with low pollution, and a reduction in economic performance, especially lowering the consumption level of the population. To reach specific standards, the strategy based on minimal costs should be chosen, and these prevention costs represent the deterioration of non-produced natural assets caused by pollution, etc.

If additional *restoration activities* were undertaken which, for example, balance the deteriorating impacts of present economic activities (see (3) in *Figure 2*) or even prevent a decrease in environmental quality (4) or increase the quality of the natural environment (5), the costs incurred could be recorded as *gross capital formation* in non-produced natural assets which balance or exceed the depreciation of natural assets caused by the impacts of economic activities in the present reporting period. It seems to be very important to show in an integrated environmental and economic accounting system not only failures but also all attempts made to improve the quality of the natural environment. This could play a central role within the environmental protection activities of the *government*. If restoration activities were observed, an eco domestic product could be derived in the following way:

	net domestic product (NDP)
-	depreciation of non-produced natural assets at prevention costs
+	increase of non-produced natural assets by restoration activities (gross capital formation)
=	eco domestic product (EDP IV)

In the case--which unfortunately is unrealistic at present--that there is a positive net capital formation (gross capital formation minus depreciation) in non-produced natural assets, the eco domestic product will be higher than the domestic product.

An important extension of the concept of environmental costs borne takes into account the environmental impacts of *international trade*. After estimating environmental costs borne in line with the method described, an input-output analysis could be carried out to calculate the direct and indirect environmental costs connected with goods and services exported. These costs should be subtracted from the environmental costs of the exporting country and added to the environmental costs of the importing country. Such corrections could be done for all internationally traded products whose production involves severe environmental problems. In this case, the corrected eco domestic product would be as follows (without taking into account restoration activities):

	net domestic product (NDP)
-	depreciation of non-produced natural assets at avoidance costs (caused by all domestic economic activities)
+	depreciation of non-produced natural assets at avoidance costs caused directly or indirectly by exported products
-	depreciation of non-produced natural assets at avoidance costs caused directly or indirectly by imported products
=	eco domestic product (EDP V)

4. IMPLEMENTATION OF INTEGRATED ENVIRONMENTAL AND ECONOMIC ACCOUNTS

To allow an adaptation of the SEEA to different environmental and socio-economic conditions in the individual countries, the SEEA has been designed to be as comprehensive, flexible and consistent as possible. The aim of *comprehensiveness* refers to both a variety of patterns of economic development or categories of environmental deterioration, and alternative theoretical approaches. Data availability and the potential of further improvement of the data base restrict the application of SEEA concepts. These constraints necessitate a *flexible* system which should comprise a variety of building blocks which could

be used independent of each other. This necessary flexibility of the SEEA should not affect the consistency of the system. A *consistent* data system will be ensured if the versions of the SEEA remain an extension of the national (economic) accounts and apply the accounting rules of extended accounts.

The implementation of the SEEA should focus on *high-priority concerns* and related economic activities. The restricted funds for statistical work do not allow a complete description of environmental-economic interrelationships. In *Table 1*, possible priorities for implementing the SEEA are shown (see United Nations, 1993, p.153). This list divides priorities according to the type of statistical unit (data in physical or monetary terms) and according to the type of country (developing or developed country). Priorities for implementing the SEEA in countries in transition to market economies have not been shown. One of the results of this workshop could be that a list of priorities is made up for integrated environmental and economic accounting.

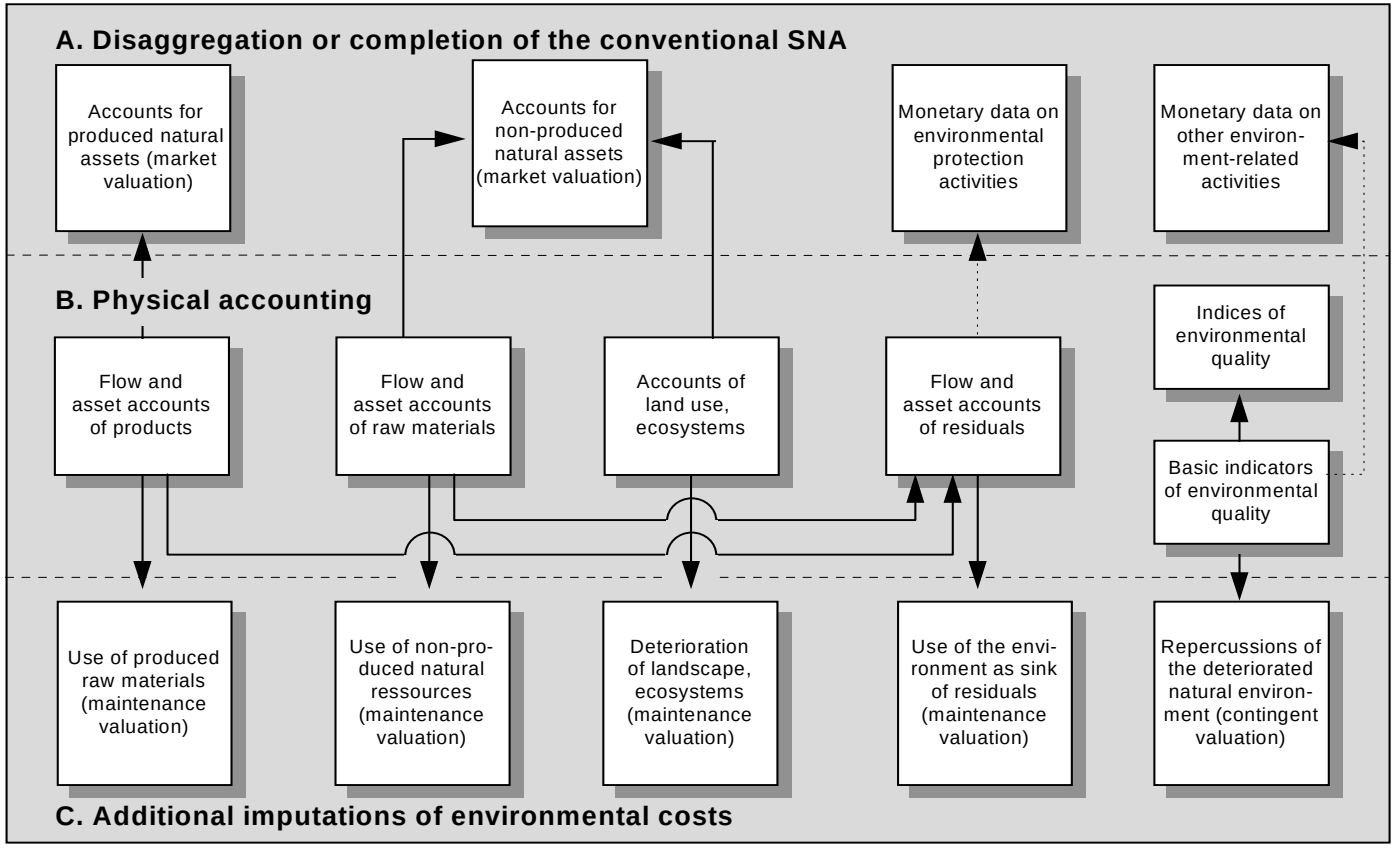
Table 1
Priorities for implementing the SEEA*)

Environmental issues	**Physical accounting**		**Monetary accounting**	
	developed country	developing country	developed country	developing country
1. Use of natural assets (except discharge of residuals)				
Depletion of				
1.1 Biological assets	+	++	+	++
1.2 Subsoil assets	+	++	+	++
1.3 Water	0	++	0	++
Degradation of land (landscape)				
1.5 Restructuring (urbani-sation, changes in land use)	++	++	+	0
1.6 Agricultural use (soil erosion)	0	++	0	++
1.7 Recreational use	+	+	+	+
2. Product flow analysis	++	0	0	0
3. Degradation of the natural environment by discharge of residuals				
3.1 Wastes and land contamination	++	0	+	+
3.2 Waste-water	++	+	+	+
3.3 Air pollution	++	+	+	+
4. Actual environment costs				
4.1 Environment protection activities			++	+

4.2 Damage costs			+	0

++: high priority, +: medium priority, 0: low priority.
*) SEEA: Satellite System for Integrated Environmental and Economic Accounting.

Figure 3: Building blocks for implementing the SEEA*)



*) SEEA: Satellite System for Integrated Environmental and Economic Accounting.

Implementation will be further limited by *data availability*. Therefore, it seems useful to start by implementing those parts of the SEEA that have high priority and a sufficient data basis. After improving the data base, more complete versions of the SEEA can be implemented. In *Figure 3* (see United Nations, 1993, p.150) an overview is given of possible building blocks of the SEEA. Of course, each building block comprises a variety of specific items that have to be compiled separately (for example, accounts for different types of products, raw materials and residuals).

The arrows in *Figure 3* represent *dependencies* between the *compilation* of data for the different building blocks. Data collection for the implementation of some building blocks may require data compiled for other parts of the system. For example, monetary data can, in many cases, be compiled only on the basis of sufficient physical data.

The compilation dependencies among the different parts of the SEEA indicate that *physical* data and accounts need to be established first. *Monetary* data could then be estimated in a second step. This procedure does not exclude the immediate implementation of monetary building blocks that are either already available or less dependent on physical data.

The complexity of the task of describing the environmental-economic interrelationships should not discourage the statisticians involved in this work. Basing the development of the data system on a *stepwise approach* with limited aims at the beginning may reduce the danger of being disappointed and overwhelmed by the difficulties. The task of supporting an integrated economic and environmental policy seems to be so important that every effort should be made to overcome the obstacles.

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