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Sustainable Development Strategy and Environmental-Economic Accounting in Germany

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Abstract:

Key words: German sustainable development strategy, sustainable development indicators, environmental-economic accounting, national accounting, socio-economic accounting, environmental-economic modelling, interlinkages between indicators.

The central subject of a policy for sustainable development is the co-ordination of the different sector policies with the objective of finding a balance between conflicting economical, ecological and social goals. The headline indicators for sustainable development are mainly a communication tool directed to the general public and the media. They are used for describing important problems under a sustainability perspective and they serve as an instrument for controlling general performance of political measures. But more detailed data are required for the analysis of the underlying mechanisms and reasons for change of the indicator values as well as for the formulation of measures and the assessment of the effects of these measures. Therefore, the individual indicators should be consistently embedded into an underlying database from which they can be derived by aggregation. Further, the underlying data for the individual indicators should be part of a comprehensive framework that ideally integrates all relevant topics, in order to take account of the interdependencies between the different indicators. The accounting system with its three principle parts, the National Accounts (SNA) and the satellite systems Environmental-Economic Accounting (EEA) and the Socio-Economic Accounting (SEA) provides an ideal framework to meet these data requirements. In Germany a rather high proportion of economic and environmental indicators of the National Strategy on Sustainable Development are embedded into the accounting system. The paper describes the steps for integrating the indicator set and the accounting system.

I. The present situation

There are two principle approaches for **measuring the "sustainability gap"**, the indicator and the accounting approach. The sustainability gap indicates how far the present state of a society differs from a situation that meets the requirements of the sustainability paradigm. Work on sustainable development indicator sets (SDI) is usually carried out more or less independently from the accounting work. In this paper it is argued that linking these two approaches could yield considerable synergies.

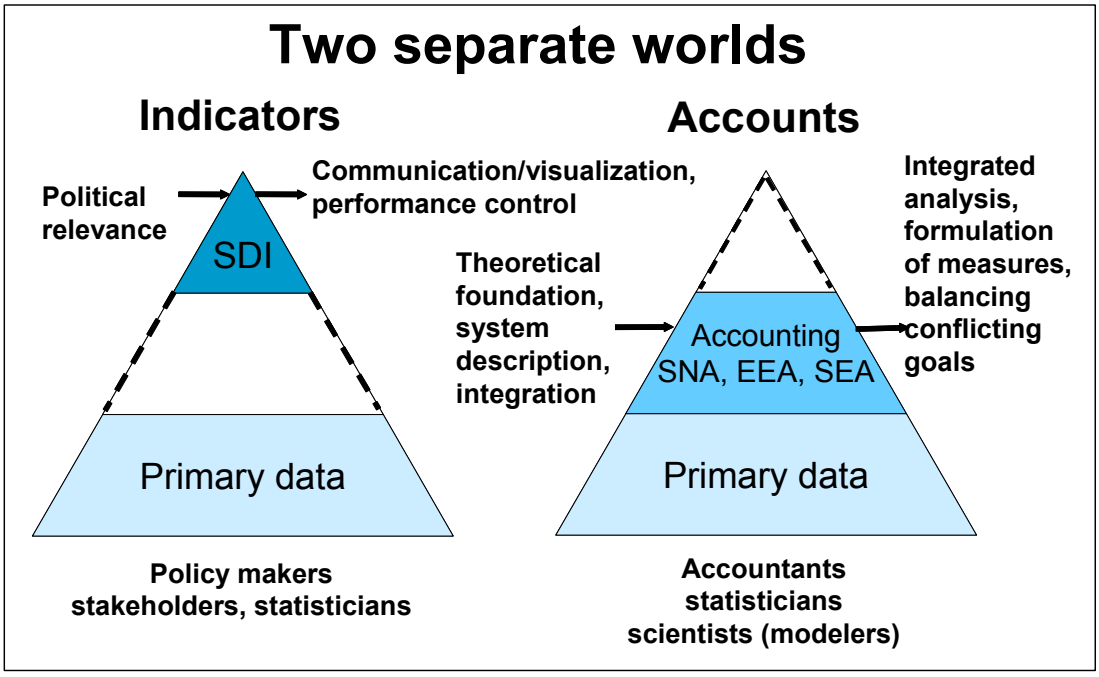
The **indicator** approach describes the sustainability gap by a selected number of issues considered to be most relevant under a sustainability perspective. The selection of the indicators is based on facts and value judgements. In order to establish broad acceptance of the SDI as being suitable for describing the state of the society objectively, a consensus about the underlying value judgements has to be found among the major protagonists. Ideally all indicators are linked to quantitative development goals. In that case the difference between the present development and the goal indicates the sustainability gap for an individual indicator and subsequently the need for action. To what extent the society as a whole is moving towards a path of sustainable development can only be estimated by a summarizing valuation of the development of the individual indicators of the SDI-set.

The international handbook on environmental-economic **accounting** (SEEA 2003) offers an approach for measuring the sustainability gap as one figure. The approach offered by the SEEA is limited to environmental sustainability. The gap is measured in monetary terms on the basis of the calculation of adjusted macro-economic aggregates, like the EDP (eco-domestic product). But it has to be noted that in the handbook itself the calculation of adjusted macro-economic aggregates is indicated as a still rather controversial issue and the calculation of adjusted aggregates is only mentioned as one possible option. The controversy described in the handbook is especially related to the problem of monetary valuation of the degradation of natural capital.

This paper does not take up the approach of one-dimensional environmentally adjusted macro-economic aggregates, but rather follows the principal idea of describing the sustainability gap by a multi-dimensional **indicator approach**. But unlike in the simple indicator approach described above, the individual indicators are systematically **linked with integrated** physical and monetary economic, environmental and social **accounting data.**

SDIs and accounts are approaches with **different purposes and characteristics**. Without entering a theoretical discussion four points could be highlighted (see figure 1):

Figure 1



- **Purpose:** SDIs – like indicators in general – are intended for the purposes of **communication and performance control**. Very often they cover specific topics of the political agenda for which they shall deliver short-term information. Accounts, on the contrary, aim at the complete and coherent **description of a system** such as a national economy (national accounts) or the relationships between economy and environment (environmental economic accounting). They are set for the long term and try to respond to more general data needs.
- **Level of detail:** SDIs are located on the top of the information pyramid; they provide a very condensed or **aggregated kind of information**. Accounts are more detailed, they belong to a **meso-level** between indicators on the top and very detailed basic statistics at the bottom of the information pyramid.

- **Foundation:** Accounting systems have a strong **theoretical foundation**. They are based on a common set of classifications, rules and concepts which define how to describe the system. Indicator selection and formulation is not following such rigid rules. In most cases there is "only" a framework which helps to structure the indicator set. The indicator set should reflect the social preferences of a society and therefore in an ideal case both framework and indicators are the outcome of **negotiation processes** among politicians, experts and stakeholders.
- **Main strengths:** Indicators are an appropriate tool to point to **relevant political problems** and to **visualize information** in a focussed way. Accounting systems benefit from their coherence and system orientation which **supports further analyses** of interdependencies and underlying causes and subsequently the formulation of political measures.

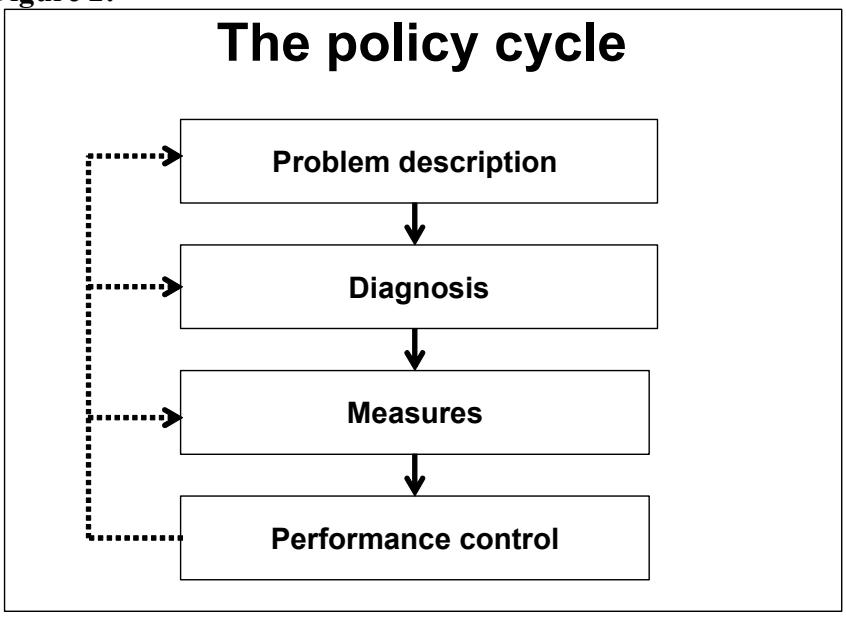
The primary data are the source for compiling the data for the accounting system. As long as the SDI and the accounting worlds are separated, the indicators are derived from primary data as well.

The vision presented in this paper is, to **merge the two pyramids** of figure 1. In terms of data that simply means, that the indicators should be embedded into the accounting data base, i.e. they could be derived by aggregation from the more detailed accounting data base. To merge the two pyramids will help to utilize the special advantages of both approaches with respect to political relevance of the data and the suitability as a communication tool, for integrated analysis as well as for formulation of measures. Why and how the two approaches should be linked and how it could be achieved is discussed below in more detail by referring to the German example.

II. Policy for sustainable development and data requirements

The respective advantages of the indicator and the accounting approach are of relevance for different steps of the **policy cycle**, i.e. problem description, diagnosis, measures and performance control (figure 2).

Figure 2:



Problem description:
SD indicators, which are usually highly aggregated, can reduce the complex reality to a limited number of figures. Therefore they can serve as a rather simple **communication tool** mainly directed to the general public and the media. They are used for describing important problems under a sustainability perspective and depending on the process of developing the indicator set, may more or less **reflect the political preferences** of the society. The sustainability gap - as mentioned - is measured indicator by indicator by comparing the observed values with the target values.

Diagnosis:
For the diagnosis or analysis highly aggregated indicators alone are generally not sufficient. An analysis of the underlying mechanisms and reasons for change of the indicator values requires **detailed disaggregated information**. The data base for further analysis can either be provided by detailed basic statistics or by an accounting system, which is rather situated at a meso-level.

Measures:
Political measures for achieving the sustainability goals of the society should be cost efficient and above all should be tailored for **balancing conflicting goals**. The general objective of sustainable development (SD) requires a holistic policy approach, as the issues of a SD-policy are closely interlinked. A policy for SD is characterised by not only looking on how far the goals for the individual indicators can be achieved, but has to have in mind the interdependencies between the topics and the simultaneous achievement of different economic, environmental and social goals. Decisions on measures aiming at the improvement of one indicator at the same time have to consider the effects that may occur on the other relevant goals of the overall strategy for SD. The rather complex analytical tools required for that type of policy approach demand a **homogeneous and coherent database** depicting the interdependencies between the different indicators. For that reason it will usually not be sufficient to deal with the different indicators individually. That is, the underlying data for the individual indicators should be part of a comprehensive framework that ideally integrates all relevant topics.

The System of National Accounts (SNA) form together with its satellite systems Environmental-Economic Accounts (EEA) and the Socio-economic Accounts (SEA) an **expanded accounting data set**. Such an expanded data set is an ideal framework to meet the above mentioned requirements[1]. The SNA is the world wide accepted standard for describing the economic process. The EEA and the SEA extend the economic accounts by a description of the interrelationships of the economic to the environmental and the social system and between the environmental and the social system. The satellite systems in principle use the same concepts, definitions and classifications as the SNA. That guaranties that the data of all three sub-systems can be combined with each other, i.e. they form an integrated database that covers the three principal topics of a sustainability approach.

An integrated analysis and especially the formulation of political measures require rather complex **analytical instruments**. It is one crucial advantage of the SNA data set that it is

[1] However it should be noted that even a highly developed accounting data base can not meet all analytical purposes in an exhausting manner. For example, it may be necessary to broaden the scope of the analysis by supplementing the headline indicators by additional indicators in order to obtain a more comprehensive description of the problem. Moreover not all data needs coming up in the course of sustainability analysis can be covered by the accounting data set. In those cases it may be necessary to use appropriate special data in addition to the principal accounting framework.

being widely used as a basis for already existing and proven analytical tools that are related to the economic process. The extension of those tools for analysing environmental-economic questions has already been put into practice successfully in Germany and other countries.

Performance control:
The indicators, especially if they are combined with quantitative goals, serve as an instrument for general performance controlling of political measures. A reduction of the gap between the observed and the target values indicates improvement of sustainable **score keeping for individual indicators**.

Modelling can provide a more complex approach of score keeping by **comparing the "business-as-usual Gross Domestic Product" (GDP) to a "sustainable GDP"**[2]. This can be achieved by comparing a modelling scenario for the economic-social-environmental system without measures (business-as-usual) with a scenario that simulates the effects of a bundle of measures which are orientated towards respecting the sustainability goals of the society.

III. The German strategy for sustainable development

In Germany the Government adopted the **National Strategy for Sustainable Development** in April 2002. The approval was preceded by a discussion of the draft with major groups and institutions of the society. With the adoption of the strategy by the government broadly accepted indicators on SD are available. The strategy was developed by the "Committee of State Secretaries for Sustainable Development" which was headed by the advisor to the Federal Chancellor. It has different elements, like defining the key focus points for SD, selecting indicators, formulating quantitative or qualitative goals related to the indicators and a set of measures related to some of the key focus points. The sustainability indicator set is comprised of 21 indicators.

By the **selection of the indicators** the responsible policy makers defined those issues which are particularly relevant under sustainability considerations. By formulating **target values** the policy side signalised that they are prepared to promote the attainment of the goals by appropriate political measures.

The National Strategy for Sustainable Development contains, beyond the indicators, an identification of a number of priority areas for which political measures where formulated.

The role of the German Federal Statistical Office (FSO) in developing the national sustainability indicators was rather limited. Though the statisticians from the FSO took part in different stages as experts, they were not involved in a systematic way with clear responsibilities. Insofar, even in the field of formulating the indicators, there was an obvious **dominance of the political side**.

As far as the development of the environment related indicators is concerned the strategy for SD could heavily draw on the work on the **German Environment Barometer** of the Ministry of Environment which was published in 1999. The Environment Barometer considerably influenced and focussed the public discussions on environmental issues. The development of the Barometer was closely related to the development of the EEA. Therefore it is not surprising that five out of six indicators of the Barometer (raw material use, the energy use, CO_2 emissions, emissions of acidification gases and land use for housing and transport) were

[2] See Meyer, B. (1998) and Radermacher, W. (1998 (2)).

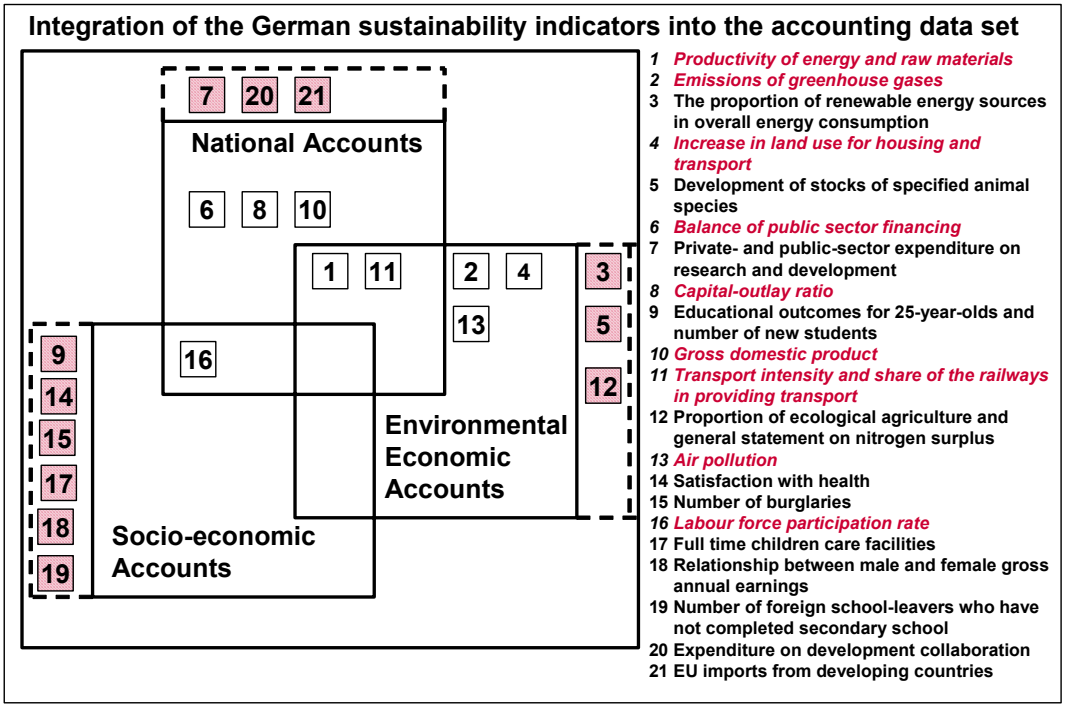
fully embedded into the EEA data-set. That is, these indicators can be derived from the EEA data by aggregation. These five indicators from the Barometer, with a few changes, are also used as the core of environment related indicators of the sustainability indicator set.

IV. German accounting data and the national sustainability strategy

The German Environmental-Economic Accounting of the FSO from the very beginning was viewed by the Ministry of Environment as a contribution to the sustainability debate and the sustainability paradigm played a central role in developing the concepts and the data of the EEA. In Germany a rather high proportion of the economic and environmental indicators of the National Strategy for Sustainable Development are embedded into the accounting system. The work on the development of a socio-economic accounting satellite is under progress. Some results have already been publishes. Important examples are the Social Accounting Matrix for the year 2000 und comprehensive time series of monetary and physical data on characteristics of private households and population[3].

Figure 3 gives an overview about the degree of **integration of the 21 indicators** of the national SD-strategy into the **accounting system**.

Figure 3



Most of the economic and environmental indicators are already embedded into the accounting data set. That refers to the indicators public sector financing (6), capital-outlay ratio (8), gross domestic product (10), productivity of energy and raw materials (1), emissions of greenhouse gases (2), increase in land use for housing and transport (4), transport intensity and share of railways in providing transport (11), air pollution (13) and labour force participation rate (16). Most of these indicators are rather strongly related to other indicators of the set. Among the

[3]See Opitz/Schwarz (2004) and Opitz (2005).

remaining indicators (box with broken line) the embedding of the indicator proportion of ecological agriculture and general statement on nitrogen surplus (12) is under preparation. The other indicators in principle could also be integrated into the accounting data set. But at least for some of these indicators integration into the accounting system seems to be less urgent.

One central classification of the accounting system which is shared commonly by all three sub-systems is the **NAMEA-type break down** (National Accounts Matrices Including Environmental Accounts) by economic activities (homogeneous branches of production or industries and private households).

All embedded indicators (except public sector financing) are available in a NAMEA-type break down, (71 branches and private households). Figure 4 shows which data of the German Environmental-Economic Accounting are available in the NAMEA-format.

Figure 4

Data of the German Environmental-Economic Accounting in a NAMEA-type breakdown

	Unit
Primary material by aggregated categories of material	Tons
Abstraction of water from nature and water flows within the economy	m^3
Primary energy consumption (total and emission relevant)	Terajoules
Air emissions	Tons
Greenhouse gases by type	Tons
Air pollution by type	Tons
Waste water and other discharge of water into nature	m^3
Waste by waste categories 1)	Tons
Land use for housing and transport by land use categories	km^2
Figures on the transport sector by mode of transport:	
Transport related energy consumption, fuel consumption, air emissions	Terajoules/Tons
Kilometres driven, person kilometres, tonnes kilometres	km
Transport related environmental taxes by type	Euro
Stock of vehicles by type	Number and Euro

1) Only figures until 1995, old classification.

Part of the sustainable development indicator set

NAMEA-type environment related data are provided for Germany on a regular basis for energy, primary material (raw material and imported material), air emissions, waste, water and wastewater flows, land use for housing and transport and data for the transport sector.

The area used for housing and transport is shown in the NAMEA-format in a further breakdown by land use categories. The land use category housing and transport area indicates a particularly intensive structural pressure on the natural assets category land respectively on the eco-systems to be localised there. A number of variables related to transport appear in the German accounts also in the NAMEA-format. In the sense of the SEEA 2003 a part of them can be assigned to the world of physical flow accounting (transport related energy use and air emissions). Some belong to the category of environment related disaggregation of monetary SNA flows or stocks (e.g. environment related taxes, stock of vehicles). Others, like kilometres driven, person kilometres, tonnes kilometres, are not covered in the SEEA-concept up to now.

The integrated accounting data can be applied for different types of analysis. Very common **applications** refer to the use of the data for descriptive analysis, like the calculation of eco-efficiency indicators on a national or a industry level, decomposition analysis (e.g. decomposition of the development of a variable by factors like economic growth, economic structure and intensity) as well as input-output analysis (e.g. calculation of indirect use of environmental resources). But the most important application is the utilisation of the data in environmental-economic modelling approaches. Those models can show the effects of measures taken not only on the SDIs primarily concerned but also the side effects on other SDIs with perhaps conflicting sustainability goals. The examples for the application of environmental-economic models in Germany range from modelling scenarios of rather comprehensive SD-policy approaches, which included quite a number of political measures for improving simultaneously the performance of economic, transport related and environmental variables like energy use, air emissions and area use, to more specialised exercises[4]. One example of the latter refers to the traffic-related SDIs of the German Sustainability Strategy: Hypothetical political measures to improve the performance of transport-indicators were modelled on the basis of Environmental Economic Accounting data. Besides effects on the performance of the transport-indicators the consequences for the trends of a number of other environment-related, economic and social SDIs were forecasted. Insofar it is important to stress that the proposed "fusion" of SDIs and accounting requires – besides politicians and statisticians/accountants – a third party: scientists who build models that run scenarios and prognoses for the trends of SDIs on the basis of accounting data.

V. A strategy for integrating indicators and accounts

A **strategy** for the development of integrated indicators and accounts as the basis for an **integrated SD policy** consists of three elements to be worked on: further adjustment of the indicator set, expansion of the accounting system and development of appropriate tools for integrated SD analysis (see figure 5).

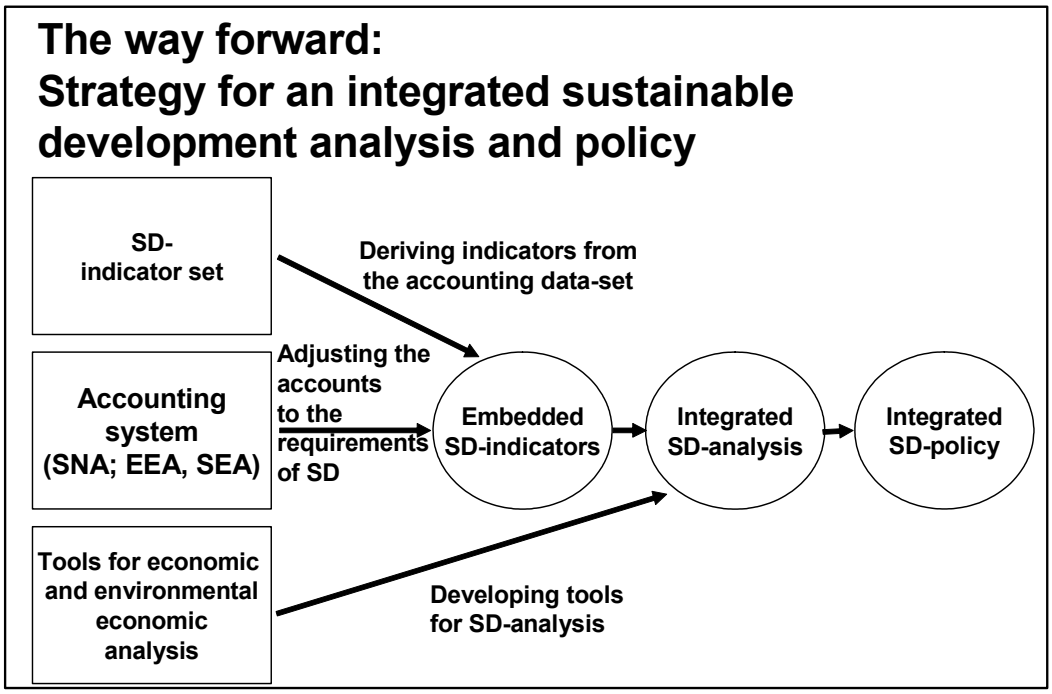
The formulation of an indicator set for SD and the creation of an integrated database necessarily has to be a long-term task. On the one hand policy demands indicators on relatively short notice for describing the sustainability problem. But on the other hand the methodological concepts for approaching the sustainability problem scientifically and politically and, above all, the appropriate database are still under development. This dilemma can be solved only by a stepwise approach.

It is the task of the political side to identify the priority issues to be included into the indicator set for SD. On that basis concrete indicators can be formulated on relative short notice by using already existing data. That was what happened in developing the present national indicator system in Germany. But indicators which were developed in such an ad-hoc manner necessarily run the risk of putting together indicators which are not linked with each other and which therefore can only be of limited use for an integrated policy on SD.

Developing an indicator set for SD that on the one hand perfectly covers the politically important issues and on the other hand is embedded into a coherent and rather comprehensive database can only be an iterative process with a threefold movement:

[4] See for example Meyer, B. (2004).

Figure 5



1. Future revisions of the indicator set should try to **derive** as much **indicators** as possible **from the** existing **accounting data set by aggregation**. In any case, in future it will be necessary to review and improve the existing indicator set in the light of new problems, methodological progress and with the goal of attaining better international harmonisation.
2. The **accounting system** itself **has to be adjusted** to the new data needs. It has to be put high priority on extending the accounting data set **towards the priority issues of a policy for SD**. The accounting framework offers rather good and cost efficient opportunities of generating the required data by reformatting already existing figures. But beyond this, depending on the quality requirements, in the long run it may also be necessary to improve some of the accounting estimates by new primary surveys.
3. At the same time, also further investment in developing appropriate **tools (modelling approaches) for an integrated environmental, social an economic analysis** will be necessary. The feedback arising from concrete analytical applications of the data have also proven to be very important for a targeted development of the accounting data set.

In the economic domain statistical data and especially accounting data as well as the analytical instruments utilising those data are a common basis for dealing with conflicts of interest and for decision finding. A policy for sustainable development can only stand firm in the social discourse against particularistic interest and particularistic policy approaches in the long run, if it is also sufficiently founded on data and facts. Insofar, investment in the development of a data base for a policy on sustainable development and the related analytical instruments is a necessary condition for carrying through that policy approach.

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